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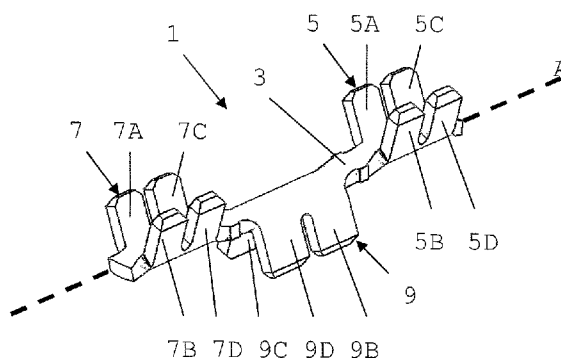


Fig. 1A

(57) Abstract: An assembly and a connector are provided. The assembly comprises a piece of textile and a first and a second conductor connected by a connector (1), the piece of textile comprising the first conductor. The connector is elongated in a direction of extension (A) and comprises a first crimping portion (5) and a second crimping portion (7) arranged along the direction of extension. The first and second crimping portion each comprise a plurality of crimping fingers (5A-5D; 7A-7D), in the assembly penetrating the textile and being crimped onto at least the first conductor. The connector further comprising a third crimping portion (9) in between the first and second crimping portions along the direction of extension, which is crimped onto at least the second conductor such that the first and second conductors are in electrical contact and extend generally parallel to each other within the connector.



Crimp connector and assembly

TECHNICAL FIELD

The present disclosure relates to a crimp connector, in particular a crimp connector for connecting an electrical conductor to a thin fabric, more in particular for connecting an electrical wire or cable portion to a piece of textile which may
5 comprise conductive portions. An assembly comprising a wire connected to a piece of textile having an embedded conductor is also disclosed.

10 BACKGROUND

Presently, consumer electronic devices are ubiquitous and there is a desire to integrate electronic devices into even more aspects of daily life. In particular, there is a desire to integrate electronic devices into clothing, e.g. to provide
15 clothes with a light source for statically or dynamically illuminated a portion of the clothing, or for collecting power and charging a battery from photovoltaic cells attached to the clothes or from electrical charges generated by wearing the clothes. Similar technology could be used for other types and/or
20 uses of textile, e.g. tents, flags and/or banners.

As a consequence, there is a desire for a connector for connecting an outside conductor to a conductor of the textile, e.g. for power transfer and/or signal transmission. Important aspects in such a connector are the conflicting demands of
25 reliability of the electrical connection to the textile and to a conductor to be connected to the textile, e.g. a wire or a cable portion, mechanical robustness of the connection and minimizing damage and/or wear of the textile.

30 SUMMARY

Herewith an assembly according to claim 1 is provided, and a connector for such an assembly, defined in claim 8. The first and second crimping portions allow crimping onto the first conductor of the textile, therewith providing attachment of the

connector to the textile. The third crimping section provides contact to the second conductor, which may be part of a cable or wire as set out in more detail below. The third crimping section being arranged in between the first and second crimping portions along the direction of extension of the elongated connector allows to arrange the locations of attachment of the connector relatively far apart. This provides a long arm for attachment to the textile and a shorter arm for attachment to the second conductor in the connector and reduces torsion of the connector onto the first conductor. The first and second conductors extend generally parallel to each other within the connector, such an arrangement allows preventing torsion of the connector onto the first and second conductors. Hence wear of the textile and the first and second conductors is reduced and a robust assembly is provided. The first conductor may be attached to the textile wherein the textile forms a flexible substrate, e.g. printed onto the textile, or be integrated into the textile, e.g. be glued, stitched, woven, braided or be included otherwise into the textile. The first conductor may be one of a plurality of conductors on and/or in the textile.

Damaging of the textile and stress on the first conductor, or at least risk thereof, is reduced with an assembly according to claim 2, since the third crimping portion does not penetrate the textile. Such assembly may be provided with a connector according to claim 9, wherein the first and second directions may extend generally opposite each other. In particular in an assembly wherein the third crimping portion extends opposite the first and second crimping portions and faces away from the textile, the third crimping portion may be prevented from pressing into the textile and causing wear thereof.

In the assembly of claim 3, crimping is facilitated and stress and wear of the textile and the first and second conductors during attachment of the connector is further reduced. The assembly is therefore generally robust. For example, the first and/or second crimping portions may be crimped in a first direction towards the textile while the third crimping portion is crimped in a direction generally perpendicular to or substantially opposite to the first

direction. Further, accommodation of different sizes and/or materials of the first and second conductors is facilitated.

5 A connector particularly suited for such assembly is specified in claim 10.

The assembly of claim 4 may comprise a fine textile with thin threads and/or may comprise a high density of threads. Due to the plural adjacent crimping fingers a strong hold may be
10 provided while the risk of cutting through and damaging threads of the textile is reduced. The connector of claim 11 is therefore well suited for use with delicate textiles or textiles with a high density of threads, e.g. a dense-woven textile, or a water-repellent textile. Also, the force required for
15 penetrating the textile may be reduced compared to wide crimping fingers, facilitating manufacturing of the assembly and reducing possibility of damaging the textile, the connector and/or the conductors during manufacture.

The assembly of claim 5 provides increased robustness.
20 Such assembly may be provided with a connector of claim 12.

The assembly of claim 6 may be manufactured efficiently. Further, exposure of the first and/or second conductor to the outside may be kept to a minimum, so that oxidation and/or otherwise degradation of a contact between the
25 connector and the conductor may be reduced or even prevented. The connector of claim 13 facilitates manufacturing of such an assembly.

The assembly of claim 7 and the connector of claim 14 facilitate use with different types of first and second
30 conductors, e.g. filaments, multi-strand wires, cables, printed conductors, etc.

The above-described aspects will hereafter be more explained with further details and benefits with reference to the drawings showing embodiments of the invention by way of
35 example.

BRIEF DESCRIPTION OF THE DRAWINGS

Figs. 1A-1B show a first embodiment of a connector;

Figs. 2A-2F show stages of a method of manufacturing an assembly of a piece of textile and a conductor connected by the connector of Figs 1A-1B;

Figs. 3A-3B show a second embodiment of a connector;

5 Figs. 4A-4B show the connector of Figs. 3A-3B in a crimped state;

Figs. 5A-5B show stages of a method of manufacturing an assembly of a piece of textile and a conductor connected by the connector of Figs. 3A-3B;

10 Figs. 6A-6B show a third embodiment of a connector;

Figs. 7A-7B show the connector of Figs. 6A-6B in a partially crimped state;

15 Figs. 8A-8B show stages of a method of manufacturing an assembly of a piece of textile and a conductor connected by the connector of Figs. 6A-6B;

Fig. 9 shows a fourth embodiment of a connector;

Figs. 10A-10C show stages of a method of manufacturing an assembly of a piece of textile and a conductor connected by the connector of Figs. 9.

20

DETAILED DESCRIPTION OF EMBODIMENTS

It is noted that the drawings are schematic, not necessarily to scale and that details that are not required for understanding the present invention may have been omitted. The
25 terms "upward", "downward", "below", "above", and the like relate to the embodiments as oriented in the drawings, unless otherwise specified. Further, elements that are at least substantially identical or that perform an at least substantially identical function are denoted by the same
30 numeral, possibly further specified with an alphabetic suffix.

The figures show different embodiments of connectors as well as stages of manufacturing assemblies of a piece of textile and a conductor connected by the respective connectors.

35 Figs. 1A-1B are a top and bottom perspective view of a first embodiment of a connector 1. The connector 1 comprises an elongated base 3 extending in a direction of extension generally denoted with A. Along the elongated base 3 the connector 1 comprises a first crimping portion 5 and a second crimping portion 7 arranged towards opposite ends of the base 3. The

first and second crimping portions 5, 7, are arranged near opposite ends of the base 3. A third crimping portion 9 is arranged in between the first and second crimping portions 5, 7 along the direction of extension A.

5 In this first embodiment, the first, second and third crimping portions 5, 7, 9 each comprise a plurality of crimping fingers 5A-5D, 7A-7D, 9A-9D sideways from the base in the form of first adjacent crimping fingers (5A, 5C; 7A, 7C; 9A, 9C) extending opposite second adjacent crimping fingers (5B, 5D; 7B, 10 7D; 9B, 9D).

The crimping fingers 5A-7D of the first and second crimping portions 5, 7 are bent to extend generally in a first direction B away from the base 3 and perpendicular to the direction of extension A of the base 3 to form a generally U-
15 shaped channel along the extension A of the base 3 and open in the first direction B. The crimping fingers 9A-9D of the third crimping portion 9 are bent to extend generally in a second direction C away from the base 3 and perpendicular to the direction of extension Z of the base 3 which is substantially
20 opposite the first direction B to form a generally U-shaped channel along the extension A of the base 3 and open in the second direction C. The crimping fingers 5A-7D each have a free tip remote from the base 3 for penetrating textile as will be explained hereafter. In order not to cut through the threads of
25 the textile the crimping fingers 5A-7D and in particular the tips thereof may be tapered, chamfered, bevelled or otherwise rounded-off to some extent, e.g. by coining, polishing etc. Preferably, sharp edges and/or burrs are removed from the entire connector 1.

30 Figs. 2A-2F show a method of connecting a conductor to a textile with the connector of Figs 1A-1B. Figs. 2A and 2B are schematic top and bottom views of a piece of textile 11 which is penetrated by the crimping fingers 5A-7D of the connector 1. In this example the textile 11 is a woven cloth comprising a warp
35 of insulating warp threads 13 and a conductor 15. In Figs. 2A-2F the weft threads are omitted for clarity. Inter alia dependent of the denier of the textile, the conductor 15 may be a single filament, a strand of more than one filament or a wire comprising plural strands, e.g. twisted or braided.

The connector 1 is arranged such that it accommodates the conductor 15 of the textile 11 in the U-shaped channel formed by the first and second crimping portions 5, 7. The base 3 and the third crimping portion 9 are arranged on the same side of the piece of textile 11, the third crimping portion 9 extending away from the textile 11. The adjacent crimping fingers 5A, 5C; 5B, 5D; 7A, 7C; 7B, 7D are separated by a small gap leaving space for the weft to reduce damage, stress and/or wear of the textile.

Figs. 2C-2D show that in a subsequent stage of the method the first and second crimping portions 5, 7, are crimped onto the first conductor 15 of the textile. Thus, the connector 1 is attached and fixed to the textile 11. Here, the conductor 15 is at least partly exposed and by crimping the connector 1 an electrical contact between the connector 1 and the conductor 15 is established.

Next, a second conductor 17, separate from the piece of textile 11, is accommodated in the third crimping portion 9 and the crimping fingers 9A-9D are crimped onto the conductor 17 to fix it to the textile 11 and to establish electrical contact between the first and second conductors 15, 17 (Figs. 2E-2F). Thus, the first and second crimping portions 5, 7 form a first channel accommodating the first conductor 15, and the third crimping portion 9 forms a second channel accommodating the second conductor 17. From Figs. 2E-2F it will be evident that all crimping portions 5-9 of this embodiment are crimped in a "B-type crimp" in opposite directions with the crimping fingers furled inward and pressing against the respective conductors.

When desired, the connector 1 may be crimped onto the second conductor 17 first and the thus formed part-assembly may then be attached to the textile 11.

The second conductor 17 may be cut off on one side of the connector 1, being fixed to the textile 11 by the connector 1. When desired the second conductor 17 may extend on both sides of the connector 1 for significant distances, e.g. as shown in Fig. 2F, e.g. to be mechanically and/or electrically connected to the textile in several locations.

The first, second and third crimp portions 5, 7, 9, are arranged such that the first and second conductors extend

generally parallel to each other within the connector, so that torque on the first conductor 15 due to sideways forces on or by the second conductor is reduced. The third crimping portion 9 is arranged entirely between the first and second crimping portions 5, 7, without any overlap. In case a sideways force is exerted onto the connector 1 by the second conductor 17 or the other way around, the first and second crimping portions provide a relatively long arm for fixing the connector 1 to the textile 11 with relatively little force.

Figs. 3A-3B show a second embodiment of a connector 1 in top and bottom perspective view, respectively. This embodiment is similar to the connector 1 of Figs. 1A-2F. However, here the first and second crimping sections 5, 7 comprise a single pair of opposed crimping fingers, 5A, 5B; 7A, 7B. The third crimping portion 9 comprises a first pair of crimping fingers 9A, 9B, to crimp onto and contact the second conductor 17 and a second pair of crimping fingers 19A, 19B configured to wrap adjacent each other around an insulating layer of an insulated second conductor, e.g. an insulating sleeve or coating, and to form a strain relief crimping portion 19.

Figs. 4A-4B show the connector of Figs. 3A-3B in crimped state (for clarity, no conductors or textile are shown). The first and second crimping portions 5, 7, are crimped in a B-crimp. The first pair of crimping fingers 9A, 9B of the third crimping portion 9 is also crimped in a B-crimp and the second pair of crimping fingers 19A, 19B are tapered, e.g. substantially triangular, and are crimped adjacent each other in an O-crimp or barrel crimp so as to hold, but not cut into, the insulation of an insulated wire or cable (not shown). Compared to the connector of Figs 1A-2F, the relatively wide crimping fingers 5A, 5B; 7A, 7B of the first and second crimping portions 5, 7, provide a relatively stronger hold onto the first conductor for the same strength of the crimping portion material. Also, local force on the first conductor 15 can be reduced due to the wider crimping portion, preventing accidental cutting or nicking the conductor. The same holds for the third crimping portion 9. The connector 1 of Figs 3A-3B is therefore relatively robust and it is e.g. well suited for conductors with

multi-filament wires, for relatively coarse textiles and/or textiles with an open weave.

Best seen in Figs. 5A-5B it is shown that the connectors 1 may be manufactured by stamping or cutting and bending of strip-material, and may be separated from a carrier strip 21 at a later time. Fig. 5B shows that plural conductors 17 may be attached to the connectors prior to separating the connectors 1 from the carrier strip 21. This may facilitate alignment of the conductors 17 and (the crimping portions of) the connectors 1, improving reliability of the crimped connections. The separation of the connectors 1 from the carrier strip 21 may be done before or after attaching the sub-assemblies of connectors 1 and conductors 17 to the textile, e.g. dependent on (the reliability of) the spacing between the connectors 1 on the carrier strip 21 and any conductors in the textile.

Figs. 6A-7B show, comparable to Figs. 3A-4B, yet another embodiment of a connector 1 in top and bottom perspective view. Figs. 8A-8B show a plurality of such connectors attached to a carrier strip 21, Fig. 8B also showing second conductors. The connector 1 of Figs. 6A-8B is similar to the connector 1 of Figs. 3A-5B, with the first and second crimping portions 5, 7 comprising a single pair of opposite crimping fingers, 5A, 5B; 7A, 7B, e.g. to establish a B-crimp (Figs. 7A-7B). Here, however, the third crimping portion 9 comprises two adjacent star crimping portions 23A, 23B (also known as crown crimps) which may be used for penetrating and contacting a conductor on a flat substrate such as conductor stripes 25 printed on a flexible substrate 27, e.g. Flexfoil®, as indicated in Fig. 8B.

In particular in case a plurality of second conductors arranged at a predetermined pitch is to be contacted at one time, it is beneficial to provide the connectors 1 attached to a carrier strip 21. The connectors 1 may be separated from the carrier strip 21 by cutting, but a provision for breaking off the connectors may also be provided, e.g. cutting a notch in the carrier strip aside each connector.

A different embodiment of a connector is shown in Fig. 9, showing a connector 100. Here, the first and second crimping

sections 105, 107, comprise crimping fingers 105A, 105B; 107A, 107B extending from an elongated base 103 and formed to be crimped adjacent each other in an O-crimp whereas the third crimping section 109 comprises adjacent pairs of opposite
5 crimping fingers 109A-109D which may form a B-crimp. In this embodiment, the first, second and third crimping portions 105-109 all extend towards the same side, forming a substantially continuous U-shaped channel open towards one side.

A method of manufacturing of an assembly of the
10 connector 100 of Fig. 9 and a piece of textile 11 is shown in Figs. 10A-10C. Fig. 10A shows a piece of textile 11 comprising a first conductor 15, wherein the textile is penetrated by all crimping fingers of the connector 100, such that the first conductor 15 is accommodated between the crimping fingers. A
15 second conductor 17, external to the textile, is accommodated also between the crimping fingers and parallel to the first conductor 15. Next, the crimping portions 105-109 are crimped to fix the first and second conductors 15, 17 together and establish electrical contact between them.

20 As shown, it is considered advantageous to first partially crimp the first and second crimping portions 105, 107 (Fig. 10B) to attach the connector to the textile 11, at least loosely, so that subsequent crimping steps which may require significantly more force for crimping are facilitated. Here, the
25 second conductor is retained within the connector 1 by forming a barrel-like portion by the O-crimp of the first and second crimping portions 105, 107. Subsequently, the third crimping portion 109 is crimped, potentially forcefully, to fix both conductors and establish contact between them. During this step
30 or thereafter the first and second crimping portions 105, 107 may be crimped more tightly if so desired (Fig. 10C). The connector 100 provides different crimping types and crimping forces between the first, second and third crimping portions 105, 107, 109. As a result, the first and second crimping
35 portions 105, 107 provide a retaining force to the first and second conductors 15, 17 and provide reduced torque on the textile when the second conductor 17 is pulled or when another force is exerted.

The connector 100 of Fig. 9 may have a smaller volume than the connector 1 of Figs. 1-8B, and/or penetrate less far from the textile.

5 The shown connectors are conductive, e.g. metal, and may comprise an insulating layer on one or more portions (not shown). A metal connector may efficiently be manufactured by stamping and bending of sheet or strip material, but other materials and/or other methods of cutting and forming may be employed.

10 The teaching of this disclosure is not restricted to the above described embodiments which can be varied in a number of ways within the scope of the claims. For instance, one or more crimping portions may be formed for other types of crimping, e.g. a ferrule crimp or hex-crimp in which a ferrule
15 is compressed substantially radially, or a crimp in which a single point is pressed into a crimping barrel. Crimping in a direction substantially parallel to the textile may also be possible.

20 In particular when the first conductor of the textile and/or the second conductor is (are) insulated, the connector may comprise one or more lances and/or teeth to penetrate the insulation and to contact the conductor inside the insulation.

25 Elements and aspects discussed for or in relation with a particular embodiment may be suitably combined with elements and aspects of other embodiments, unless explicitly stated otherwise.

CLAIMS

1. Assembly comprising a piece of textile (11) and a first (15) and a second conductor (17) connected by a connector
5 (1; 100),

the piece of textile comprising the first conductor (15),

wherein the connector is elongated in a direction of extension (A) and comprises a first crimping portion (5; 105)
10 and a second crimping portion (7; 107) arranged along the direction of extension, the first and second crimping portion each comprising a plurality of crimping fingers (5A-5D; 7A-7D; 105A, 105B; 107A, 107B), penetrating the textile and being crimped onto at least the first conductor,

15 the connector further comprising a third crimping portion (9; 109) in between the first and second crimping portions along the direction of extension, which is crimped onto at least the second conductor such that the first and second conductors are in electrical contact and extend generally
20 parallel to each other within the connector.

2. Assembly of claim 1, wherein the third crimping portion (9) is arranged outside the textile (11).

25 3. Assembly of claim 2, wherein the first and second crimping portions (5; 7) are crimped in a first general direction and wherein the third crimping portion (9) is crimped in a different direction than the first and second crimping portions.

30

4. Assembly of any preceding claim, wherein at least one of the first, second and third crimping portions (5; 7; 9; 109) comprises a first plurality of adjacent crimping fingers (5A, 5C; 7A, 7C; 109A; 119A) opposite a second plurality of
35 adjacent crimping fingers (5B, 5D; 7B, 7D; 109B; 119B).

5 5. Assembly of any preceding claim, wherein at least one of the first and the second conductors (15; 17) comprises an insulating layer and wherein at least one of the first, second and third crimping portions (9; 105; 107) comprises a strain relief portion (19; 105; 107) crimped onto the insulating layer.

10 6. Assembly of any preceding claim, wherein at least one of the first and second conductors (15; 17) comprises an insulating layer and wherein at least a portion of one of the first, second and third crimping portions penetrates the insulating layer and contacts the conductor.

15 7. Assembly of any preceding claim, wherein the third crimping portion (9; 109) provides a different type of crimping than the first and second crimping portions (5; 7; 105; 107).

20 8. Connector (1; 100) for an assembly of any preceding claims, wherein the connector is elongated in a direction of extension (A) and comprises a first crimping portion (5; 105) and a second crimping portion (7; 107) arranged along the direction of extension, the first and second crimping portion each comprising a plurality of crimping fingers (5A-5D; 7A-7D; 105A, 105B; 107A, 107B) configured to penetrate the piece of textile (11) and to be crimped onto at least the first conductor (15);

25 wherein the connector further comprises a third crimping portion (9; 109) in between the first and second crimping portions along the direction of extension, wherein the third crimping portion is configured to be crimped onto at least the second conductor to make electrical contact between the first and second conductors with the first and second conductors extending generally parallel to each other within the connector.

30 9. Connector of claim 8, wherein the connector (1; 100) comprises a base (3), and

wherein the crimping fingers (5A-5D; 7A-7D) of the first and second crimping portions (5; 7) extend in a first

direction (B) away from the base to form a generally U-shaped channel open in the first direction, and wherein the third crimping portion (9) extends from the base in a second direction (C) different from the first direction.

5

10. Connector (1) of claim 9, wherein the first and second crimping portions (5; 7) are configured to be crimped in a first general direction (B) and wherein the third crimping portion (9) is configured to be crimped in a second direction (C) different from the first general direction.

10

11. Connector (1; 100) of any one of claims 8-10, wherein at least one of the first, second and third crimping portions (5; 7; 9; 109) comprises a first plurality of adjacent crimping fingers (5A, 5C; 7A, 7C; 109A; 119A) opposite a second plurality of adjacent crimping fingers (5B, 5D; 7B, 7D; 109B; 119B).

15

12. Connector (1; 100) of any one of claims 8-11, wherein at least one of the first, second and third crimping portions comprises a strain relief portion (19; 105; 107) comprising crimping fingers (19A, 19B; 105A, 105B; 107A, 107B) configured to wrap around an insulating layer of an insulated second conductor.

20

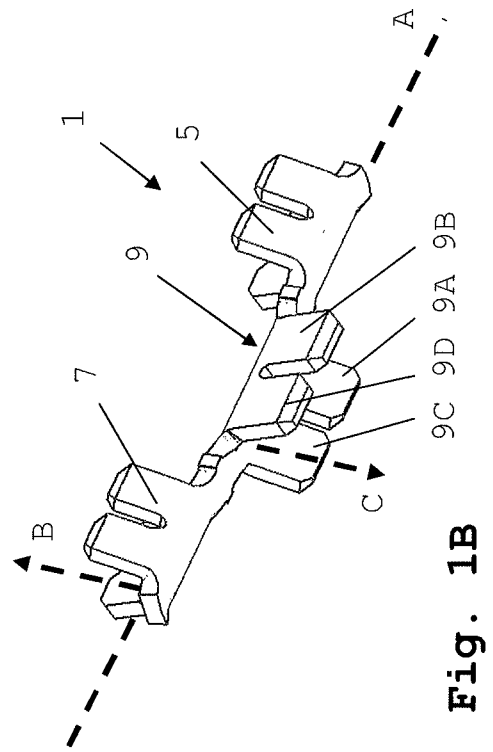
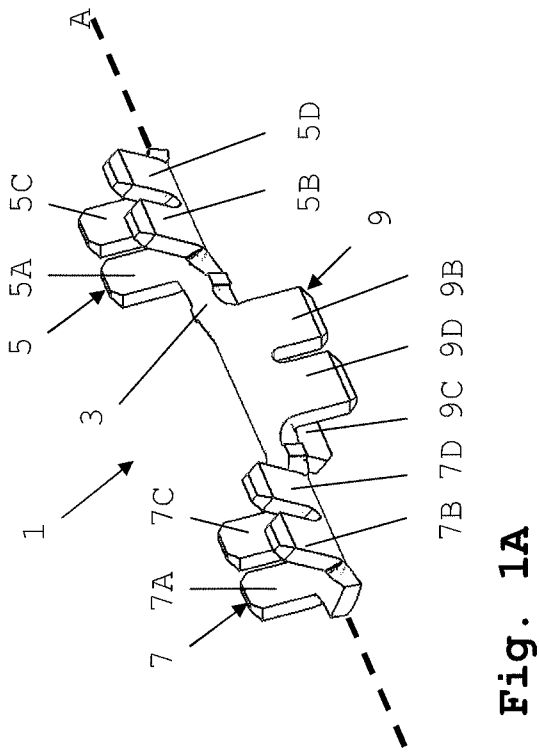
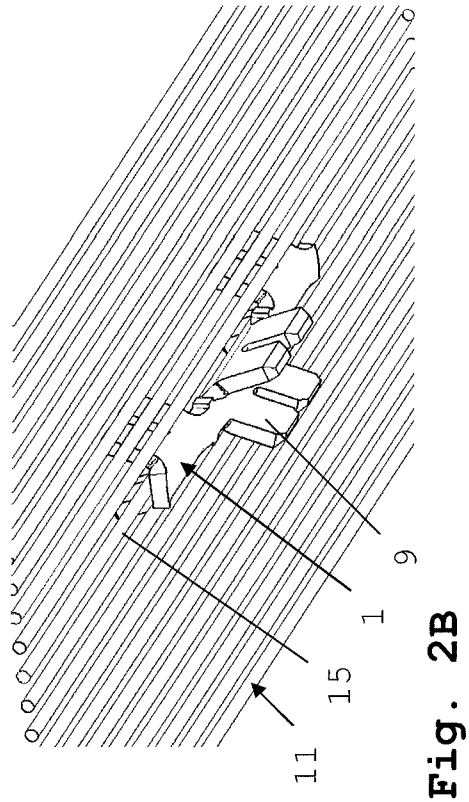
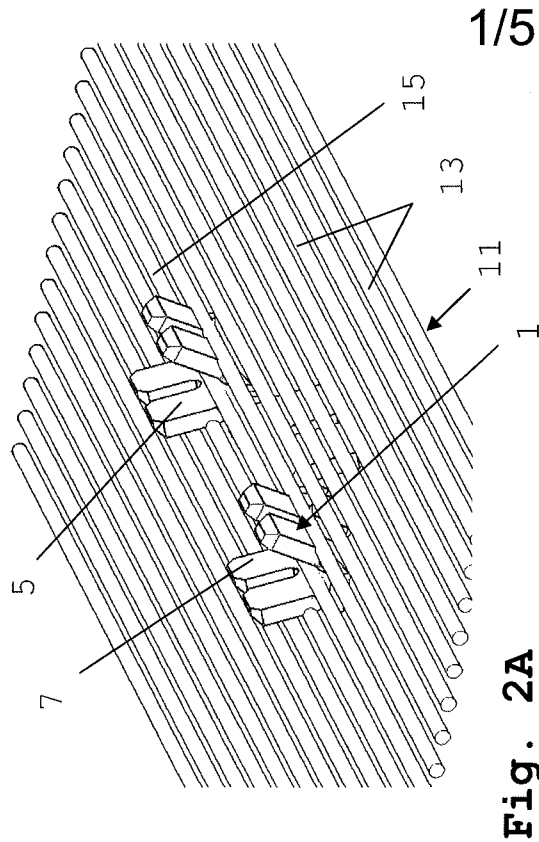
13. Connector of any one of claims 8-12, wherein at least one of the first, second and third crimping portions comprises a penetrator to penetrate the insulating layer of an insulated conductor and to contact the conductor.

25

14. Connector (1; 100) of any one of claims 8-13, wherein the third crimping section (9; 109) is configured to provide a different type of crimping than the first and second crimping portions (5, 7; 105, 107).

30

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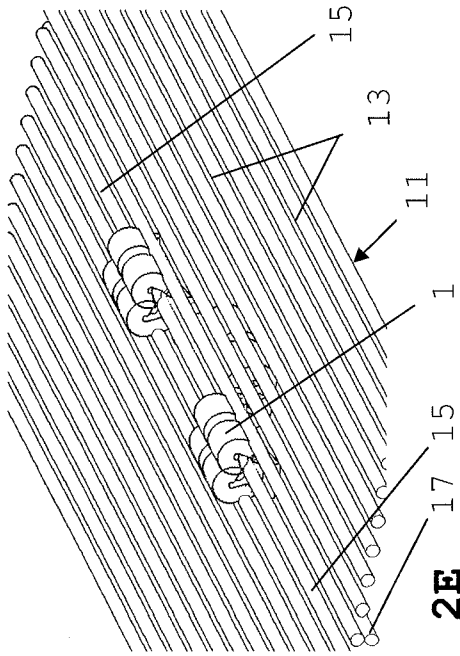


Fig. 2C

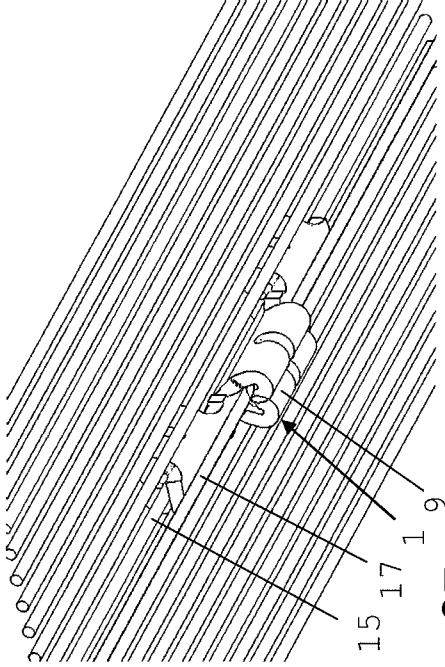


Fig. 2D

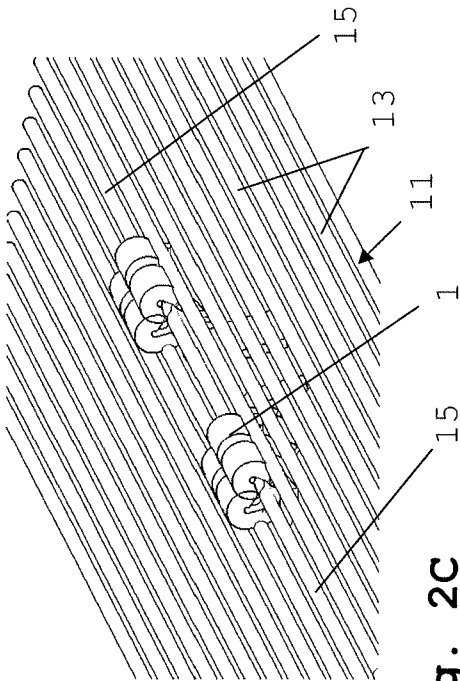


Fig. 2E

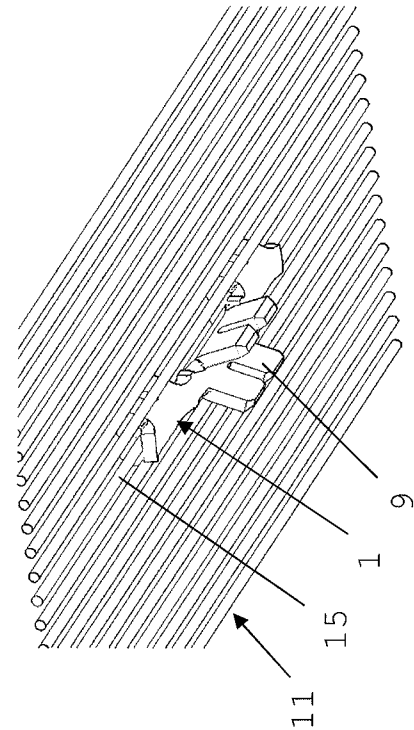


Fig. 2F

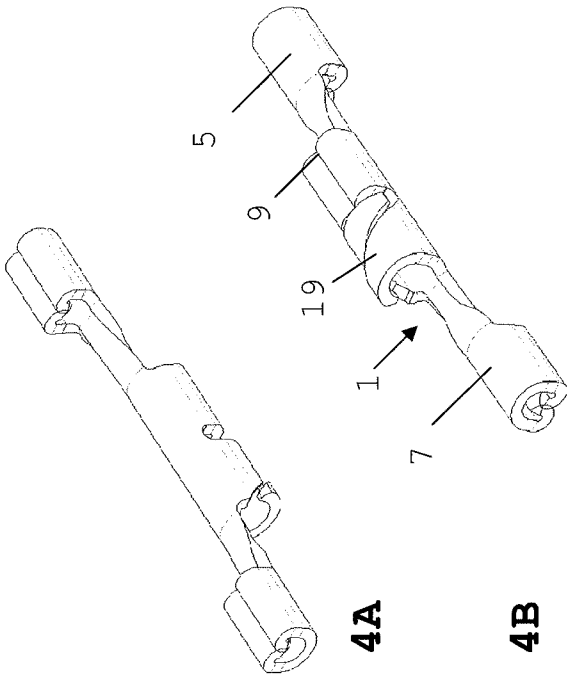


Fig. 4A

Fig. 4B

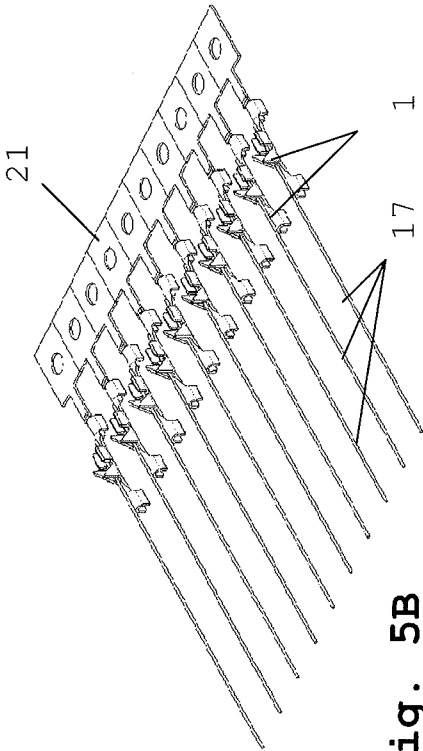


Fig. 5B

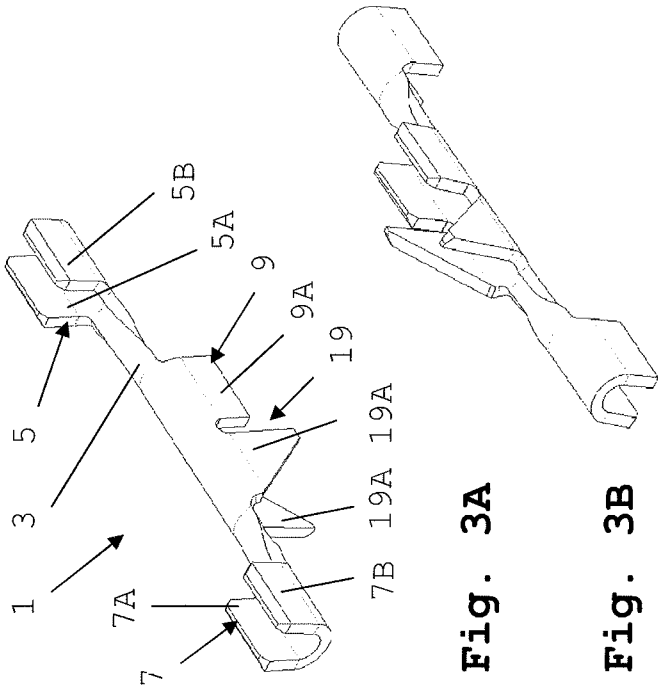


Fig. 3A

Fig. 3B

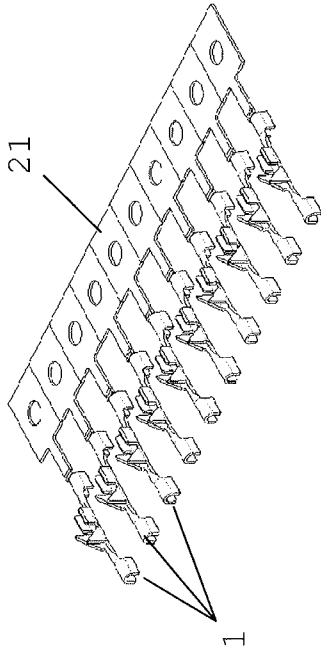


Fig. 5A

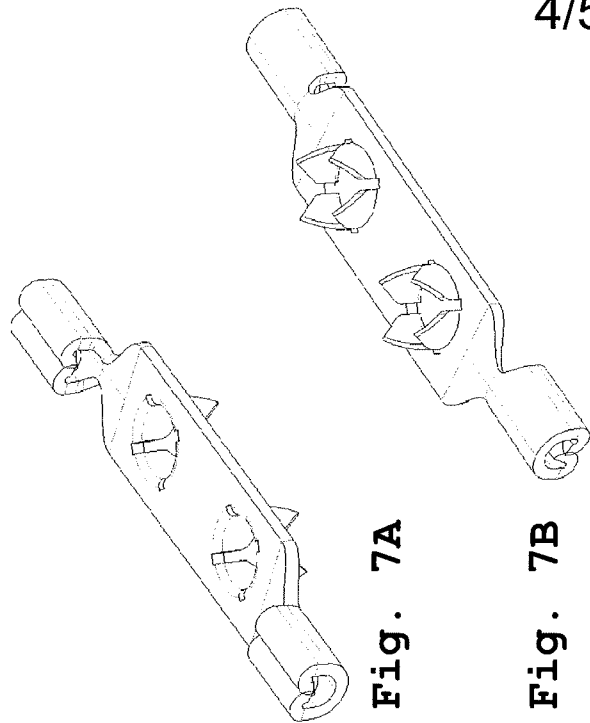


Fig. 7A

Fig. 7B

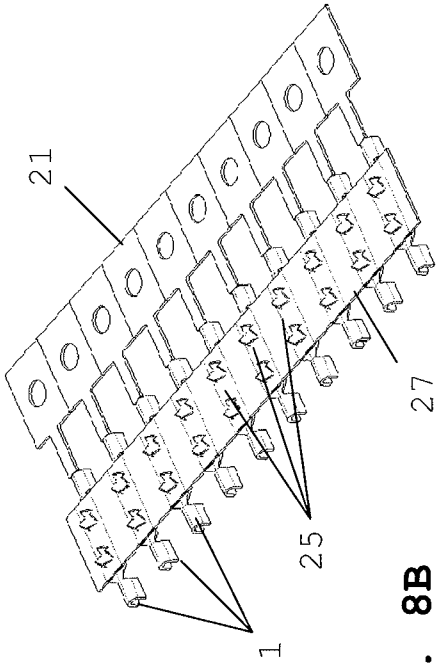


Fig. 8B

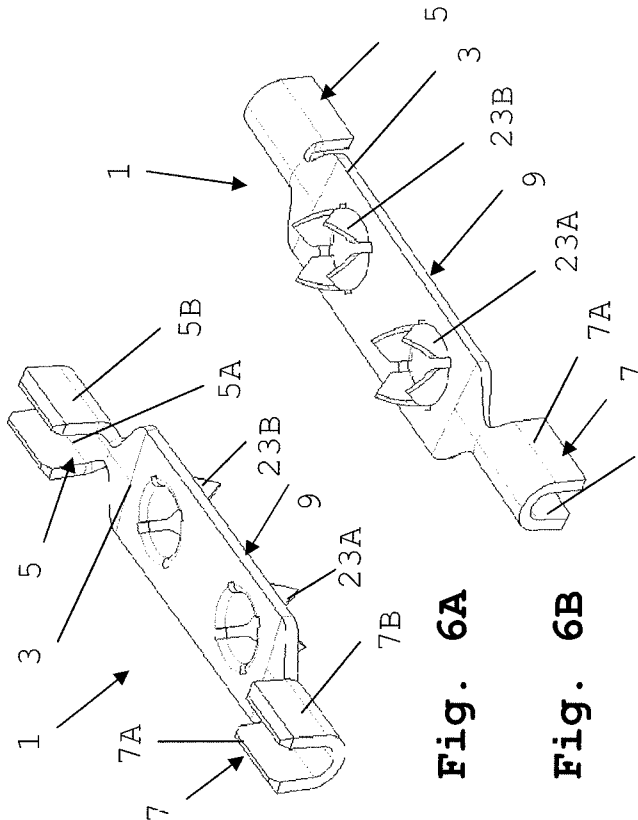


Fig. 6A

Fig. 6B

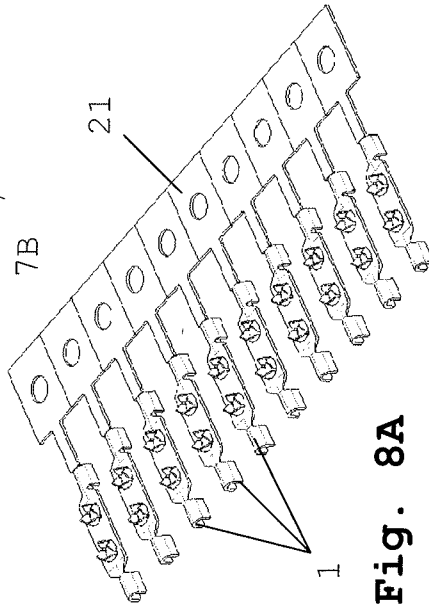


Fig. 8A

Fig. 10A

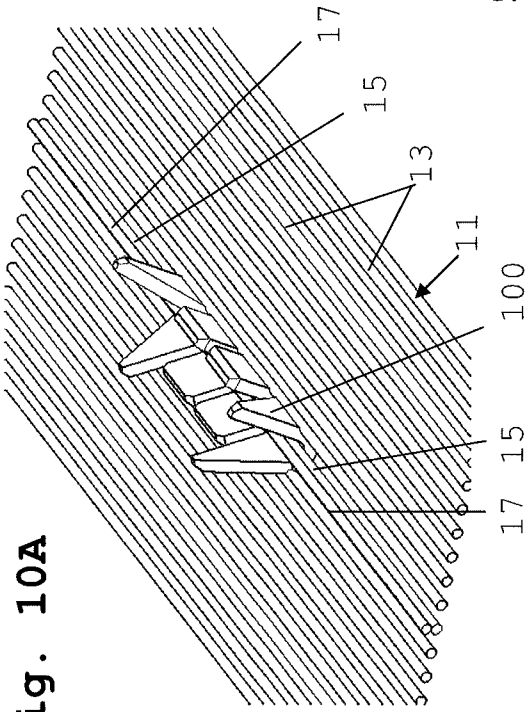


Fig. 10C

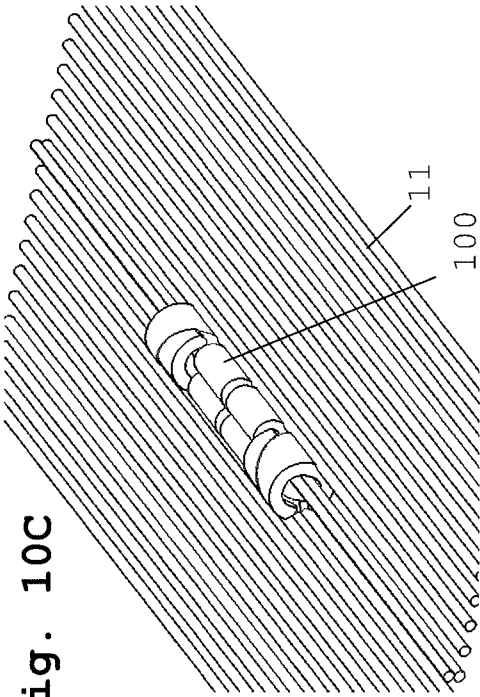


Fig. 9

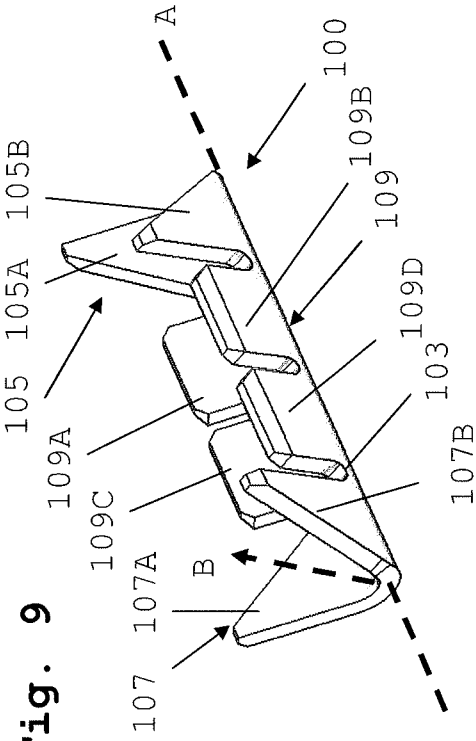
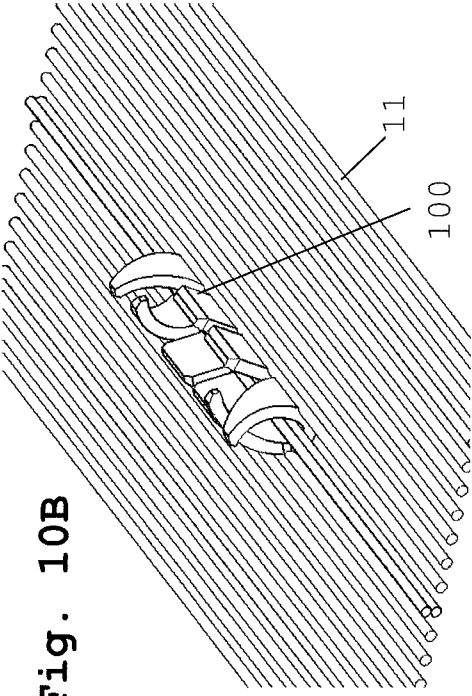


Fig. 10B



INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2012/055077

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)

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	GB 2 396 256 A (JONES DIANNE [GB]; LEFTY STEVEN [GB]; SUNDERLAND MATTHEW [GB]; SUNDERL) 16 June 2004 (2004-06-16) figures 1-3	1-14
A	US 2 691 198 A (FLOOD CARL A) 12 October 1954 (1954-10-12) the whole document	1-14
A	US 2006/201695 A1 (KOSSAK ROBERT W [US] ET AL) 14 September 2006 (2006-09-14) the whole document	1-14
A	DE 18 02 168 A1 (AMP INC) 8 May 1969 (1969-05-08) the whole document	1-14
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See patent family annex.

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Date of the actual completion of the international search

14 June 2012

Date of mailing of the international search report

25/06/2012

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Camerer, Stephan

INTERNATIONAL SEARCH REPORT

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PCT/EP2012/055077

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 3 414 666 A (DOUNDOULAKIS GEORGE J ET AL) 3 December 1968 (1968-12-03) the whole document -----	1-14

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2012/055077

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
GB 2396256	A	16-06-2004	NONE	

US 2691198	A	12-10-1954	NONE	

US 2006201695	A1	14-09-2006	NONE	

DE 1802168	A1	08-05-1969	DE 1802168 A1	08-05-1969
			ES 358755 A1	01-05-1970
			FR 1583047 A	10-10-1969
			GB 1181337 A	11-02-1970
			NL 6813848 A	11-04-1969
			US 3406247 A	15-10-1968

US 3414666	A	03-12-1968	DE 1465444 A1	30-01-1969
			ES 304925 A1	16-05-1965
			ES 308800 A1	16-05-1965
			GB 1088768 A	25-10-1967
			NL 6411939 A	15-04-1965
			US 3414666 A	03-12-1968
