

- 1 -

**ELECTRICAL CONNECTOR WITH TERMINAL
SUPPORTING WALLS**

5 The invention relates to an electrical connector with insulation displacement terminals, and more particularly, to an electrical connector with insulation displacement terminals that are wider than spacing between adjacent contacts in the connector.

10 US-A-5,121,850 discloses an electrical connector comprising, an insulating housing and a termination cover that is movable toward a cable receiving face on the housing. Electrical contacts are spaced apart in the housing. Insulation displacement terminals on respective contacts are spaced apart from one another. The contacts and the terminals are arranged in two rows. The terminals
15 are the widest portions of respective contacts. The contacts must be spaced apart to prevent electrical shorting between adjacent terminals. Accordingly, the width of the terminals determine how closely spaced the contacts can be adjacent to one another.

20 As disclosed in US-A-5,122,079, the contacts can be spaced closer together, even when the terminals are wider than the spacing between the contacts. The terminals on contacts in one row of contacts are alternately positioned along opposite sides of a channel shaped opening. Thus,
25 two rows of terminals extend from one row of contacts. The terminals are alternately spaced apart to prevent electrical shorting between adjacent contacts in the same row of contacts. It has been observed that the terminals are susceptible to undesired misalignment and undesired
30 bending within the channel shaped opening, especially during penetration of the terminals into a cable for electrical connection of the terminals to the cable. Once the cable is clamped between the cover and the housing, the terminals are hidden. A misaligned or bent terminal
35 could produce a defective electrical connection. Heretofore, the terminals were installed in the housing, and a separate insulator was assembled to surround the



terminals. The separate part increased the cost of the connector, and required an extra assembly step.

5 A feature of the invention resides in a housing that resists bending of two rows of terminals that extend from one row of electrical contacts. The housing eliminates the need for a separate insulator to surround the terminals.

10 According to an embodiment, a housing is constructed such that contact receiving cavities communicate with two slotted openings, an electrical contact in each of the cavities extends along one or the other of the slotted openings, projecting walls on the housing extend rearward of the slotted openings, a terminal on the contact is wider than the spacing between adjacent cavities, the
15 terminal is received in slotted spaces between the projecting walls, and opposite sides of the terminal are confined between respective projecting walls to resist bending of the terminal.

20 An embodiment of the invention will now be described by way of example with reference to the accompanying drawings, according to which:

FIGURE 1 is a cross section view of an electrical connector as shown in US-A-5,122,079, together with a feature of the invention not present in the connector of
25 said Patent;

FIGURE 2 is an end view of the connector shown in Fig. 1, with parts cut away;

FIGURE 3 is an isometric view of an electrical contact in the connector shown in Fig. 1;

30 FIGURE 4 is an isometric view of another electrical contact in the connector shown in Fig. 1;

FIGURE 5 is an enlarged cross section of a PRIOR ART housing of the electrical connector as shown in US-A-5,122,079;

35 FIGURE 6 is an enlarged cross section of a housing of the electrical connector as shown in Fig. 1; and

FIGURE 7 is an enlarged isometric view of the connector shown in Fig. 1 with parts cut away.



- 3 -

With reference to the drawings, an electrical connector 1 comprises an insulating housing 2, a first or cable receiving face 3 on a rear of the housing 2, a termination cover 4, Fig. 1, and a cable engaging face 5 on the cover 4, the cover being movable toward the cable engaging face 3 to terminate and clamp an electrical cable, not shown. Further details of the connector 1 are disclosed in the aforementioned US-A-5,122,079.

The connector 1 further comprises, multiple contact receiving cavities 6 in the housing 2, the cavities 6 being arranged in two rows, Figs. 1, 5 and 6. Adjacent cavities 6 are in the same row of cavities 6, as shown in Fig. 2. An open mouth 7 in a second face or mating front end 8 of the connector 1 communicates with each of the cavities 6. First projecting walls 9 are unitary with the housing 2 and separate adjacent cavities 6 from each other, Figs. 1, 2 and 6, with additional walls 9 being beside cavities 6 that are at the ends of each of the rows of the cavities 6. The walls 9 extend to the cable receiving face 3, as shown in Fig 6. Fig. 5 illustrates a housing 1 without the walls 9. Second projecting walls 10 are unitary with the housing 2, and extend along opposite sides of cavities 6. The walls 10 extend to the cable receiving face 3. The cable receiving face 3 is distributed over and along rear ends of the respective walls 10 and rear ends of the respective walls 9, Fig. 6. The walls 10 extend along both sides of the rows of the contacts 13, and extend transversely with respect to the walls 9.

With reference to Figs. 1, 2, 6 and 7, slotted spaces 11 are at opposite ends of each of the walls 9. The slotted spaces separate the walls 9 from the walls 10. The slotted spaces 11 extend alongside the walls 10. The slotted spaces extend between respective walls 10 and respective walls 9. Each of the cavities 6 communicates with two, spaced apart, slotted openings 12. The slotted openings 12 communicate with respective slotted spaces 11.

- 4 -

With respect to the Figs. 1, 3, 4 and 7, electrical contacts 13 are stamped and formed from thin metal strip having a plane of thickness. A curved contact portion 14 at a front of each contact 13 is received in a corresponding cavity 6. A rearward contact section or insulation displacement terminal 15 on a rear, thin plate of each contact 13 comprises, an insulation displacement slot 16 between flanges 17 extending in a plane of thickness of the thin plate of the contact 13. The flanges 17 define a width of the terminal 15 that is wider than the spacing between adjacent cavities 6. Adjacent cavities 6 are in the same row of cavities and are on opposite sides of a common wall 9.

Each contact 13 is constructed with one of two shapes. One shape, Fig. 4, on one of the contacts 13 comprises an offset bent portion 18 to extend the terminal 15 along a first of the slotted openings 12 when the contact 13 is inserted into a corresponding cavity 6. The other shape comprises an unbent portion 19, instead of the bent portion 18, to extend the terminal 15 along a second of the slotted openings 12. Barbs 20 on a portion of each contact 13 project in the plane of thickness of the contact 13. The barbs 20 engage opposite interior sides of the corresponding slotted opening 12, thereby to lock the contact 13 to the housing 2. Adjacent cavities 6 contain adjacent contacts 13. The terminals 15 on the adjacent contacts 13 are wider than the spacing between the adjacent contacts 13. The adjacent contacts 13 comprise the two contacts 13 of different shape. The terminals 15 on the adjacent contacts 13 extend to two different rows of the terminals 15, thereby to prevent electrical shorting of the terminals 15.

The widths of the slotted spaces 11 are slightly wider than the plane of thickness of a corresponding terminal 15. Opposite sides of each terminal 15 are confined in a corresponding slotted space 11, Figs. 1, 2, and 7. Opposite sides of the terminal 15 are confined between respective projecting walls 9 and 10. The

- 5 -

adjacent terminals 15 on the adjacent contacts 13 are overlapped by the same one of said projecting walls 9 to resist bending of said adjacent terminals 15. Accordingly, the walls 9 and 10 resist bending of the
5 terminal 15.

An advantage of the invention resides in an electrical connector comprising a housing that eliminates the need for a separate insulator to surround the terminals to resist bending of the terminals.

WHAT IS CLAIMED IS:

1. An electrical connector (1) of the type wherein contacts (13) are insertable into cavities (6) of an insulative housing (2) from a first face (3) toward a second face (8), and said contacts include rearward contact sections (15) that are received into rearward cavity portions, characterized in that:

each of the cavities (6) communicates with two slotted openings (12) adjacent the first face (3);
the electrical contact (13) in each of the cavities (6) extends along one or the other of the slotted openings (12),

projecting walls (9,10) on the housing (2) extend rearward of the slotted openings (12),
the rearward section (15) of the contact (13) is received in slotted spaces (11) between the projecting walls (9,10), and

opposite sides of the rearward contact section (15) are confined between respective projecting walls (9,10) to resist bending of the rearward contact section (15).

2. An electrical connector as recited in claim 1, wherein said rearward contact section (15) is wider than the spacing between adjacent cavities (6).

3. An electrical connector as recited in claim 1, wherein first ones of said contacts (13) include an offset bent portion (18) forwardly of said rearward contact section (15) thereof to align said rearward contact section with one of said slotted openings (12) for insertion thereinto, and second ones of said contacts (13) include an unbent portion forwardly of said rearward contact section (15) thereof to align said rearward contact section with the other of said slotted openings.

4. An electrical connector as recited in claim 1, and further comprising: a thin plate on each rearward contact section (15), each plate having a plane of thickness, an insulation displacement slot (16) in an end of the thin plate, and flanges (17) being on the thin plate and projecting in the plane of thickness.





- 7 -

5. An electrical connector as recited in claim 4 wherein, a cable termination cover (4) is adapted to be secured to said first face (3) to clamp an electrical cable along said first face (3), maintaining conductors of the cable in said insulation displacement slots (16) of respective said rearward contact sections (15).

6. An electrical connector as recited in claim 1 wherein, said cavities (6) extend transversely between first ones (9) of said projecting walls, and second ones (10) of said projecting walls extend transversely between said first ones (9) of said projecting walls.

7. An electrical connector as recited in claim 6 wherein, the first face (3) is distributed along each of the projecting walls (9,10).

8. An electrical connector as recited in claim 1 wherein, the slotted spaces (11) are at opposite ends of each of said first projecting walls (9).

9. An electrical connector as recited in claim 1 wherein, adjacent ones of said rearward contact sections (15) are overlapped by the same one of said projecting walls (9,10) to resist bending of said rearward contact sections (15).

10. An electrical connector (1) comprising:
a cable receiving face (3) on an insulating housing (2),

adjacent cavities (6) in the housing (2),
adjacent contacts (13) in respective adjacent cavities (6),

projecting walls (9,10) on the housing (2) between adjacent cavities (6) in the same row of cavities, and slotted spaces (11) between the projecting walls,

a first terminal (15) on one of the adjacent contacts (13), the first terminal being in one of said slotted spaces (11),

a second terminal (15) on another of the adjacent contacts (13), the second terminal being in a second of said slotted spaces (11), and



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- 8 -

the first and second terminals being overlapped by the same one of said projecting walls (9,10) to resist bending of said terminals (15).

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AMENDED CLAIMS

[received by the International Bureau on 29 May 1996 (29.05.96);
original claim 1 amended; remaining claims unchanged (1 page)]

1. An electrical connector (1) of the type wherein
contacts (13) are insertable into cavities (6) of an
5 insulative housing (2) from a first face (3) toward a
second face (8), and said contacts include rearward
contact sections (15) that are received into rearward
cavity portions, characterized in that:

each of the cavities (6) communicates with two
10 slotted openings (12) coextending from adjacent the first
face (3) to communicate with the second face (8);

the electrical contact (13) in each of the cavities
(6) extends along one or the other of the slotted openings
(12),

15 projecting walls (9,10) on the housing (2) extend
rearward of the slotted openings (12),

the rearward section (15) of the contact (13) is
received in slotted spaces (11) between the projecting
walls (9,10), and

20 opposite sides of the rearward contact section (15)
are confined between respective projecting walls (9,10) to
resist bending of the rearward contact section (15).

2. An electrical connector as recited in claim 1,
wherein said rearward contact section (15) is wider than
25 the spacing between adjacent cavities (6).

3. An electrical connector as recited in claim 1,
wherein first ones of said contacts (13) include an offset
bent portion (18) forwardly of said rearward contact
section (15) thereof to align said rearward contact
30 section with one of said slotted openings (12) for
insertion therinto, and second ones of said contacts (13)
include an unbent portion forwardly of said rearward
contact section (15) thereof to align said rearward
contact section with the other of said slotted openings.

35 4. An electrical connector as recited in claim 1,
and further comprising: a thin plate on each rearward
contact section (15), each plate having a plane of
thickness, an insulation displacement slot (16) in an end
of the thin plate, and flanges (17) being on the thin
40 plate and projecting in the plane of thickness.



1 / 4

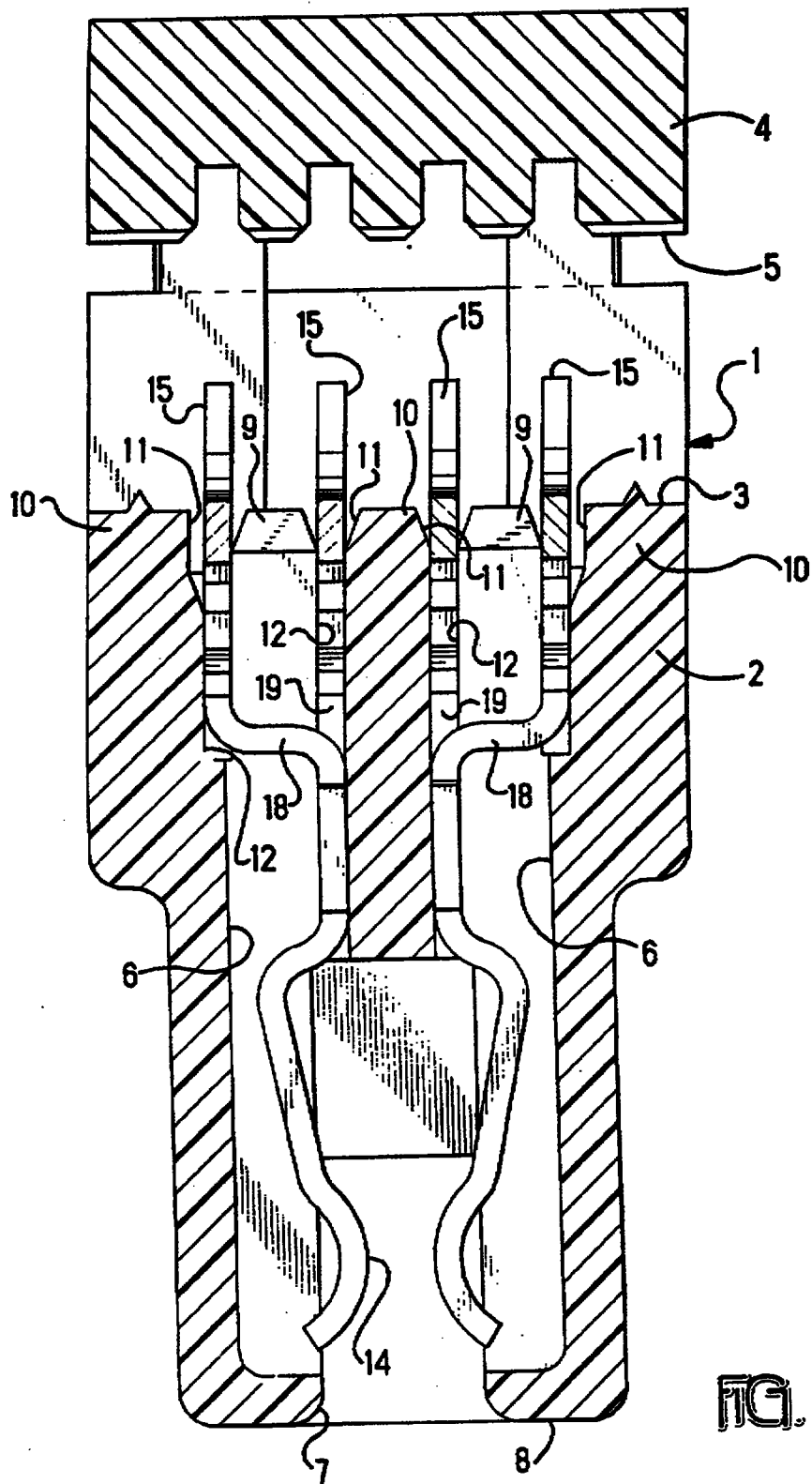
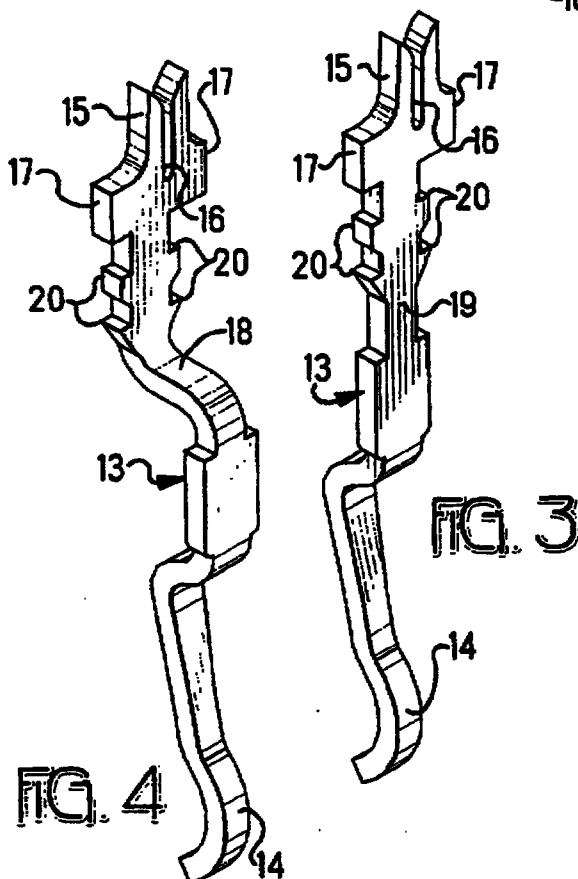
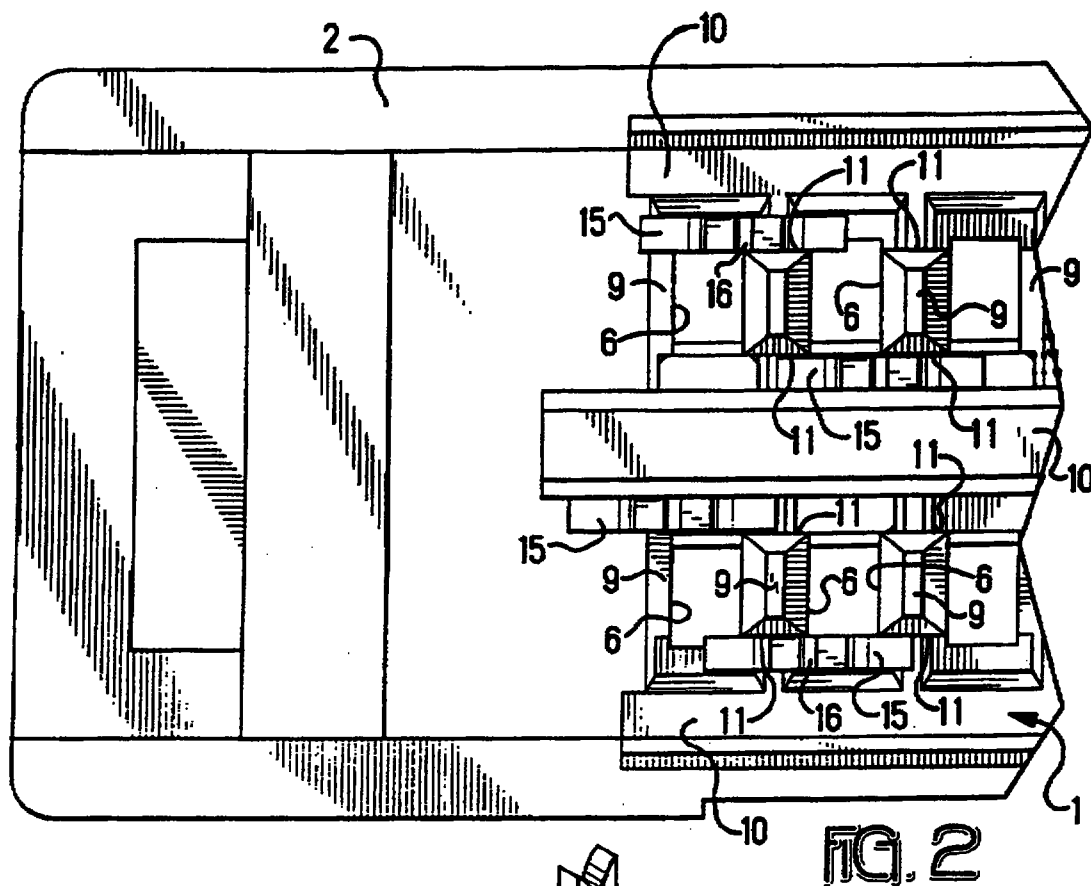
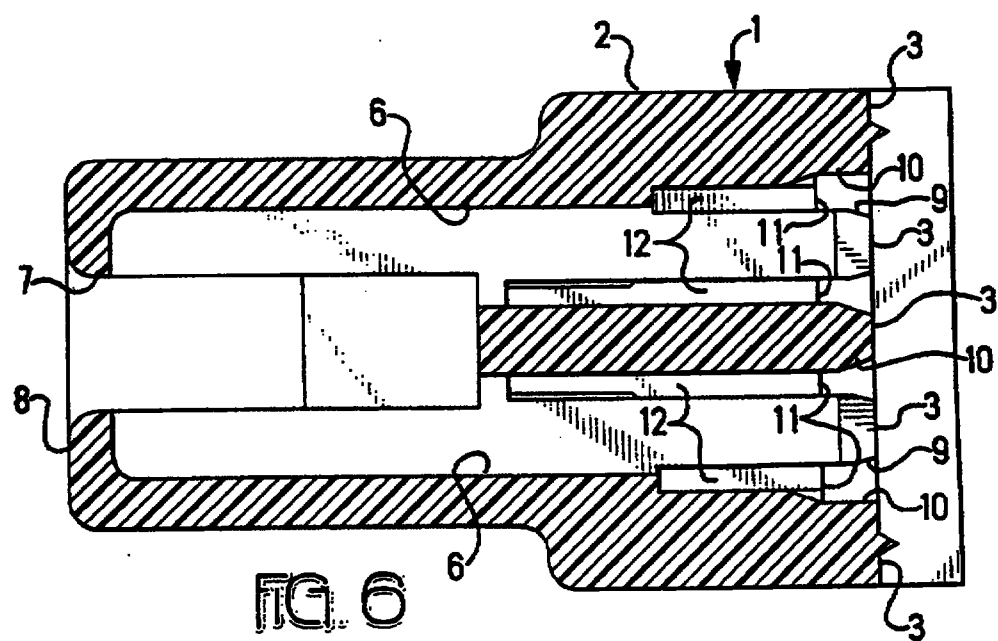
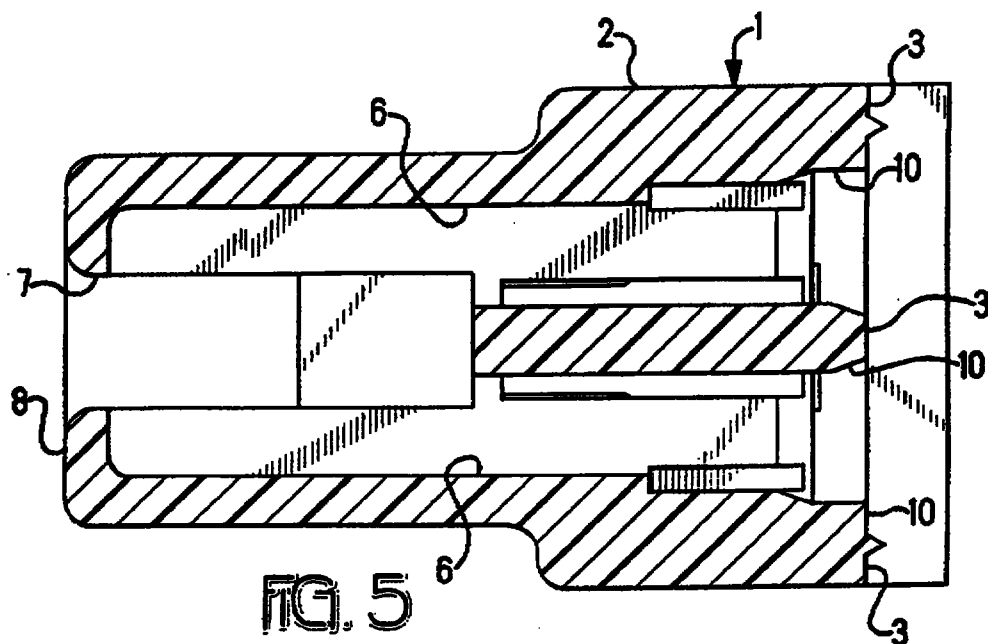


FIG. 1

2 / 4





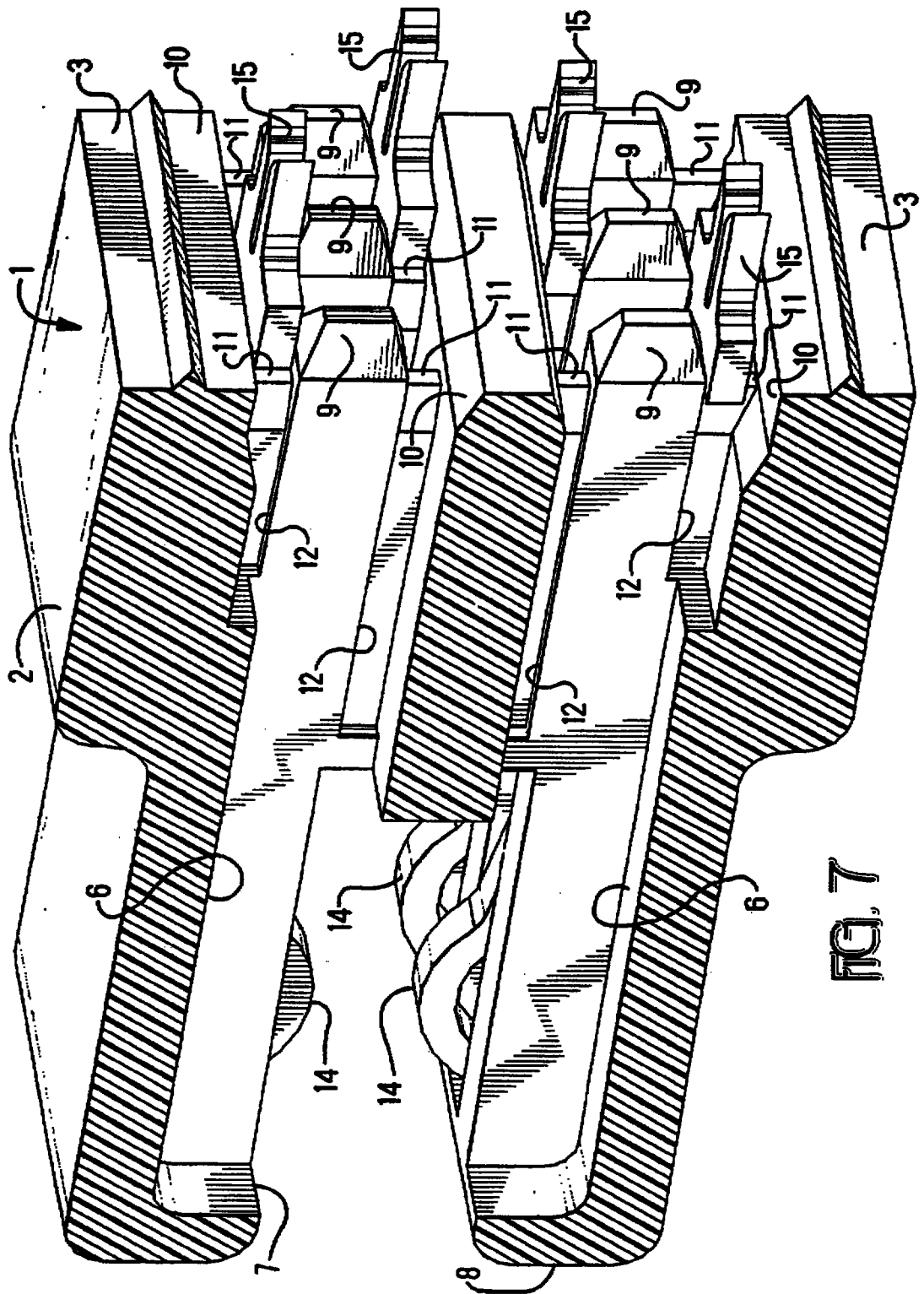


FIG. 7

-1-

**ELECTRICAL CONNECTOR WITH TERMINAL
SUPPORTING WALLS**

The invention relates to an electrical connector with
5 insulation displacement terminals, and more particularly,
to an electrical connector with insulation displacement
terminals that are wider than spacing between adjacent
contacts in the connector.

In EP-A-0571156 is disclosed a connector having
10 cavities that communicate with two slotted openings,
contacts that extend along one or the other of the
openings, projecting walls that extend rearward of the
slotted openings, a rearward section of each contact that
is received in one of the slotted spaces between the
15 projecting walls, and opposite sides of each rearward
contact section that are confined between respective
projecting walls to resist bending of the rearward contact
section.

US-A-5,125,850 discloses an electrical connector
20 comprising, an insulating housing and a termination cover
that is movable toward a cable receiving face on the
housing. Electrical contacts are spaced apart in the
housing. Insulation displacement terminals on respective
contacts are spaced apart from one another. The contacts
25 and the terminals are arranged in two rows. The terminals
are the widest portions of respective contacts. The
contacts must be spaced apart to prevent electrical
shorting between adjacent terminals. Accordingly, the
width of the terminals determine how closely spaced the
30 contacts can be adjacent to one another.

As disclosed in US-A-5,122,079, the contacts can be
spaced closer together, even when the terminals are wider
than the spacing between the contacts. The terminals on
contacts in one row of contacts are alternately positioned
35 along opposite sides of a channel shaped opening. Thus,
two rows of terminals extend from one row of contacts.
The terminals are alternately spaced apart to prevent
electrical shorting between adjacent contacts in the same
row of contacts. It has been observed that the terminals

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- 2 -

are susceptible to undesired misalignment and undesired bending within the channel shaped opening, especially during penetration of the terminals into a cable for electrical connection of the terminals to the cable. Once the cable is clamped between the cover and the housing, the terminals are hidden. A misaligned or bent terminal could produce a defective electrical connection.

Heretofore, the terminals were installed in the housing, and a separate insulator was assembled to surround the terminals. The separate part increased the cost of the connector, and required an extra assembly step.

A feature of the invention resides in a housing that resists bending of two rows of terminals that extend from one row of electrical contacts. The housing eliminates the need for a separate insulator to surround the terminals.

According to an embodiment, a housing is constructed such that contact receiving cavities are defined in rows each by a series of transverse walls between opposed longitudinal walls with slotted spaces extending longitudinally therebetween along a cable receiving face, each cavity communicates with two slotted openings extending inwardly from shoulders at the slotted spaces, an electrical contact in each of the cavities extends along one or the other of the slotted openings and is retainingly engaged in the slotted opening, a terminal on the contact is wider than the spacing between adjacent cavities and is received in the slotted spaces between the projecting walls, and opposite sides of the terminal are confined between respective projecting walls to resist bending of the terminal.

In one aspect of the invention, the terminals of adjacent contacts are overlapped by the same transverse wall and opposed ones of the longitudinal walls to resist bending.

An embodiment of the invention will now be described by way of example with reference to the accompanying

- 2 a -

drawings, according to which:

FIGURE 1 is a cross section view of an electrical connector as shown in US-A-5,122,079, together with a feature of the invention not present in the connector of said Patent;

FIGURE 2 is an end view of the connector shown in Fig. 1, with parts cut away;

FIGURE 3 is an isometric view of an electrical contact in the connector shown in Fig. 1;

FIGURE 4 is an isometric view of another electrical contact in the connector shown in Fig. 1;

FIGURE 5 is an enlarged cross section of a PRIOR ART housing of the electrical connector as shown in US-A-5,122,079;

FIGURE 6 is an enlarged cross section of a housing of the electrical connector as shown in Fig. 1; and

FIGURE 7 is an enlarged isometric view of the connector shown in Fig. 1 with parts cut away.

WHAT IS CLAIMED IS:

1. An electrical connector (1) of the type wherein contacts (13) are insertable into cavities (6) of an insulative housing (2) from a first face (3) toward a second face (8), and said contacts include rearward contact sections (15) that are received into rearward cavity portions, characterized in that:

said cavities are formed by a series of transverse walls (9) and a pair of longitudinally extending walls (10), and each of the cavities (6) communicates with opposed slotted openings (12) coextending toward the second face (8) from adjacent the first face (3);

each said slotted opening (12) is defined by a portion of longitudinally extending walls (10) and is recessed behind consecutive transverse walls (9), and each ends at a respective shoulder recessed inwardly from the first face (3) in slotted spaces (11) between the transverse walls (9) and the longitudinally extending walls (10); and

electrical contacts (13) extend along one or the other of slotted openings (12) in contact retaining engagement therewith while rearward sections (15) of the electrical contacts (13) fit into the slotted spaces (11) in a staggered relationship whereby confinement of opposite sides of the contacts (13) between the walls (9,10) resists bending of the contacts and flanges of the rearward portions (15) extend along said slotted spaces (11).

2. An electrical connector as recited in claim 1, wherein said rearward contact section (15) is wider than the spacing between adjacent cavities (6).

3. An electrical connector as recited in claim 1, wherein first ones of said contacts (13) include an offset bent portion (18) forwardly of said rearward contact section (15) thereof to align said rearward contact section with one of said slotted openings (12) for insertion thereinto, and second ones of said contacts (13) include an unbent portion forwardly of said rearward



-7-

contact section (15) thereof to align said rearward contact section with the other of said slotted openings.

4. An electrical connector as recited in claim 1, and further comprising: a thin plate on each rearward contact section (15), each plate having a plane of thickness, an insulation displacement slot (16) in an end of the thin plate, and flanges (17) being on the thin plate and projecting in the plane of thickness.

5. An electrical connector as recited in claim 4 wherein, a cable termination cover (4) is adapted to be secured to said first face (3) to clamp an electrical cable along said first face (3), maintaining conductors of the cable in said insulation displacement slots (16) of respective said rearward contact sections (15).

6. An electrical connector as recited in claim 1 wherein, said cavities (6) extend transversely between first ones (9) of said projecting walls, and second ones (10) of said projecting walls extend transversely between said first ones (9) of said projecting walls.

7. An electrical connector as recited in claim 6 wherein, the first face (3) is distributed along each of the projecting walls (9,10).

8. An electrical connector as recited in claim 1 wherein, the slotted spaces (11) are at opposite ends of each of said first projecting walls (9).

9. An electrical connector as recited in claim 1 wherein, adjacent ones of said rearward contact sections (15) are overlapped by the same one of said projecting walls (9,10) to resist bending of said rearward contact sections (15).

10. An electrical connector (1) of the type having an insulative housing (2) defining a cable receiving face (3) and contacts (13) in respective ones of a plurality of cavities (6), and each contact (13) includes a terminal (15) along the cable receiving face (3), characterized in that:

said cavities (6) are formed by a series of transverse walls (9) and a pair of longitudinally extending walls (10) with adjacent ones of cavities (6)



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-8-

divided by transverse walls (9) that extend between
opposed longitudinally extending walls, and each of the
cavities (6) communicates with opposed slotted spaces (11)
5 extending along respective longitudinally extending walls
(10) and adjacent said transverse walls (9), and

terminals (15) on adjacent ones of contacts (13) in
adjacent cavities (6) are disposed in opposed ones of
slotted spaces (11) and are overlapped by the same one of
10 said projecting walls (9) and opposed ones of
longitudinally extending walls (10) to resist bending of
said terminals (15).



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(21) International Application Number: PCT/US95/16564 (22) International Filing Date: 15 December 1995 (15.12.95) (30) Priority Data: 08/413,731 28 February 1995 (28.02.95) US (71) Applicant: THE WHITAKER CORPORATION [US/US]; Suite 450, 4550 New Linden Hill Road, Wilmington, DE 19808 (US). (72) Inventor: ENGLERT, Michael, W., Jr.; 2733 Kendrick Av- enue, Charlotte, NC 28269 (US). (74) Agents: NESS, Anton, P. et al.; The Whitaker Corporation, Suite 450, 4550 New Linden Hill Road, Wilmington, DE 19808 (US).	(81) Designated States: CN, JP, KR, SG, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE). Published With international search report. With amended claims.	

(54) Title: ELECTRICAL CONNECTOR WITH TERMINAL SUPPORTING WALLS

(57) Abstract

An electrical connector (1) comprises, a cable receiving face on an insulating housing (2), a cable engaging face on a termination cover (3), cavities (6) in the housing (2), each of the cavities (6) communicating with two slotted openings (12), electrical contacts (13) received in one or the other of the slotted openings (12), insulation displacement terminals (15) on adjacent contacts (13) being wider than spacing between the adjacent contacts (13), and opposite sides of the terminals (15) being confined between respective first and second walls (9, 10) to resist bending of the terminals (15).

