



(51) International Patent Classification:

H01R 13/115 (2006.01) H01R 4/18 (2006.01)

(21) International Application Number:

PCT/IB2018/052631

(22) International Filing Date:

16 April 2018 (16.04.2018)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

15/587,600 05 May 2017 (05.05.2017) US

(71) Applicant: TE CONNECTIVITY CORPORATION

[US/US]; 1050 Westlakes Drive, Berwyn, PA 19312 (US).

(72) Inventors: DIDONATO, Michael Edward;

156 Erford Road, Apt. 410, Camp Hill, PA 17011 (US). HUMPHREY, David Tracy; 515 East Broadway, Red Lion, PA 17356

(US). LONDON, III, Raymond Leroy; 964 Hedgewyck Lane, Elizabethtown, PA 17022 (US).

(74) Agent: OAKES, Brian C.; 4550 Linden Hill Road, Suite 140, Wilmington, DE 19808 (US).

(81) Designated States (unless otherwise indicated, for every

kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH,

(54) Title: ELECTRICAL TERMINAL HAVING A PUSH SURFACE

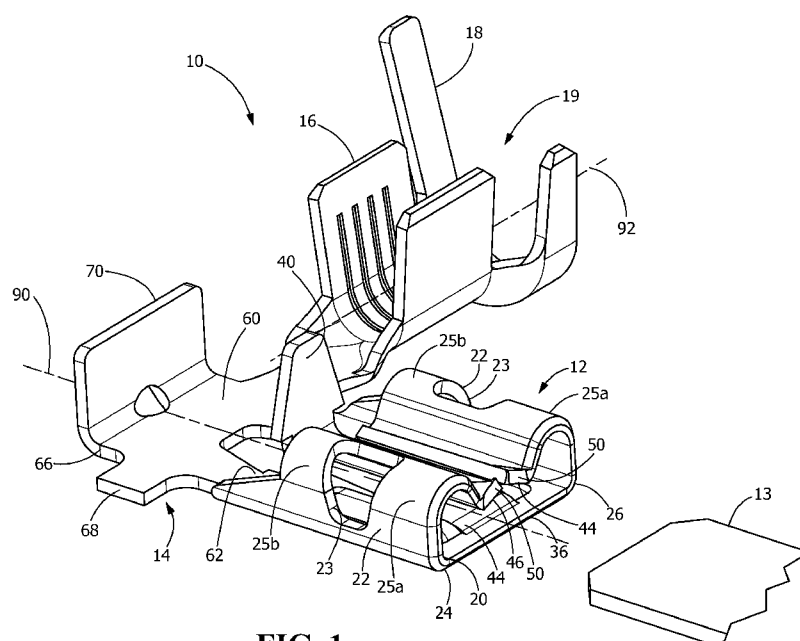


FIG. 1

(57) Abstract: An electrical terminal (10) having a contact portion (12), a wire termination portion (19) and a transition portion (14) is disclosed. The contact portion (12) is configured to receive a mating terminal (13) along a mating axis. The wire termination portion (19) defines a wire terminal axis (92) that intersects a mating axis (90). The transition portion extends between the contact portion and the wire termination portion. The transition portion (14) extends parallel to the mating axis (90) and the wire terminal axis (92). An engagement section (70) extends at an angle from the transition portion (14). The engagement section (70) has a push surface intersecting the mating axis (90). A force can be applied to the push surface (72) to mate the contact portion (12) with the mating terminal (13).

GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ,  
UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ,  
TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK,  
EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV,  
MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM,  
TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW,  
KM, ML, MR, NE, SN, TD, TG).

**Published:**

— *with international search report (Art. 21(3))*

## **ELECTRICAL TERMINAL HAVING A PUSH SURFACE**

### **FIELD OF THE INVENTION**

**[0001]** The present invention is directed to an electrical terminal with an enhanced bearing surface. In particular, the invention is directed to a terminal with a push surface which facilitates the mating or insertion of the terminal onto a mating connector or into a connector housing.

### **BACKGROUND OF THE INVENTION**

**[0002]** Quick-connect terminal connectors are female terminals that mate with male tab terminals, tab adapters and tab terminal blocks. They are used where quick attachment and removability are desired. Flag terminals have the quick attachment at a right angle to the electrical wire to which the connector is attached. They are available as fully insulated, non-insulated or partially insulated. They are available with open or closed barrel crimps.

**[0003]** One reason for the existence of flag terminals is for space saving because a right angle terminal can generally fit into smaller spaces than straight terminals. The quick connect portion of flag terminals of the prior art extend at a right angle away from the axis of the wire in an L shape.

**[0004]** While flag terminals are beneficial in various applications, the insertion of the flag terminals into housings or the mating of the flag terminals with mating terminals can be difficult. The bearing surface on known flat terminals is small and difficult to access and may have sharp edges, making it difficult to insert the terminals into the connector housing or mate with the mating terminals. This can cause injuries to the assemblers of the terminals and damage to the terminals and connectors if the insertion of the terminal position assurance device or of the connector housing is not done properly. Alternatively, machinery or tooling may be used to facilitate the assembly or mating of the terminals.

**[0005]** A need remains for a terminal, in particular a flag terminal, which can be easily and effectively inserted into the connector housing or mated with a mating terminal. In particular, it would be beneficial to provide a device with an ergonomically friendly bearing surface which allows for ease of insertion of the terminal in a connector housing and/or which allows for the ease of mating the terminal with a mating terminal.

#### SUMMARY OF THE INVENTION

**[0006]** The solution is provided by an electrical terminal having a contact portion, a wire termination portion and a transition portion. The contact portion is configured to receive a mating terminal along a mating axis. The wire termination portion defines a wire terminal axis that intersects the mating axis. The transition portion extends between the contact portion and the wire termination portion. The transition portion extends parallel to the mating axis and the wire termination axis. An engagement section extends at an angle from the transition portion. The engagement section has a push surface intersecting the mating axis. Wherein a force can be applied to the push surface to mate the contact portion with the mating terminal.

#### BRIEF DESCRIPTION OF THE DRAWINGS

**[0007]** The invention will now be described by way of example with reference to the accompanying drawings in which:

**[0008]** FIG. 1 is a top, front perspective view of an illustrative embodiment of the terminal according to the present invention.

**[0009]** FIG. 2 is a bottom rear perspective view of the terminal of FIG. 1.

**[0010]** FIG. 3 is a top view of the terminal of FIG. 1.

**[0011]** FIG. 4 is a side view of the terminal of FIG. 1.

## DETAILED DESCRIPTION OF THE INVENTION

**[0012]** The description of illustrative embodiments according to principles of the present invention is intended to be read in connection with the accompanying drawings, which are to be considered part of the entire written description. In the description of embodiments of the invention disclosed herein, any reference to direction or orientation is merely intended for convenience of description and is not intended in any way to limit the scope of the present invention. Relative terms such as "lower," "upper," "horizontal," "vertical," "above," "below," "up," "down," "top" and "bottom" as well as derivative thereof (e.g., "horizontally," "downwardly," "upwardly," etc.) should be construed to refer to the orientation as then described or as shown in the drawing under discussion. These relative terms are for convenience of description only and do not require that the apparatus be constructed or operated in a particular orientation unless explicitly indicated as such.

**[0013]** Terms such as "attached," "affixed," "connected," "coupled," "interconnected," and similar refer to a relationship wherein structures are secured or attached to one another either directly or indirectly through intervening structures, as well as both movable or rigid attachments or relationships, unless expressly described otherwise. Moreover, the features and benefits of the invention are illustrated by reference to the preferred embodiments. Accordingly, the invention expressly should not be limited to such preferred embodiments illustrating some possible non-limiting combination of features that may exist alone or in other combinations of features, the scope of the invention being defined by the claims appended hereto.

**[0014]** An object of the invention is to provide a terminal which can be easily and effectively mated to a mating terminal without the need for special tooling and/or without injury to the assembler. Another object of the invention is to provide a terminal which can be easily and effectively inserted into a connector housing without the need for special tooling and/or without injury to

the assembler. Yet another object of the invention is to provide a terminal with an ergonomically friendly bearing surface which allows for ease of mating or insertion.

**[0015]** As best shown in FIGS. 1 through 4, a receptacle, socket or female electrical terminal 10 includes a contact portion 12, a transition portion 14, a wire barrel 16 and an insulation barrel 18. The wire barrel 16 is configured for crimped connection with an end of a conductive core of an insulated wire. The insulation barrel 18 is configured for crimped connection with an end of the insulation coating or jacket of the wire. The wire barrel 16 and the insulation barrel 18 are part of a wire termination portion 19. Although the wire barrel 16 and the insulation barrel 18 are shown, other types of termination portions may be used without departing from the scope of the invention. In addition, although illustrative contact portion 12 is shown, other types of contact portions may be used without departing from the scope of the invention. In the illustrative embodiment shown, the terminal 10 is stamped and formed from a metal plate having a good electrical conductivity.

**[0016]** The contact portions 12 is configured to receive a mating terminal 13 of a mating electrical connector or device. The illustrative contact portion 12 includes a bottom wall 20 and resilient contact arms 22 which extend from either side 24, 26 of the bottom wall 20. As best shown in FIG. 2, the bottom wall 20 has a spring arm 42 provided thereon. The spring arm 42 is stamped and formed from the bottom wall 20. The illustrative contact portion 12 is shown and described in co-pending U.S. Patent Application Number 15/203,024, which is hereby incorporated by reference in its entirety.

**[0017]** The spring arm 42 extends from the bottom wall 20 to create a raised portion or end wall 40 extending from the inner surface of the bottom wall 20 toward the resilient arms 22. The spring arm 42 may include a projection or embossment, such as, but not limited to, a detent, dimple or lance 41 which is formed from the spring arm 42 to create a raised area on an

inner surface of the spring arm 42. The lance 41 engages the mating terminal 13 as the mating terminal 13 is inserted into the mating portion 12.

**[0018]** In the illustrative embodiment shown, each resilient arm 22 has an opening or cutout 23 with a first resilient contact section 25a and a second resilient contact section 25b extending on either side of the opening 23. The first resilient contact section 25a is positioned proximate a mating end 36 of the contact portion 12. The second resilient contact section 25b is remote from the mating end 36 and located near the end wall 40 of the spring arm 42. The openings 23 extend between and separate the resilient contact sections 25a, 25b.

**[0019]** The resilient contact sections 25a, 25b have arcuate or curled portions which extend from the bottom wall 20 to a mating terminal engagement member 50. The configuration of each respective contact section 25a, 25b of the resilient contact arms 22 allows the stiffness and spring rate of each respective resilient contact section 25a, 25b and the resilient contact arms 22 to be controlled. Consequently, the respective resilient contact sections 25a, 25b may each be configured to generate a different contact force, resulting in different contact forces for the resilient contact arms 22.

**[0020]** The mating terminal engagement members 50 of the resilient contact arms 22 extend from the resilient contact sections 25a, 25b and span opening 23. In the illustrative embodiment shown, the mating terminal engagement members 50 are asymmetrical, having lead-in surfaces 44 positioned proximate the mating end 36. The lead-in surfaces 44 are provided to prevent stubbing of the mating terminal 13 on the edge of the resilient arms 22 and to help guide the mating terminal 13 into a mating slot 46 of the contact portion 12 and to reduce the insertion force required to insert the mating terminal 13 into the slot 46. The configuration of the resilient contact arms 22 provide the resiliency needed to allow the mating terminal engagement member 50 to move relative to the bottom wall 20 as the mating terminal 13 is inserted into the slot 46.

**[0021]** In the illustrative embodiment shown, the spring arm 42 is stamped and formed from the bottom wall 20. The spring arm 42 is formed to allow a free end thereof to move or be resiliently deformed relative to the bottom wall 20, allowing the spring arm 42 and the lance 41 to move toward and away from the mating terminal engagement member 50.

**[0022]** In the illustrative embodiment shown, the spring arm 42 has an end wall 40 provided thereon. The end wall 40 extends from the spring arm 42 to create a stop portion which extends from the inner surface of the spring arm 42 toward the mating terminal engagement member 50. The end wall 40 is provided to limit the distance the mating terminal 13 can be inserted into the slot 46.

**[0023]** The configuration of the resilient contact arms 22 and the spring arm 42 allows the contact portion 12 to compensate for minor misalignment of the mating terminal 13 or minor warpage or imperfections associated with the mating terminal 13.

**[0024]** In a fully inserted position, the lance 41 of the spring arm 42 and the mating surfaces of the mating terminal engagement members 50 are all provided in electrical and mechanical contact with the mating terminal 13. The multiple areas of contact allow the receptacle terminal 10 to be used in applications in which higher current levels, such as, but not limited to, 15 amps to 20 amps or more. The configuration of the spring arm 42 and mating terminal engagement member 50 provides a stable and reliable electrical connection between the mating terminal 13 and the terminal 10. The configuration of the lance 41 of the spring arm 42 and the mating terminal engagement member 50 provide for higher Hertzian stresses, thereby eliminating or minimizing fretting corrosion between the terminal 10 and the mating terminal 13, thereby providing a stable and reliable electrical connection between the mating terminal 13 and the terminal 10.

**[0025]** The configuration of the resilient contact arms 22 and the spring arm 42 and the use of multiple contact areas allows for a lower normal force during mating and unmating of the mating terminal 13 from the receptacle terminal 10. This allows the mating terminal 13 and the receptacle terminal 10 to be more durable over numerous cycles, as there is less plating wear due to the lower mating or normal forces. The number of contact areas also allows the receptacle terminal 10 to be used at higher current levels, as the multiple contact areas allow the extreme heat associated with the high current levels to be dispersed, thereby preventing welding of the contact asperities.

**[0026]** The illustrative contact portion 12 shown in FIGS. 1 through 4 is just one example of the type of contact portion 12 that can be used with transition portion 14 of the present invention.

**[0027]** The transition portion 14 extends between the contact portion 12 and the wire barrel 16. In the illustrative embodiment shown, the contact portion 12 defines a mating axis 90 (FIGS. 1 and 3) along which the mating terminal is received. The wire barrel 16 and the insulation barrel 18 define a wire termination axis 92 that extends at an angle, preferably perpendicular, to the mating axis 90. The transition portion 14 has a main body portion 60 with a first end 62 which is integrally attached to the contact portion 12, a second end 64 which is integrally attached to the wire barrel 16, a third end 66 which is opposite the first end 62 and a fourth end 68 which is opposite the second end 64.

**[0028]** The third end 66 has an engagement section 70 which extends therefrom. In the illustrative embodiment, the engagement section 70 extends at approximately 90 degrees (i.e., perpendicularly) to the main portion 60 of the transition portion 14, however, the engagement section 70 may extend at other angles other than 90 degrees. The engagement section 70 extends at least part of the length of the third end 66, extending from proximate the fourth end 68 toward the second end 64 and the wire barrel 16. As best shown in FIG. 1, the engagement section 70 is provided in approximate alignment with

the contact portion 12. The engagement section 70 has an ergonomic bearing or push surface 72 that allows an assembler to push the engagement section 70 during assembly of the terminal 10 into a mating connector or the mating of the terminal 10 to the mating terminal 13, as will be more fully described.

**[0029]** As best shown in FIG. 4, the push surface 72 of the engagement section 70 has a height H1 which is greater than the height H2 of the main portion 60 of the transition portion 14. Consequently, the surface area of the push surface 72 is significantly larger than an exposed edge of the main portion 60 of the transition portion 14. Stated differently, the push surface 72 provides a surface area which is wider or higher than the height of the edge of the main portion 60 of the transition portion 14. This allows the assembler to use his thumb or finger to push the push surface 72 and consequently, the terminal 10 into proper position. This is in contrast to known flat terminals which have small surfaces and sharp edges, thereby causing difficulty for assemblers to properly mate or assemble the terminal to a mating connector or connector housing. By providing the engagement surface 72, the terminal is more ergonomically friendly. This helps to prevent damage or injury to the assembler's thumbs, fingers and wrists, thereby reducing the amount of injury claims brought by the assemblers. In addition, as the force applied by the assemblers is able to be more consistent, less mating or insertions errors occur, thereby providing a more cost effective method of mating or assembly.

**[0030]** In the illustrative embodiment shown, the push surface 72 and the engagement section 70 are in-line with the contact portions 12, such that the mating axis 90 intersects the push surface 72 and the engagement section 70. Preferably, the push surface 72 extends perpendicular to the mating axis. This allows a force applied to the push surface 72 and the engagement section 70 to be uniformly distributed over the entire transition portion 14 and contact portion 12, thereby minimizing the force required for insertion of the terminal 10 into the connector 16.

**[0031]** As described above, the assembler engages and pushes the push surface 72 of the engagement section 70 to mate the terminal 10 with the mating terminal 13 or to insert the terminal 10 into a connector housing. In the illustrative embodiment, the push surface 72 is dimensioned to allow the thumb of the assembler to engage and drive the engagement surface 72. The use of the thumb has been found to be an ergonomically friendly method of moving the terminal 10. In addition, as the push surface 72 is positioned away from the wire barrel 16 and the insulation barrel 18, the wires terminated to the wire barrels 16 and insulation barrels 18 do not significantly interfere with the assembler engaging the engagement surface 72.

## CLAIMS

1. An electrical terminal (10) comprising:
  - a contact portion (12) configured to receive a mating terminal (13) along a mating axis (90);
  - a wire termination portion (19) defining a wire terminal axis (92) that intersects the mating axis (90);
  - a transition portion (14) extending between the contact portion (12) and the wire termination portion (19), the transition portion (14) extending parallel to the mating axis (90) and the wire termination axis (92), an engagement section (70) extending at an angle from the transition portion (14), the engagement section (70) having a push surface (72) intersecting the mating axis (90);
  - wherein a force can be applied to the push surface (72) to mate the contact portion (12) with the mating terminal (13).
2. The electrical terminal (10) as recited in claim 1, wherein the engagement section (70) extends at approximately 90 degrees to a main portion (60) of the transition portion (14).
3. The electrical terminal (10) as recited in claim 2, wherein the main body portion (60) has a first end (62) which is integrally attached to the contact portion (12), a second end (64) which is integrally attached to the wire terminating portion (19), a third end (66) which is opposite the first end (62) and a fourth end (68) which is opposite the second end (64).
4. The electrical terminal (10) as recited in claim 3, wherein a longitudinal axis of the contact portion (12) is at a right angle relative to a longitudinal axis of the insulated wire which is terminated in the wire terminating portion (19).
5. The electrical terminal (10) as recited in claim 4, wherein the engagement section (70) extends from the third end (66) of the transition portion (14).

6. The electrical terminal (10) as recited in claim 5, wherein the engagement section (70) extends from proximate the fourth end (68) toward the second end (64) and the wire terminating portion (19).
7. The electrical terminal (10) as recited in claim 1, wherein the push surface (72) of the engagement section (70) has a surface height which is greater than the edge height of the main portion (60) of the transition portion (14), wherein a surface area of the push surface (72) is significantly larger than a surface area of an exposed edge of the main portion (60) of the transition portion (14).
8. The electrical terminal (10) as recited in claim 1, wherein the push surface (72) is positioned away from the wire terminating portion (19), wherein wires terminated in the wire terminating portion (19) do not interfere with the assembler engaging the engagement surface (70).
9. The electrical terminal (10) as recited in claim 1, wherein the contact portion (12) has resilient contact arms (22) extending from opposed sides (24) of a bottom wall (20).
10. The electrical terminal (10) as recited in claim 9, wherein a spring arm (42) extends from the bottom wall (20).
11. The electrical terminal (10) as recited in claim 1, wherein the wire terminating section (19) has a wire barrel (16) and an insulation barrel (18).

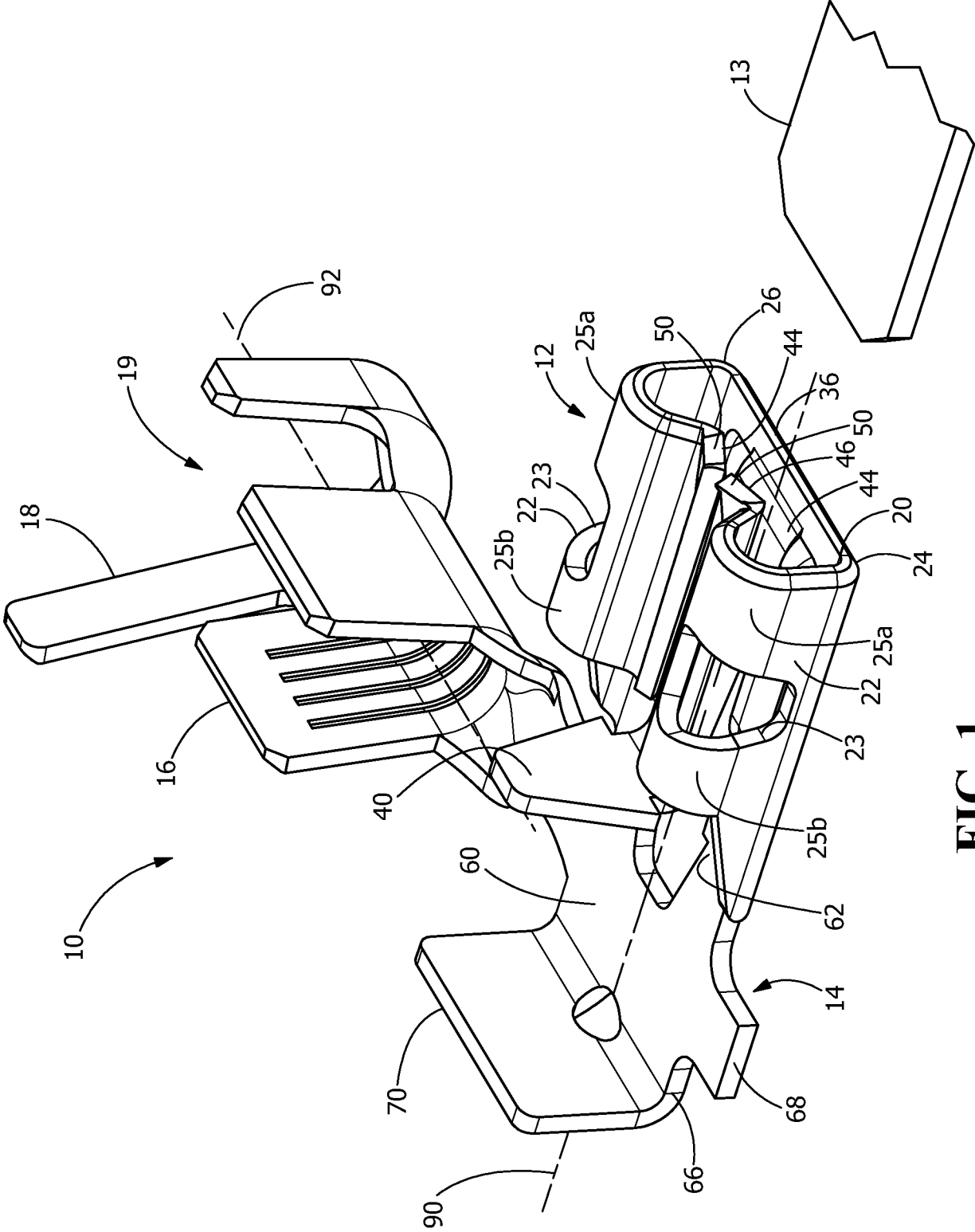


FIG. 1

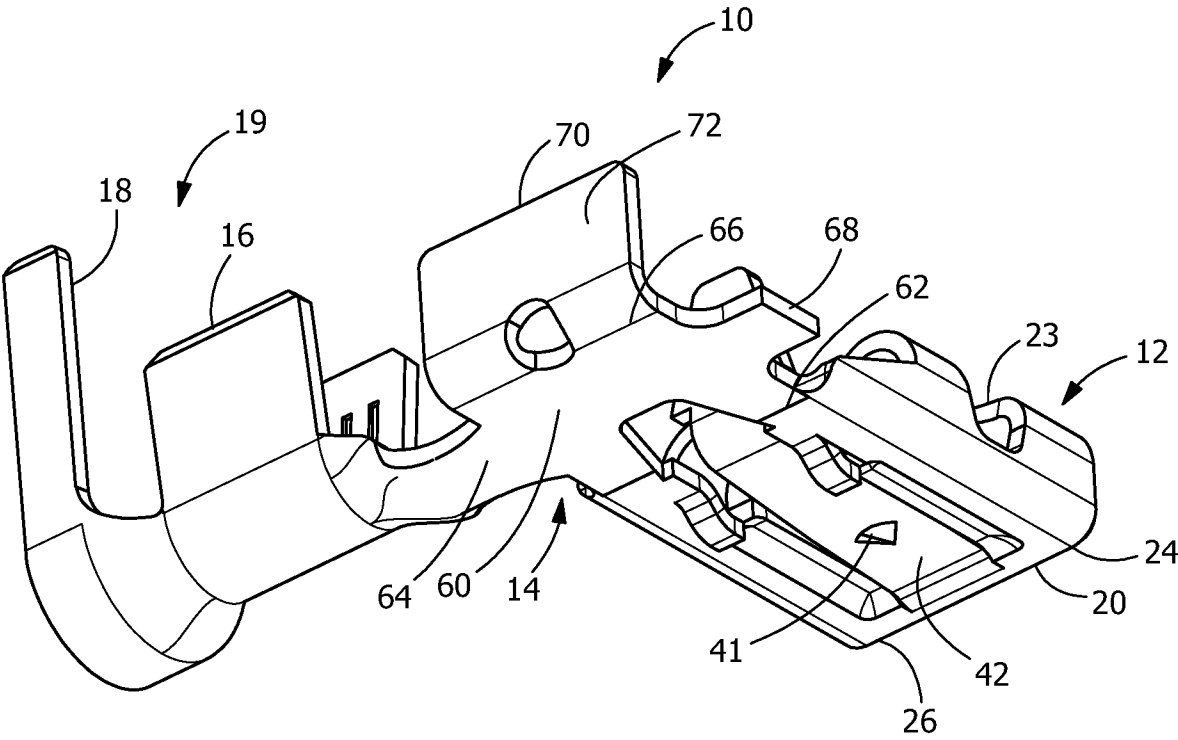


FIG. 2

3/3

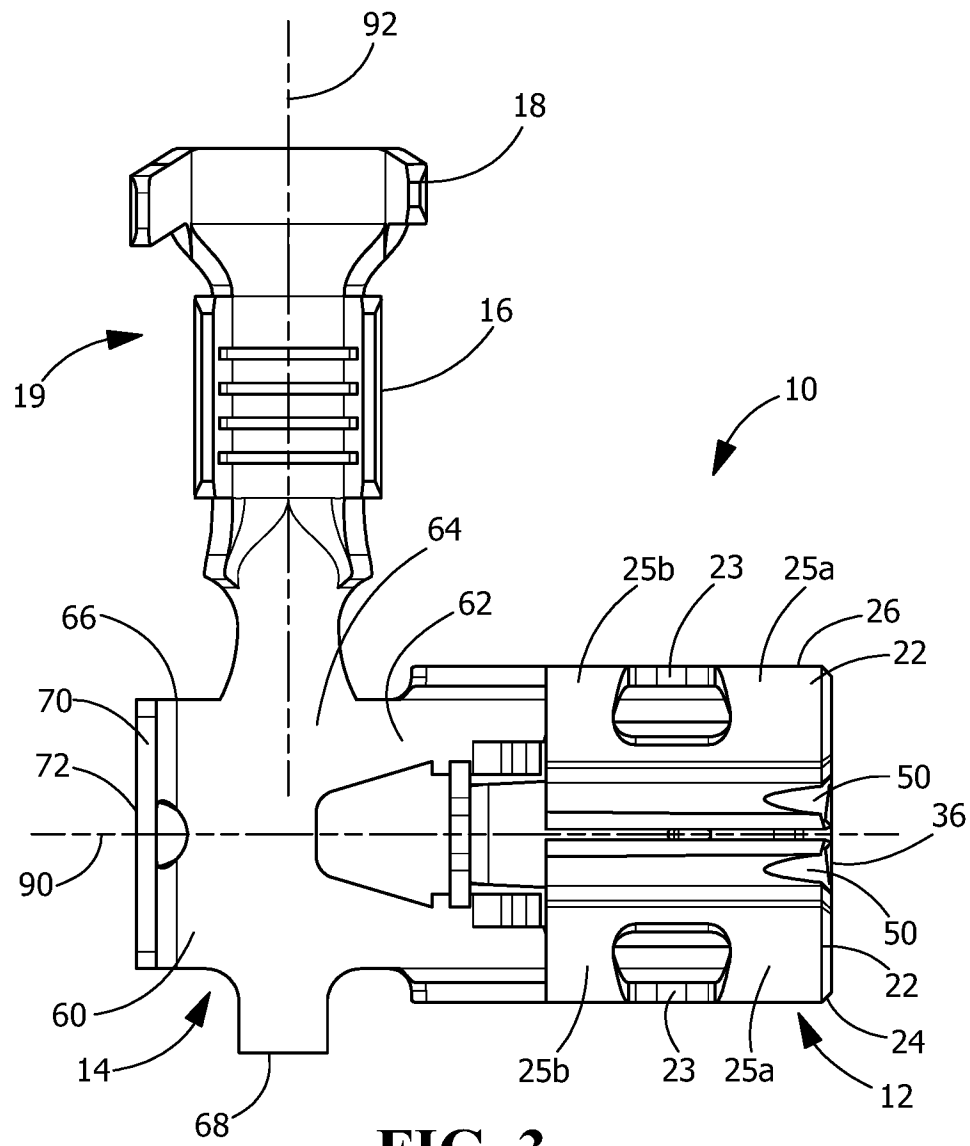


FIG. 3

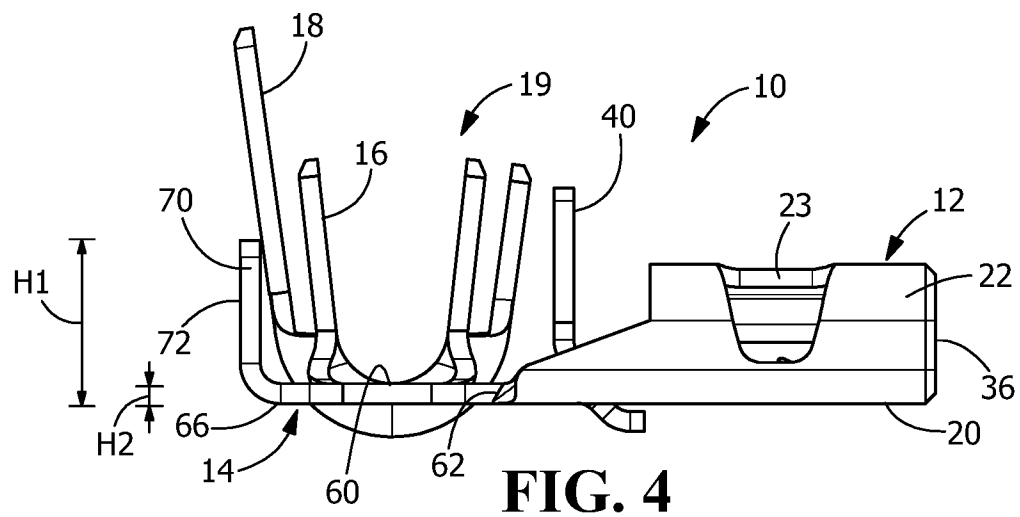


FIG. 4

# INTERNATIONAL SEARCH REPORT

International application No  
PCT/IB2018/052631

A. CLASSIFICATION OF SUBJECT MATTER  
INV. H01R13/115 H01R4/18  
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)  
H01R

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EP0-Internal, WPI Data

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages                                                                 | Relevant to claim No. |
|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|
| X         | WO 2012/033231 A1 (YAZAKI CORP [JP]; HONDA MOTOR CO LTD [JP]; SUGIE NAOTO; MIYAKAWA TOMOY) 15 March 2012 (2012-03-15)<br>figure 1<br>pages 8-13    | 1-11                  |
| X         | -----<br>US 4 391 485 A (URANI ANGELO)<br>5 July 1983 (1983-07-05)<br>figures 1-5<br>columns 3-4                                                   | 1                     |
| A         | -----<br>US 2002/142663 A1 (TAKEYAMA TETSUO [JP] ET AL) 3 October 2002 (2002-10-03)<br>figures 1, 2<br>paragraphs [0003] - [0072]<br>-----<br>-/-- | 1-11                  |



Further documents are listed in the continuation of Box C.



See patent family annex.

\* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

12 June 2018

Date of mailing of the international search report

19/06/2018

Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2  
NL - 2280 HV Rijswijk  
Tel. (+31-70) 340-2040,  
Fax: (+31-70) 340-3016

Authorized officer

Kandyla, Maria

# INTERNATIONAL SEARCH REPORT

International application No

PCT/IB2018/052631

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages                                            | Relevant to claim No. |
|-----------|-------------------------------------------------------------------------------------------------------------------------------|-----------------------|
| A         | US 2013/052889 A1 (SHEN CHU-PING [TW])<br>28 February 2013 (2013-02-28)<br>figures 1-4<br>paragraphs [0002] - [0022]<br>----- | 1-11                  |

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/IB2018/052631

| Patent document<br>cited in search report | Publication<br>date | Patent family<br>member(s)                                                                                                             | Publication<br>date                                                                            |
|-------------------------------------------|---------------------|----------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|
| WO 2012033231 A1                          | 15-03-2012          | BR 112013005698 A2<br>CN 103098308 A<br>DE 112011103022 T5<br>JP 5140125 B2<br>JP 2012059623 A<br>US 2013171890 A1<br>WO 2012033231 A1 | 03-05-2016<br>08-05-2013<br>13-06-2013<br>06-02-2013<br>22-03-2012<br>04-07-2013<br>15-03-2012 |
| US 4391485 A                              | 05-07-1983          | NONE                                                                                                                                   |                                                                                                |
| US 2002142663 A1                          | 03-10-2002          | JP 3464461 B2<br>JP 2002270261 A<br>US 2002142663 A1                                                                                   | 10-11-2003<br>20-09-2002<br>03-10-2002                                                         |
| US 2013052889 A1                          | 28-02-2013          | NONE                                                                                                                                   |                                                                                                |