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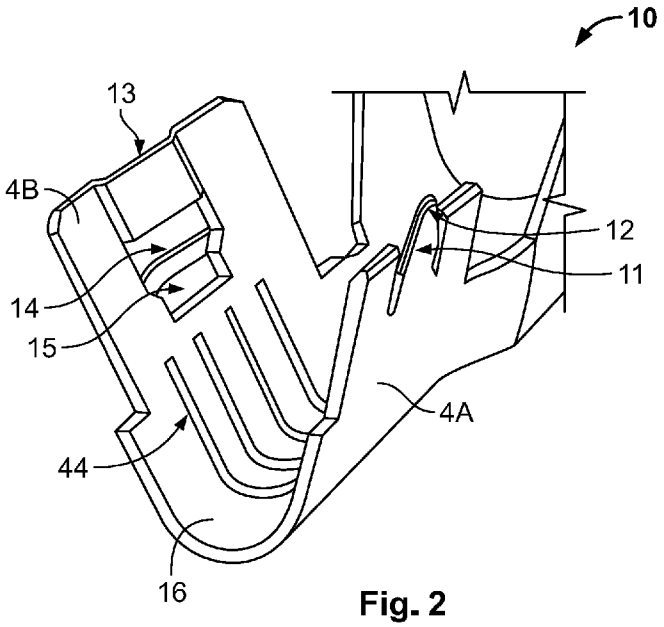

Fig. 2

(57) Abstract: A crimp terminal (10, 100) for connecting wires, comprising at least one crimp barrel (16, 116), wherein the crimp barrel (16, 116) comprises at least one base and at least two opposing side walls (4A, 4B) extending from the base, wherein the first side-wall (4A) is provided with at least one self-locking wing (11, 101, 111) and the second side wall (4B) is provided with at least one self-locking pocket (14) such that the self-locking wing (11, 101, 111) is adapted to lock with the self-locking pocket (14, 104, 114) creating a crimp connection of high robustness against mechanical, torsional and thermal stresses.

WO 2020/002222 A1

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SEAM SELF LOCKING CRIMP

The present disclosure relates to a crimp with increased robustness and thinner stock material.

In electronics and electrical engineering, there are known a large number of electromechanical connections, which serve to transmit electrical currents, electrical voltages and/or electrical signals with the greatest possible range of currents, voltages, and frequencies and/or data rates. Such connections must temporarily, where applicable after a comparatively long period of time, or permanently ensure correct transmission of mechanical contact, electrical power, electrical signals and/or data under thermally loaded, dirty, damp and/or chemically aggressive conditions. Therefore, a large number of specially constructed electromechanical contacts, in particular crimp contacts are known.

A crimp connection is a solderless connection. Crimping connection is advantageous over normal pinching the terminal on to the end of a wire. The shape of the crimp and amount of pressure applied must be correct in order to obtain the desired performance and durability of the connection. Improper crimps may generate heat due to poor electrical connections and may result in the rework of the product, increase scrap and in extreme cases catastrophic failure.

Electrical terminals are often used to terminate the ends of wires. Such electrical terminals typically include an electrical contact and a crimp barrel. In some terminals, the crimp barrel includes an open area that receives an end of the wire therein. The crimp barrel is crimped around the end of the wire to establish an electrical connection between electrical conductors in the wire and the terminal as well as to mechanically hold the electrical terminal on the wire end. When crimped over the wire end, the crimp barrel establishes an electrical and mechanical connection between the conductors of the wire and the electrical contact.

In addition to a permanent electrical connection, a permanent mechanical connection must also be produced between the cable and a conductor crimp region of the crimp contact by means of a contact. For an electromechanical connection, the crimp contact has a conductor crimp region, and in most cases an insulation crimp region for the cable. Miniaturization and cost savings are forcing manufacturers towards smaller and thinner contacts.

Crimp connections known in the art serve to establish an electrical contact as well as to provide a mechanically resilient connection between a crimping base and at least one electrical conductor, which can consist of one or more individual wires. The crimp barrel

usually consists of a metal plate, which is bent to have a U- or V-shaped cross-section, or has rectangular cross-sections with a flat base. The underside of the U- or V-shape is hereinafter referred to as crimp base. The upwardly pointing legs of the U- or V-shape are generally known as crimp flanks.

Figure 1 shows a typical wire barrel crimp 200 as found in the prior art. Such a crimp suffers from the problem of lack of robustness during mechanical and torsional stresses.

The crimp connection is produced by means of a crimping die, which consists of an anvil and crimping stamp. For crimping, the crimping base is positioned centrally on the anvil, and the electrical conductor is placed between crimping legs on the crimping barrel. Subsequently, the crimping stamp descends onto the anvil and bends the crimp flanks around the electrical conductor in order to compress it tightly, and to fix it in a force-locking manner with the crimping barrel. In the transition area from the crimp base to the crimp side-walls, the so-called crimping roots, as well as laterally at the crimp side-walls, zones of high bending stresses are formed in the crimp barrel.

The force connection between the crimp barrel and the electrical conductor can be improved by providing additional form-fitting elements, for example, recesses or depressions on the inner side of the crimp barrel facing the conductor for the creation of locking elements, wherein displaced conductor material can penetrate into the recesses during compression.

The pressed zones of a crimping connection have better electrical properties. The less heavily pressed areas have a higher mechanical stability.

The crimping barrel and the electrical conductor can be locally reinforced by means of steps or projections in the crimping die.

US Pat. No. 5,901,439 discloses how the compression can be locally increased by feeding an additional punch through an opening in the working surface of the anvil when the crimping die is closed.

Patent Application DE 10 2006 045 567 A1 describes a staggered seam on an F-Crimp formed by a crimp tool with consecutive offset in the roll-in geometry. In this crimp connection, the crimp with a thinner sheet metal presents the problems mentioned below.

If the crimp connection is subjected to mechanical stress, the crimping flanks may spring up along the crimping roots and other zones of high bending stresses. There is the risk that the crimping base opens along the longitudinal seam at the ends of the crimp side-walls. Depending on the type of stress, the ends of the crimp side-walls can also move axially

relative to each other. Moreover, a reduction in the crimping forces in the prior art is favored in that the individual wires of the electrical conductor can move relative to each other. When they are displaced in the longitudinal direction, the force of the crimped connection is reduced by the resultant free spaces. The free spaces offer the possibility of external material penetrating into the crimped connection. The crimping forces are then further weakened by corrosion of the electrical conductor and the crimping barrel caused by the external agents.

In the event of a loss of crimping force, the desired mechanical stability of the crimping connection can no longer be maintained. It was found with conventional crimps that in case of movements on the connected line or the electrical conductor, a movement of the individual wires of the electrical conductor at the other end of the crimp connection can be observed. This indicates that both the individual wires of the electrical conductor, as well as the electrical conductor and the crimp barrel are no longer fixed in a sufficiently secure manner. In the individual case, therefore, increased electrical transition resistances between the crimp barrel and the electrical conductor can occur.

To achieve mechanical and electrical robustness of a crimp, in particular an F-Crimp, the crimp barrel must have a sufficient stock thickness of the sheet metal (related to the wire size). Especially for large wires, this minimum barrel stock thickness creates disadvantages such as less suitability to be cut or bent in stamping process for manufacturing an electrical terminal from sheet metal, high force required for the crimp process, and high material cost. In order to address the above problems, crimps in the prior art uses a thin stock.

However, it was found that with that when using too thin stock the crimp starts to fail at the seam of the roll-in for mechanical and electrical performance. There is a need for providing a terminal device that allows safely, electrically connecting a large number of wires, and the terminal device being robust and cost effective at the same time.

The object of the present disclosure is to provide a crimp connection with improved robustness for think stock F-Crimp barrel.

This object is solved by the subject-matter of the independent claims. Advantageous embodiments of the present invention are the subject-matter of the dependent claims.

The present invention is based on the idea to provide an interlock of the seam of the crimp to increase crimp robustness with thinner stock thickness.

The measures known in the art for providing form-locking elements or a reinforced crimping connection elements cannot prevent the crimp barrel from being deflected, as well as a relative movement of the individual wires of the electrical conductor and the resulting losses of crimping forces.

One of the non-limiting and exemplary embodiments provides a crimping connection including a staggered seam that may solve the aforementioned problems.

In one of the general aspect a crimp is provided for connecting wires comprising at least one crimp barrel, wherein the crimp barrel comprises at least one base and at least two opposing side walls extending from the base, wherein the first side-wall is provided with at least one self-locking wing and the second side wall is provided with at least one self-locking pocket, such that the self-locking wing of the first side wall is adapted to lock with the self-locking pocket of the second side wall.

Advantageously, the self-locking pocket is provided with an entry guide in the front and rear side of the entry guide.

Advantageously, the self-locking wing is provided with an entry chamber.

Advantageously, the first wall is provided with a second self-locking pocket and the second wall is provided with a second self-locking wing.

Advantageously, the self-locking wing and self-locking pocket extend up to the base of the crimp.

Advantageously, the crimp barrel is an F-crimp wire barrel.

Further, a crimper is provided for producing a crimp for connecting wires comprising a step of bending a base of a crimp barrel around the wires, wherein the crimp barrel comprises at least one base and at least two opposing side walls extending from the base, wherein the first side-wall is provided with at least one self-locking wing, and the second side wall is provided with at least one self-locking pocket, such that the self-locking wing of the first side wall is adapted to lock with the self-locking pocket of the second side wall.

Advantageously, the self-locking pocket of above method is provided with an entry guide in the front and rear side of the entry guide

Advantageously, the self-locking wing in the method above is provided with an entry chamber.

Advantageously, in the method above, the first wall is provided with a second self-locking pocket and the second wall is provided with a second self-locking wing.

Advantageously, the crimp barrel used in the method above is an F-crimp wire barrel.

Advantageously is provided a crimping device comprising a crimp tooling member that has a profile for crimping the crimp such that the profile aligns operationally during crimping both with a front portion, and a rear portion of the walls of the crimp barrel.

Advantageously is provided a crimping device comprising a crimp tooling member that has a profile for crimping the crimp such that the profile aligns operationally during crimping with a front portion, a middle portion, and a rear portion of the walls of the crimp barrel.

Additional benefits and advantages of the disclosed embodiments will become apparent from the specification and drawings. The benefits and/or advantages may be individually obtained by the various embodiments and features of the specification and drawings, which need not all be provided in order to obtain one or more of such benefits and/or advantages.

The invention is explained in greater detail below with reference to embodiments and the appended drawings. Elements or components which have an identical, univocal or similar construction and/or function are referred to in various Figures of the drawings with the same reference numerals. In the detailed Figures of the drawings:

Fig. 1 is a schematic view of the conventional wire crimp barrel;

Fig 2 is a schematic perspective view of an embodiment of a seam self-locking crimp according to the present disclosure;

Fig. 3 is schematic view of the top and bottom view of the seam self-locking crimp according to the present disclosure;

Fig. 4 is a schematic of the crimp connection according to another embodiment of a crimp connection according to the present disclosure;

Fig.5 is schematic view of a crimper used in the crimping tool according the method of the present disclosure.

Prior to a description of embodiments of the present disclosure, underlying knowledge forming the basis of the present disclosure is described. Based on the foregoing consideration, the inventors have conceived of the following aspects of the present disclosure.

More specific embodiments of the present disclosure are described below. Note, however, that an excessively detailed description may be omitted. For example, a detailed description of an already well-known matter, and a repeated description of substantially identical components may be omitted. This is intended to avoid unnecessary redundancies of the following description and facilitate understanding of persons skilled in the art. It should be noted that the inventors provide the accompanying drawings and the following description so that persons skilled in the art can fully understand the present disclosure, and that the accompanying drawings and the following description are not intended to limit the subject matters recited in the claims. In the following description, identical or similar constituent elements are given the same reference numerals.

According to the general idea of the present disclosure, a crimp is provided for connecting wires comprising at least one crimp barrel, wherein the crimp barrel comprises at least one base and at least two opposing side walls extending from the base. The first side-wall is provided with at least one self-locking wing, and the second side wall is provided with at least one self-locking pocket, such that the self-locking wing of the first side wall is adapted to lock with the self-locking pocket of the second side wall.

Figure 2 shows a schematic representation of a seam self-locking crimp 10 according to an embodiment of the present disclosure. First side wall 4A is provided with a self-locking wing 11 and an entry chamber 12. Second side wall 4B is provided with a self-locking pocket 14 and a front entry guide 13, and a rear entry guide 15. In seam self-locking crimp 10 the self-locking wing 11 gets interlocked with the self-locking pocket 14, which in turn gives more mechanical robustness and electrical robustness against mechanical and torsional stresses.

Due to the compression and axial elongation during forming of the seam self-locking crimp 10, the edges of the self-locking wing 11 and self-locking pocket 14 get squeezed against each other, which creates an additional clinch connection of the seam, thus providing additional robustness.

Figure 3A is a flat perspective top view of the seam self-locking crimp 10 according the present disclosure. Various dimensions of the self-locking wing and the self-locking pocket can be suitably adapted to the particular use case.

Figure 3B shows the respective bottom view before the crimp is bent.

Optionally, the interior surfaces of the crimp barrel may include one or more serrations 44 for penetrating an oxide and/or other surface material (such as, but not limited to, residual wire extrusion enhancement materials, and/or the like), layer that has built up on the electrical

conductors 30. The interior surfaces may each be referred to herein as a “metallic surface” of the crimp barrel.

Figure 4 is a schematic of a seam self-locking crimp 100, according to another embodiment of a crimp connection according to the present disclosure. In this embodiment, the first side wall is provided with a self-locking wing 101, a self-locking pocket 101, and the opposite side walls is also provided with a self-locking wing 111, and a self-locking pocket 114. Further, depending on the use case different combinations of the self-locking wings and the self-locking pocket could be realized in the present embodiment. Such additional self-locking wings and self-locking pockets, provide extra robustness to enhance the resilience of the seam self-locking crimp against stress.

In order to contact an electrically conductive wire, the crimp is, for example, attached to a non-insulated wire. The electrical insulation layer may be removed from at least a portion of ends of the electrical conductors for exposing the conductor ends. In some alternative embodiments, the electrical contact is another crimp barrel 16 that is configured to be crimped around the end of another electrical wire (not shown), to mechanically and electrically connect the other electrical wire to the terminal.

Accordingly, in some alternative embodiments, the terminal is configured to electrically connect the electrical wire to another electrical wire. In other words, the terminal may be used to splice the electrical wire to another wire in some alternative embodiments.

The crimp segment of the above embodiments are used for realizing the electrical and mechanical connections using a crimping device or crimper. The crimping device crimps a crimping segment to a wire. In an embodiment, the electrical wire has electrical conductors that are received in a crimp barrel. For example, an end segment of the wire has exposed conductors that are loaded into the crimp barrel. During a crimping operation, the barrel is crimped around the conductors forming a mechanical and electrical connection between the crimp segment and the electrical wire.

Figure 5 is schematic view of a crimping device also known as a “crimper” used in the crimping tool according the method of the present disclosure. When the crimping gets started, the self locking wing will enter inside the self-locking pocket and get crimped with wire strands. The groove 51 in the crimper allows the easy flow of the self-locking wing for creating a seam self-locking.

The crimping operation entails forming the crimp segment 10, 100 to mechanically hold the conductors, and to provide an engagement between the conductors and the crimp segment

10, 100. Forming of the terminal may include bending arms or tabs around the wire conductors as in an open terminal (e.g., “F” type crimp), or compressing a closed barrel around the wire conductors as in a closed terminal (e.g., “O” type crimp). As the terminal is formed around the wires during the crimping action, the metal of the terminal and/or of the conductors within the terminal may be extruded. It is desirable to provide a secure mechanical connection, and a good quality electrical connection between the terminal and the electrical wire. Using the embodiments of crimp tooling as disclosed herein creates a formed feature on the terminal that is formed during the crimping operation due to the extrusion of the metal(s). With this tooling, the formed feature can be formed on various types of terminals with varying terminal shapes and designs.

The crimping device 50 is provided with a crimping tooling member 51 with a profile for crimping the crimp. During crimping the profile aligns operationally with a front portion 54b, 55b and a rear portion 54a 55a of the walls of the crimp barrel as shown in embodiment in Figures 2 and 3A and 3B.

In an alternative embodiment the crimping tooling member is such that during crimping the crimping profile aligns operationally with a front portion 54’b, 55’b, a middle portion 56’a, 56’b and a rear portion 54’a 55’a of the walls of the crimp barrel having a self locking wing and a self locking pocket on the same wall as shown in embodiment of Figure 4.

According to the preferred embodiments of this invention, the length of the side walls is such that when the sidewalls are engaged to form a staggered seam, the ends of the side walls do not hit the inner surface of the crimp.

A crimping device 50, may include an anvil [not shown in the figure] and a crimp tooling member 51. The anvil has a top surface that receives the crimp segment thereon. The electrical conductors of the wire are received in the crimp barrel on the anvil. The crimp tooling member 51 includes a forming profile that is selectively shaped to form or crimp the barrel around the conductors when the forming profile engages the crimp segment. The forming profile defines part of a crimp zone in which the crimp segment and wire are received during the crimping operation. The top surface of the anvil also defines a part of the crimp zone, as the terminal is crimped to the wire between the crimp tooling member and the anvil.

The crimp tooling member 51 is movable towards and away from the anvil along a crimp stroke in a direction 53 as shown in Figure 5. The crimp stroke has an upward component away from the anvil, and a downward component towards the anvil. The crimp tooling member moves bi-directionally towards and away from the anvil, along a crimp axis52. The crimp tooling member forms the terminal around the electrical conductors during the

downward component of the crimp stroke as the crimp tooling member moves towards the anvil. Although not shown, the crimp tooling member may be coupled to a mechanical actuator that propels the movement of the crimp tooling member along the crimp stroke. For example, the crimp tooling member may be coupled to a movable ram of an applicator, or lead-maker machine. In addition, the applicator or the lead-maker machine may also include or be coupled to the anvil and the base support of the crimping device.

During a crimping operation, the crimp segment 10, 100 is loaded onto the top surface of the anvil. The wire is moved in a loading direction towards the crimp zone such that the electrical conductors are received in the crimp barrel 16 between the two side-walls of the crimp barrel. As the crimp tooling member moves toward the anvil, the forming profile descends over the crimp barrel and engages the side-walls to bend or form the walls around the electrical conductors. More specifically, side tabs and the top-forming surface of the forming profile gradually bend the side-walls over a top of the electrical conductors as the crimp tooling member 51 moves downward.

The self-locking wing 11 is configured to engage with the self-locking pocket 14 of the crimp. At a bottom dead position of the crimp tooling member, which is the lowest position (or most proximate position to the base support) of the crimp tooling member during the crimp stroke, part of the forming profile may extend beyond the top surface of the anvil. The crimp segment is compressed between the forming profile and the anvil, which causes the side-walls of the crimp barrel to mechanically engage and electrically connect to the electrical conductors of the wire. High compressive forces cause metal-to-metal bonds between the side-walls and the conductors. One or more embodiments described herein is directed to the forming profile such that during the seam self-locking operation as described herein is formed when the side-walls of the crimp barrel engage with each other.

Further the mechanics and the behavior of the crimp connection under external forces will be described.

There are two mechanisms for establishing and maintaining permanent contact in a crimp connection, namely cold welding and the generation of an appropriate residual force distribution. Both mechanisms contribute for creating a permanent connection and are independent of each other. During crimping, two metal surfaces are brought under an applied force to sliding or wiping actions, thus welding the metals in a cold version also known as cold welding. Under an appropriate residual force distribution the contact interface will experience a positive force. During crimping, residual forces are developed between the conductor and the crimp barrel as the crimp tooling is removed which is an indicative of different elastic recovery.

When the electrical conductor tends to the spring back more than the crimp barrel, the barrel exerts a compressive force on the conductor which maintains the integrity of the contact interface. The electrical and the mechanical performance of a crimped connection results from a controlled deformation of conductors and crimp barrel which produce micro cold welded junctions between the conductors and between conductors and the crimp barrel. These junctions are maintained by an appropriate residual stress distribution within the crimped connection which leads to residual forces which in turn maintain the stability of the junctions.

During the application of an external force (for example tensile force) on the crimp connection, the interlocking between the crimps flanks could be misaligned, thus resulting in a poor crimp connection. Hence, crimp connections with the self-locking wing and the self-locking pocket are provided in embodiments of the seam self-locking crimp connection of the present disclosure.

Such tapered embossed areas could be provided both inside or outside of the crimp flanks thereby ensuring that interlocking is maintained even when the tensile force applied at an angle not equal to the normal vector in the lateral direction of the outer surface of the crimp flank.

While the present disclosure has been particularly shown and described with reference to exemplary embodiments thereof, it will be understood by those skilled in the art that various changes in form and details may be made therein without departing from intent of the disclosure as defined by the appended claims. The exemplary embodiments should be considered in descriptive sense only and not for purposes of limitation. Therefore, the scope of the present disclosure is defined not by the above description of the invention but by the appended claims, and all differences within the scope will be construed as being included in the present invention.

List of reference numerals

Reference Numeral	Description
10, 100	Seam self-locking crimp
4A, 4B	Side Walls
11, 101, 111	Self-locking wing
14, 104, 114	Self-locking pocket
13	Entry guide front
15	Entry guide rear
16, 116	Crimp barrel
31	Deepened areas
40, 42	Inner surface of crimp barrel
44	Serrations
51	Groove of crimper
52	Crimp axis
53	Direction of movement
200	Conventional crimp

Claims:

1. A crimp (10, 100) for connecting wires comprising at least one crimp barrel, wherein the crimp barrel comprises at least one base and at least two opposing side walls (4A, 4B) extending from the base, wherein the first side-wall (4A) is provided with at least one self-locking (11, 101) wing and the second side wall (4B) is provided with at least one self-locking pocket such that the self-locking wing of the first side wall is adapted to lock with the self-locking pocket of the second side wall.

2. The crimp (10, 100) according to claim 1, wherein the self-locking (14, 104) pocket is provided with an entry guide in the front (13) and rear side of the entry guide (15).

3. The crimp (10, 100) according to claim 1, wherein the self-locking (11, 101) wing is provided with an entry chamber.

4. The crimp (10, 100) according to claims 1 to 3, wherein the first wall is provided with a second self-locking pocket and the second wall is provided with a second self-locking wing.

5. The crimp (10, 100) according to claim 1, wherein the self-locking wing and self-locking pocket extend up to the base of the crimp.

6. The crimp (10, 100) according to any one of the claim above, wherein the crimp barrel is an F-crimp wire barrel.

7. A method for producing a crimp for connecting wires comprising a step of bending a base of a crimp barrel around the wires, wherein the crimp barrel comprises at least one base and at least two opposing side walls extending from the base, wherein the first side-wall is provided with at least one self-locking wing and the second side wall is provided with at least one self-locking pocket, such that the self-locking wing of the first side wall is adapted to lock with the self-locking pocket of the second side wall.

8. The method for producing the crimp according to claim 7, wherein the self-locking pocket is provided with an entry guide in the front and rear side of the entry guide

9. The method for producing the crimp according to claim 7, wherein the self-locking wing is provided with an entry chamber.

10. The method for producing the crimp according to claim 7, wherein the first wall is provided with a second self-locking pocket and the second wall is provided with a second self-locking wing.

11. The method of producing the crimp according to any of claims 7 to10, wherein the crimp barrel is an F-crimp wire barrel.

12. A crimping device (50) comprising a crimp tooling member (51) having a profile for crimping the crimp of Claim 1 such that the profile aligns operationally during crimping with a front portion (54b, 55b), and a rear portion (54a, 55a) of the walls of the crimp barrel.

13. A crimping device (50) comprising a crimp tooling member (51) having a profile for crimping the crimp of Claim 1 such that the profile aligns operationally during crimping with a front portion (54'b, 55'b), a middle portion (56'a, 56'a), and a rear portion (54'a, 55'a) of the walls of the crimp barrel.

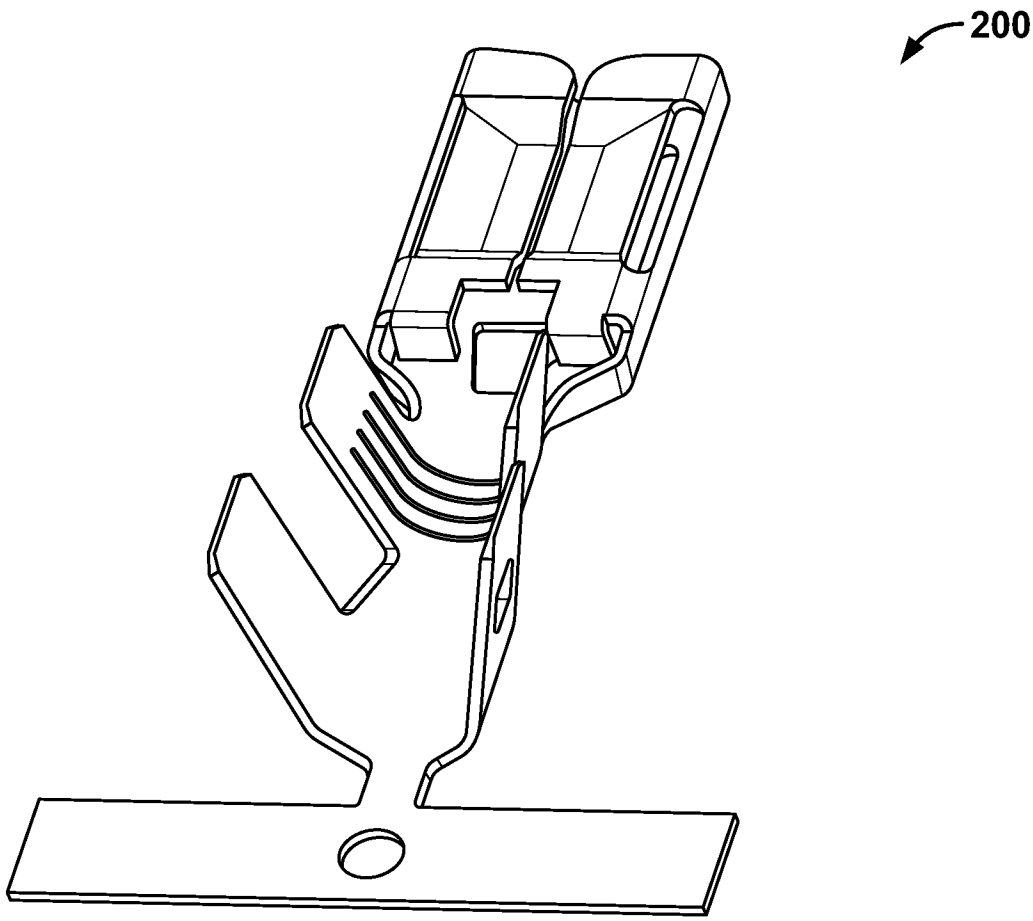

Fig. 1

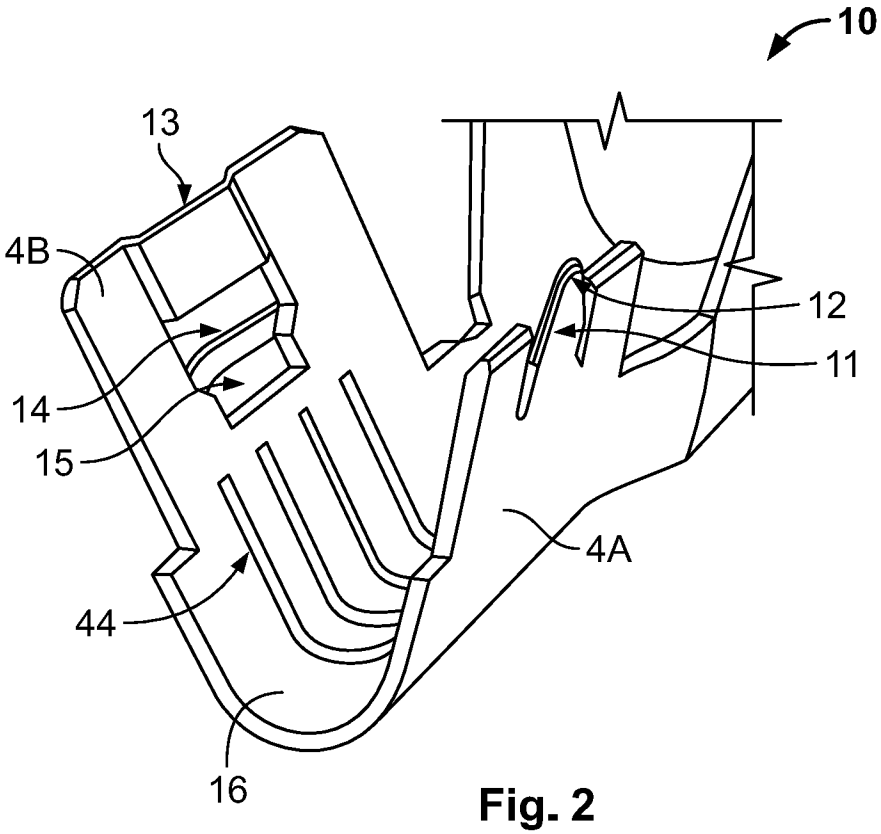

Fig. 2

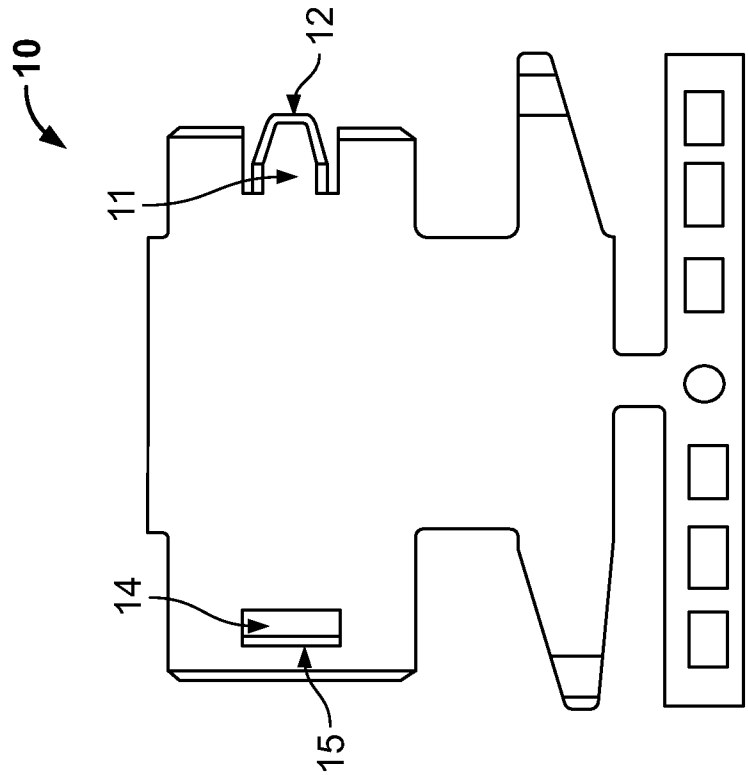

Fig. 3B

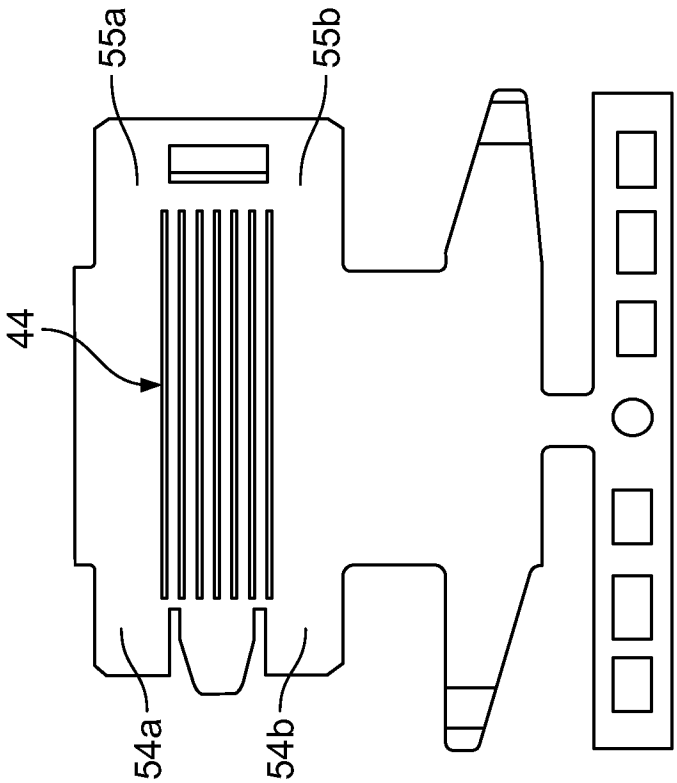

Fig. 3A

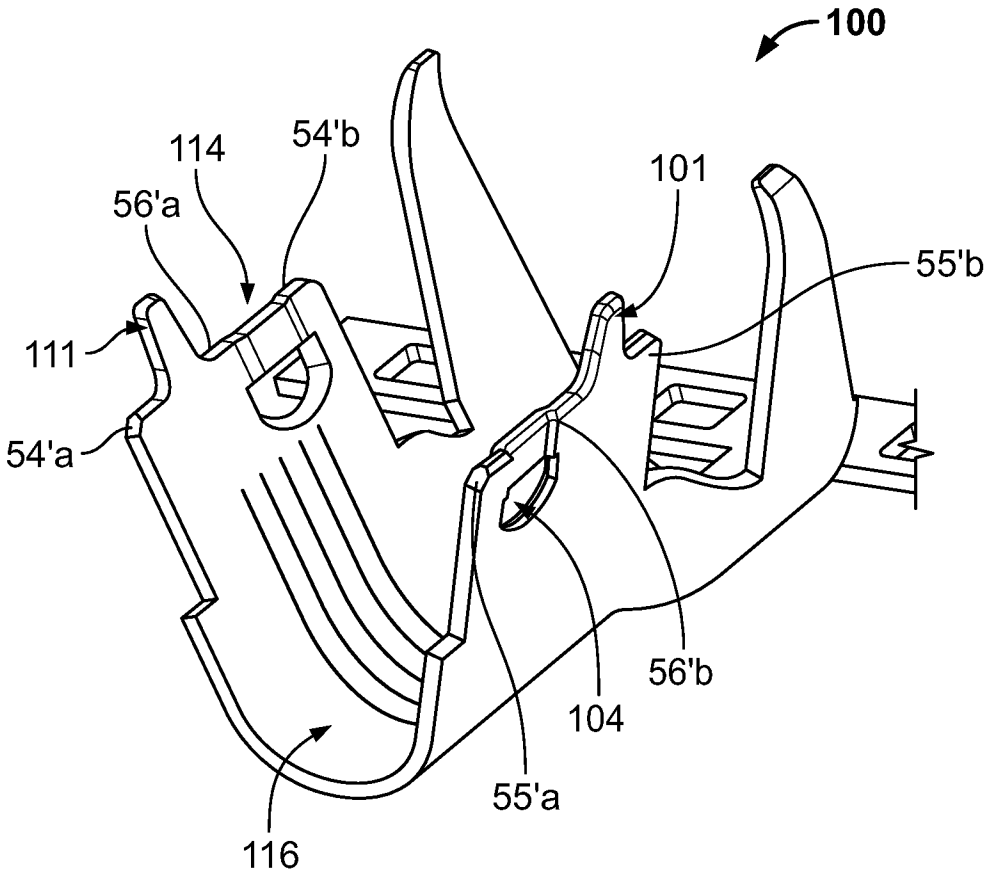
100
114
54'b
56'a
101
55'b
111
54'a
56'b
104
55'a
116

Fig. 4

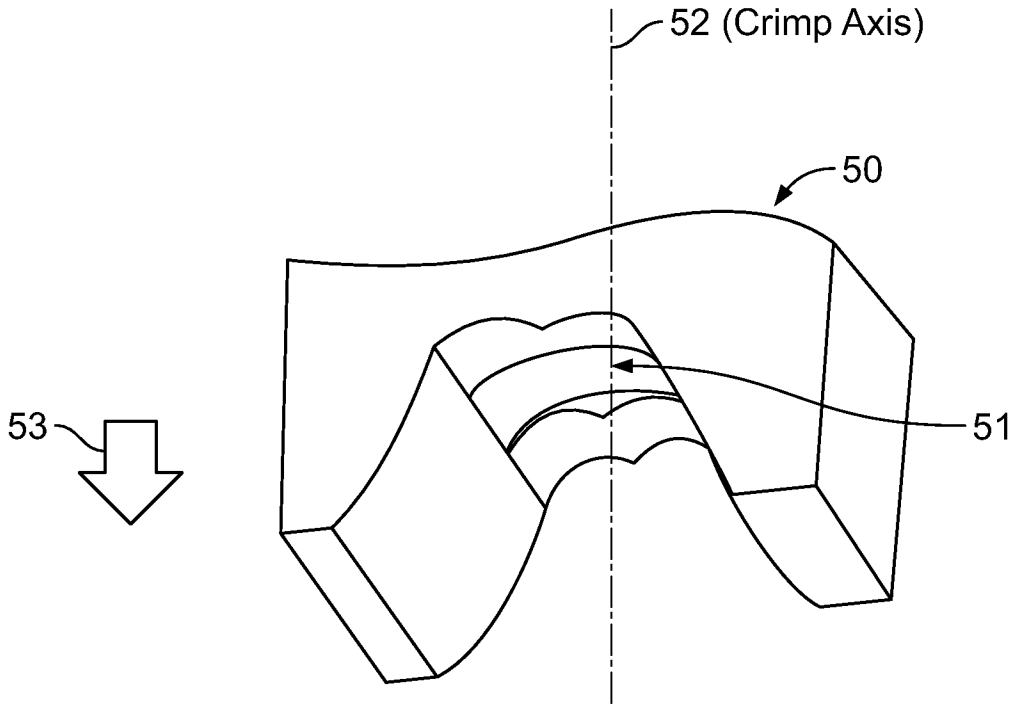
52 (Crimp Axis)
50
53
51

Fig. 5

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2019/066654

A. CLASSIFICATION OF SUBJECT MATTER
INV. 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)
EPO-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	US 3 032 602 A (FARNELL SAMUEL J) 1 May 1962 (1962-05-01) figures 1,2,5-7,11,12 column 1, line 60 - column 2, line 24	1-13
X	NL 6 610 432 A (AMP INC [US]) 6 February 1967 (1967-02-06) figures 1,2,7 page 2, lines 32-34	1-13
X A	US 4 692 122 A (MONTALBANO PETER [US]) 8 September 1987 (1987-09-08) figures 1-4	1-3,5-9, 11-13 4,10
X	EP 1 764 869 A2 (GEBAUER & GRILLER [AT]) 21 March 2007 (2007-03-21) figures 1-6	1-13

-/--

[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

* Special categories of cited documents :

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
20 August 2019	29/08/2019

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Hugueny, Bertrand

1

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INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2019/066654

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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X	GB 2 041 794 A (BICC BURNDY LTD) 17 September 1980 (1980-09-17) figures 1,2 -----	1-13
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1

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International application No
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