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(72) Inventors:
• **KASSER, Michael**
42369 WUPPERTAL (DE)
• **PACKEBUSCH, Swindhard**
42111 WUPPERTAL (DE)

(74) Representative: **Robert, Vincent et al**
Delphi France SAS
Bâtiment Le Raspail - Paris Nord 2
22, avenue des Nations
CS 65059 Villepinte
95972 Roissy CDG Cedex (FR)

(71) Applicant: **Delphi Technologies, Inc.**
Troy, MI 48007 (US)

(54) **POWER TERMINAL WITH CRIMPING WINGS AND A WELD AREA**

(57) The invention relates to a power terminal (1) comprising a first pair of insulation crimping wings (4) and a second pair of insulation crimping wings (5) for crimping to an insulation (3) of an insulated electrical wire (6). The terminal comprises a weld area (7) provided between the first pair of insulation crimping wings (4) and

the second pair of insulation crimping wings (5) for welding to a lead (9) of the insulated electrical wire (6). The length (LW) of the weld area (7) is substantially equal to the length (LL) of the lead (9). The power terminal comprises power connector (10) in conductive contact with the weld area (7).

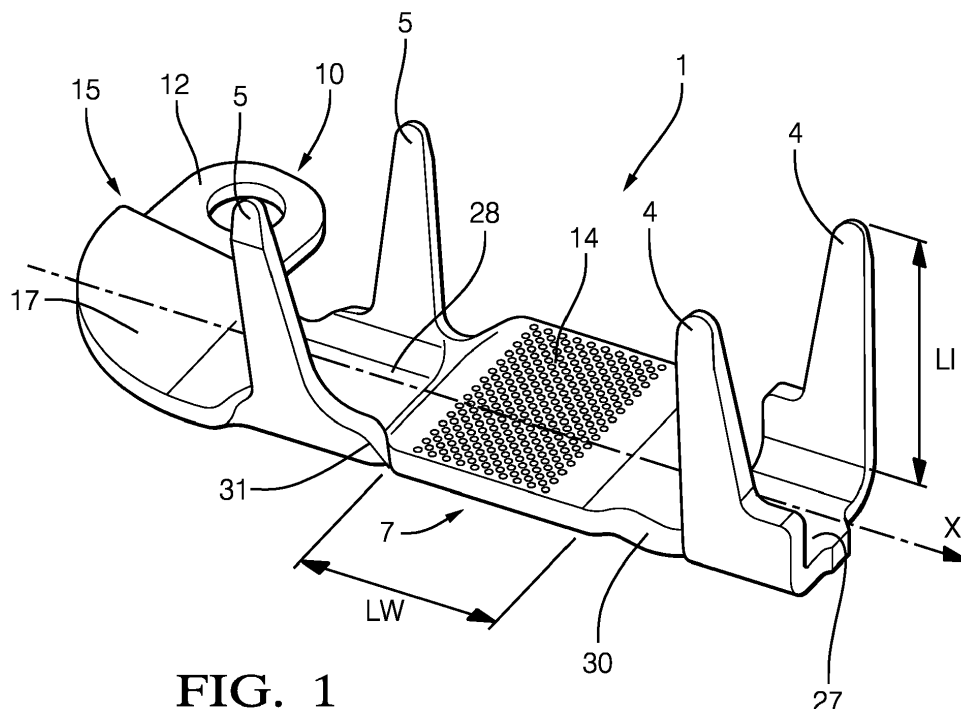


FIG. 1

Description

TECHNICAL FIELD

[0001] The invention relates to a power terminal and a method for crimping and welding said terminal to an insulated electrical wire.

BACKGROUND OF THE INVENTION

[0002] In vehicle wire harnesses there is a demand for connecting electrical wires to a power supply. Use is made of a power terminal with a first end that is typically crimped or welded to an end of an insulated electrical wire. The other end of the power terminal often comprises a ring terminal. The ring terminal is subsequently attached to a pin on the power supply. An example of a power supply is a starter/alternator battery. Typically a first power terminal is used to connect a first insulated electrical wire to a male pin on the starter/alternator battery. A second power terminal is used to connect a second insulated electrical wire to the same male pin on the starter/alternator.

[0003] Drawback of such power terminals is that two power terminals are needed to connect two different wires to a single male pin.

SUMMARY OF THE INVENTION

[0004] The object of the invention is to solve above drawback or at least provide an alternative. In particular, the object of the invention is to provide a faster way of connecting two wires to a power supply.

[0005] The present invention, in particular claim 1, solves the above problem by providing a power terminal that comprises a first pair of insulation crimping wings for crimping to an insulation of the insulated electrical wire and a second pair of insulation crimping wings for crimping to an insulation of the same insulated electrical wire. The power terminal further comprises a weld area that is provided between the first pair of insulation crimping wings and the second pair of insulation crimping wings. The weld area is suitable for welding the terminal to a lead of the insulated electrical wire. The length of the weld area is substantially equal to the length of the lead. The power terminal further comprises a power connector that is in conductive contact with the weld area. The power connector is adapted to connect to a terminal of the power supply.

[0006] A power terminal having a weld area in between two pairs of insulation crimping wings allows for welding the terminal to a lead of an insulated electrical wire that is in between the ends of this single wire. One power terminal can be used to provide power towards ends of the wire. In other words, the power terminal provides an electrical junction between the power supply and two ends of a single wire. This avoids the need of using two power terminals and thereby having to perform two elec-

trical welding steps.

[0007] Therefore, the power terminal according to the invention improves existing power terminals and/or at least provides an alternative.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0008] In a preferred embodiment of the power terminal according to the invention, the first pair of insulation crimping wings, the second pair of insulation crimping wings and the weld area are longitudinally arranged. With longitudinally is meant that said pairs of crimping wings and the weld area are arranged and aligned along a longitudinal axis of the terminal. The longitudinal axis of the terminal is then parallel with the insulated wire when the wire is crimped and welded to the terminal.

[0009] Advantage of this arrangement is that the lead of the wire in between the pair of insulation crimping wings may be free from bends. This may result in a better weld between lead and weld area as the lead is straight, i.e. aligned with the longitudinal axis.

[0010] In an embodiment of the invention, the power connector preferably at least partly extends transversely from the longitudinal axis of the power terminal.

[0011] Advantage of having the power connector extending transversely is that it allows the power connector to be provided next to the electrical wire when the electrical wire is welded and crimped to the power terminal. In other words, the power connector may be spaced or offset from the electrical wire. This may result in more space for connecting the power connector with for example a male pin of the power supply.

[0012] In an embodiment of the invention, the power connector is a ring terminal for receiving an electrical pin.

This allows the power terminal to be electrically and mechanically connected to a male pin on the power supply.

[0013] In an embodiment of the invention, the power connector comprises a flat connector surface and the weld area comprises a flat weld surface, wherein the flat connector surface is parallel with the flat weld surface.

[0014] This has as advantage that the power terminal may be stamped from a single sheet of metal in an easy way.

[0015] Preferably, the power terminal is made from a single sheet of metal resulting in a power terminal having substantially a same thickness. For example, the crimping wings, the weld area and the power connector all have substantially the same thickness.

[0016] In a further embodiment, the flat weld surface is offset from the flat connector surface. Preferably, the flat connector surface is below the insulated electrical wire. In other words, a plane spanned by the flat connector surface is free from an intersection with the insulated electrical wire when the insulated electrical wire is crimped and welded to the power terminal. In even other words, the flat connector surface is spaced away from the flat weld surface in an opposite direction with respect to the direction in which ends of the insulation crimping

wings are pointing when the power terminal is in a pre-weld state.

[0017] This has as advantage that the lead of the insulated electrical conductor may be firmly in contact with the flat weld surface after welding. Due to a thickness of the insulation of the insulated electrical wire bending moments may occur after the lead is welded to the flat surface as there is a transition area between end of the insulation and beginning of the lead. Having the flat connector surface spaced away from the flat weld surface allows reduction of such unwanted bending moments.

[0018] In an alternative embodiment, the flat connector surface is level with the flat weld surface.

[0019] This has as advantage that a more compact connection may be acquired.

[0020] In an embodiment, the power terminal comprises a first flat bridge portion between the wings of the first pair of insulation wings. A first step is provided between the weld area and the first flat bridge portion. The weld area, preferably a flat weld surface, is spaced away from the first flat bridge portion. The first step may compensate for a transition area between the end of the insulation and the beginning of the lead. This may reduce unwanted bending moments.

[0021] In a further embodiment, the power terminal comprises a second flat bridge portion between the wings of the second pair of insulation wings. A second step is provided between the weld area and the second flat bridge portion. The weld area, preferably a flat weld surface, is spaced away from the second flat bridge portion and is level with the first flat bridge portion. The second step may compensate for a transition area between the end of the insulation and the beginning of the lead. The height of the second step between weld area and second bridge portion is preferably equal to the height of the first step between weld area and first bridge portion. This may minimize unwanted bending moments when there are two transition areas in an insulated electrical wire where a lead is in between ends of the insulated electrical wire.

[0022] In an embodiment, the length of the insulation wings is substantially equal to the length of the weld area.

[0023] When the length of the weld area (and thereby the length of the lead) is too long, there is a great risk that the weld connection may deteriorate. For example corrosion effects and continuous mechanical loads may weaken the weld connection.

[0024] When the length of the weld area (and thereby the length of the lead) is too small the electrical connection may not be sufficient as there is too little contact area between lead and weld area.

[0025] There is a delicate balance between the length of the lead and the diameter of the insulated electrical wire to overcome both drawbacks. With that, there is a delicate balance between the length of the length of weld area and the insulation wings respectively.

[0026] There is an optimum when the length of the insulation wings are substantially equal to the length of the weld area.

[0027] In an embodiment, the terminal is made of aluminum.

[0028] In an alternative embodiment, the terminal is made of copper.

5 **[0029]** The invention further relates to a wire terminal assembly. The wire terminal assembly comprises a power terminal according to one of the preceding embodiments and an insulated electrical wire. The insulated electrical wire is crimped and welded to the terminal.

10 **[0030]** In an embodiment, the insulated electrical wire comprises a copper conductor.

[0031] In an alternative embodiment the insulated electrical wire comprises an aluminum conductor.

15 **[0032]** The invention further relates to a method for crimping and welding a terminal according to one of the above embodiments to an insulated electrical wire. The method comprises the step of at least partly removing an insulation of the insulated electrical wire from an area between the ends of the insulated electrical wire thereby uncovering a lead of the insulated electrical wire. A further step is aligning the lead with the weld area of the terminal. Another step is welding the lead to the weld area. A further step is crimping the first pair of insulation wings to the insulation of the insulated electrical wire. Another step is crimping the second pair of insulation wings to the insulation of the insulated electrical wire.

20 **[0033]** The advantage of this method is that it allows a power terminal having a weld area in between two pairs of insulation crimping wings to be welded to a lead of an insulated electrical wire that is in between the ends of this single wire. It allows the use of only one power terminal to provide power towards ends of the wire. This avoids the need of using two power terminals and thereby having to perform two electrical welding steps.

25 **[0034]** Therefore, the method according to the invention improves existing methods for crimping and welding a terminal to an insulated electrical wire.

30 **[0035]** In an embodiment of the method, the welding of the lead to the weld area is by means of ultrasonic welding.

35 **[0036]** These and further embodiments of the power terminal, wire terminal assembly and method according to the invention are captured in the dependent claims.

45 BRIEF DESCRIPTION OF THE DRAWINGS

[0037] Above and other aspects, characteristics and advantages of the present invention will be explained in more detail by means of the following description of a non-limiting embodiment of the power terminal, wire terminal assembly and method according to the invention, in which identical reference numerals denote identical components, and in which:

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- figure 1 shows a perspective view of a power terminal in a pre-weld state according to the invention; and
 - figure 2 shows a perspective view of the power terminal in a welded state when crimped and welded

to an insulated electrical wire.

[0038] Figure 1 shows a power terminal 1 comprising a first of insulation crimping wings 4 and a second pair of insulation crimping wings 5. The power terminal 1 is shown in a pre-weld state prior to be welded and crimped to an insulated electrical wire 6 as shown in figure 2. In the pre-weld state, the pairs of crimping wings 4, 5 extend substantially transverse with respect to a longitudinal axis (X) of the power terminal 1. The insulation crimping wings are suitable for crimping to insulation 3 of the insulated electrical wire 6. The first pair and second pair of insulation crimping wings 4, 5 are suitable to be crimped to insulation of the same insulated electrical wire 6.

[0039] In between the first pair and second pair of insulation crimping wings 4, 5 a weld area 7 is provided. The weld area 7 is suitable for welding to a lead 9 of the insulated electrical wire 6.

[0040] The length LW of the weld area 7 is substantially equal to the length LL of the lead 9.

[0041] The power terminal 1 further comprises a power connector 10 that is in conductive contact with the weld area 7. The power connector 10 is suitable to be connected to a terminal of a power supply (not shown).

[0042] Figure 2 shows the power terminal 1 in a welded state, i.e. crimped and welded to the insulated electrical wire 6.

[0043] As can be shown in both figure 1 and figure 2, the first pair of insulation crimping wings 4, the second pair of insulation crimping wings 5 and the weld area 7 are arranged longitudinally along the longitudinal axis X of the terminal 1. In figure 2, from left to right, the power terminal 1 is arranged with the first pair of insulation crimping wings 4, the weld area 7, the second pair of insulation crimping wings 5 and the power connector 10. In the welded state, the longitudinal axis X of the terminal 1 is parallel, i.e. aligned, with the insulated wire 6.

[0044] The power connector 10 extends transversely from the longitudinal axis X of the terminal 1. This way the power connector is spaced away from the insulated electrical wire 6 such that it allows for connection to a power supply. In the shown embodiment, the power connector 10 is a ring terminal comprising a flat connector surface 12. The ring terminal is suitable for receiving an electrical pin of the power supply.

[0045] The power terminal comprises an intermediate longitudinal ridge 15 provided between the power connector 10 and the second pair of insulation crimping wings 5. The intermediate longitudinal ridge 15 provides support to the insulation of the insulated electrical wire 6. Here, as can be seen in figure 1, the ridge 15 is longitudinal and thus parallel with the longitudinal axis X of the power terminal 1 and with the insulated electrical wire. On other words, the longitudinal ridge 15 supports and extends along the insulated electrical wire 6 when said wire is crimped and welded to the power terminal. The intermediate longitudinal ridge 15 is provided between the power connector 10 and an angled portion 17. The

angled portion 17 is a flat portion between the power connector 10 and the second pair of insulated crimping wings 5. As best shown in figure 2, the intermediate longitudinal ridge 15 protrudes from the angled flat portion 17 and the flat connector surface 12. This allows a better support of the insulated electrical wire 6.

[0046] Preferably, the weld area 7 comprises a flat weld surface 14.

[0047] The flat connector surface 12 is parallel with the flat weld surface 14.

[0048] In a further preference, the flat connector surface 12 is offset with respect to the flat weld surface 14.

[0049] As can be seen in figure 1, the power terminal 1 comprises a first flat bridge portion 27 between the wings of the first pair of insulation wings 4. A first step 30 is provided between the weld area 7 and the first flat bridge portion 27. Here, the flat weld surface 14 is parallel with the first flat bridge portion 27. Due to the first step 30, the flat weld surface 14 is offset or spaced away from the first flat bridge portion 27.

[0050] Preferably, as can be seen in figure 1, the power terminal 1 comprises a second flat bridge portion 28 between the wings of the second pair of insulation wings 5. A second step 31 is provided between the weld area 7 and the second flat bridge portion 28. The flat weld surface 14 is parallel with the second flat bridge portion 28. Due to the second step 31, the flat weld surface 14 is offset or spaced away from the second flat bridge portion 28.

[0051] Preferably, the first flat bridge portion 27 and the second flat bridge portion 28 are parallel and level. In other words, the flat bridge portions 27, 28 are in a same plane. In a further preference, the flat weld surface 14 is spaced away from this same plane in a direction equal to the direction in which the wings extend in the pre-weld state. The height of the first step and the second step are substantially equal.

[0052] The length of the insulation crimping wings LI is substantially equal to the length of the weld area LW.

[0053] The power terminal 1 may be made from aluminum and/or copper.

[0054] Figure 2 shows a power connection assembly 20, comprising the terminal 1 and the insulated electrical wire 6. The wire 6 is crimped and welded to the terminal 1. The insulated electrical wire 6 comprises a copper electrical conductor or and/or an aluminum electrical conductor. The lead 9 is made of the same material as the electrical conductor.

[0055] Now, the method for crimping and welding the power terminal 1 to the insulated electrical wire 6 according to the invention is described. Firstly, an insulation of the insulated electrical wire 6 is at least partly removed. The insulation that is removed is in an area in between ends of the insulated electrical wire 6. With the removal of the insulation the lead 9 of the insulated electrical wire 6 is uncovered. Note that, lead 9 may sometimes be understood as being a portion in an end of an electrical wire. However, here, lead 9 is to be understood as an uncov-

ered portion of the electrical conductor inside an insulated electrical wire 6. Therefore, here, the lead 9 is not at ends of the insulated electrical wire but in between ends of the insulated electrical wire 6, e.g. in a middle of the insulated electrical wire 6.

[0056] Secondly, the uncovered lead 9 is aligned with the weld area 7 of the power terminal 1. As the length of the lead LW and the length of weld area LW are substantially equal, the aligning results that both lengths are parallel with each other and have a beginning and end that are aligned.

[0057] Thirdly, the lead 9 is welded to the weld area 7, preferably by ultrasonic welding.

[0058] Fourthly, the first pair of insulation crimping wings and the second pair of insulation crimping wings are crimped to the insulation of the insulated electrical wire. There is no preference in which order the first pair and second pair are crimped.

[0059] Above described power terminal 1, power connector assembly 20 and method improve existing power terminals, power connector assemblies and methods for connecting a power terminal to an insulated electrical wire.

[0060] Instead of multiple power terminals only one power terminals may be used to connect to an insulated electrical wire wherein both ends of the wire may be provided with its own terminal for distributing power.

[0061] The power terminal 1 according to the invention allows a robust and secure mechanical and electrical connection to a lead 9 of the insulated electrical wire 6, where the lead is located between ends of the insulated electrical wire. For that purpose insulation is removed locally in between ends of the insulated electrical wire which results in the lead 9 being uncovered.

Claims

1. Power terminal (1) comprising;

- a first pair of insulation crimping wings (4) for crimping to an insulation (3) of an insulated electrical wire (6);
- a second pair of insulation crimping wings (5) for crimping to an insulation (3) of the same insulated electrical wire (6);
- a weld area (7) provided between the first pair of insulation crimping wings (4) and the second pair of insulation crimping wings (5) for welding to a lead (9) of the insulated electrical wire (6), wherein the length (LW) of the weld area (7) is substantially equal to the length (LL) of the lead (9);
- a power connector (10) in conductive contact with the weld area (7).

2. Power terminal (1) according to claim 1, wherein the first pair of insulation crimping wings (4), the second

pair of insulation crimping wings (5) and the weld area (7) are arranged longitudinally along a longitudinal axis (X) of the terminal (1), wherein the longitudinal axis (X) of the terminal (1) is parallel with the insulated wire (6) when the wire (6) is crimped and welded to the terminal (1).

3. Power terminal (1) according to the preceding claim, wherein the power connector (10) at least partly extends transversely from the longitudinal axis (X) of the terminal (1).

4. Power terminal (1) according to one of the preceding claims, wherein the power connector (10) is a ring terminal for receiving an electrical pin.

5. Power terminal (1) according to one of the preceding claims, wherein an intermediate longitudinal ridge is provided between the power connector and one of the pair of insulation crimping wings, wherein the longitudinal ridge supports and extends along the insulated electrical wire when said wire is crimped and welded to the power terminal.

6. Power terminal (1) according to one of the preceding claims, wherein the power connector (10) comprises a flat connector surface (12) and the weld area comprises a flat weld surface (14), wherein the flat connector surface (12) is parallel with the flat weld surface (14).

7. Power (1) terminal according to one of the preceding claim, wherein the flat connector surface (12) is offset with respect to the flat weld surface (14).

8. Power terminal (1) according to one of the preceding claims, comprising a first flat bridge portion (27) between the wings of the first pair of insulation wings (4), wherein a first step (30) is provided between the weld area (7) and the first flat bridge portion (27).

9. Power terminal (1) according to one of the preceding claims, comprising a second flat bridge portion (28) between the wings of the second pair of insulation wings (5), wherein a second step (31) is provided between the weld area (7) and the second flat bridge portion (28).

10. Power terminal (1) according to one of the preceding claims, wherein the length of the insulation wings (LI) is substantially equal to the length of the weld area (LW).

11. Power terminal (1) according to one of the preceding claims, wherein the terminal is made of aluminum and/or copper.

12. Power connection assembly (20), comprising a ter-

minal (1) according to one of the preceding claims and the insulated electrical wire (6), said wire (6) being crimped and welded to the terminal (1).

13. Power connection assembly (20), according to the preceding claim, wherein the insulated electrical wire (6) comprises a copper electrical conductor or and/or an aluminum electrical conductor. 5

14. Method for crimping and welding a power terminal (1) according to one of preceding claims to an insulated electrical wire (6), the method comprising the steps of: 10

- at least partly removing an insulation of the insulated electrical wire at an area in between ends of the insulated electrical wire thereby uncovering a lead of the insulated electrical wire; 15
- aligning the lead with the weld area of the terminal; 20
- welding the lead to the weld area;
- crimping the first pair of insulation wings to the insulation of the insulated electrical wire; and
- crimping the second pair of insulation wings to the insulation of the insulated electrical wire. 25

15. Method according to the preceding claim, wherein the welding of the lead to the weld area is by means of ultrasonic welding. 30

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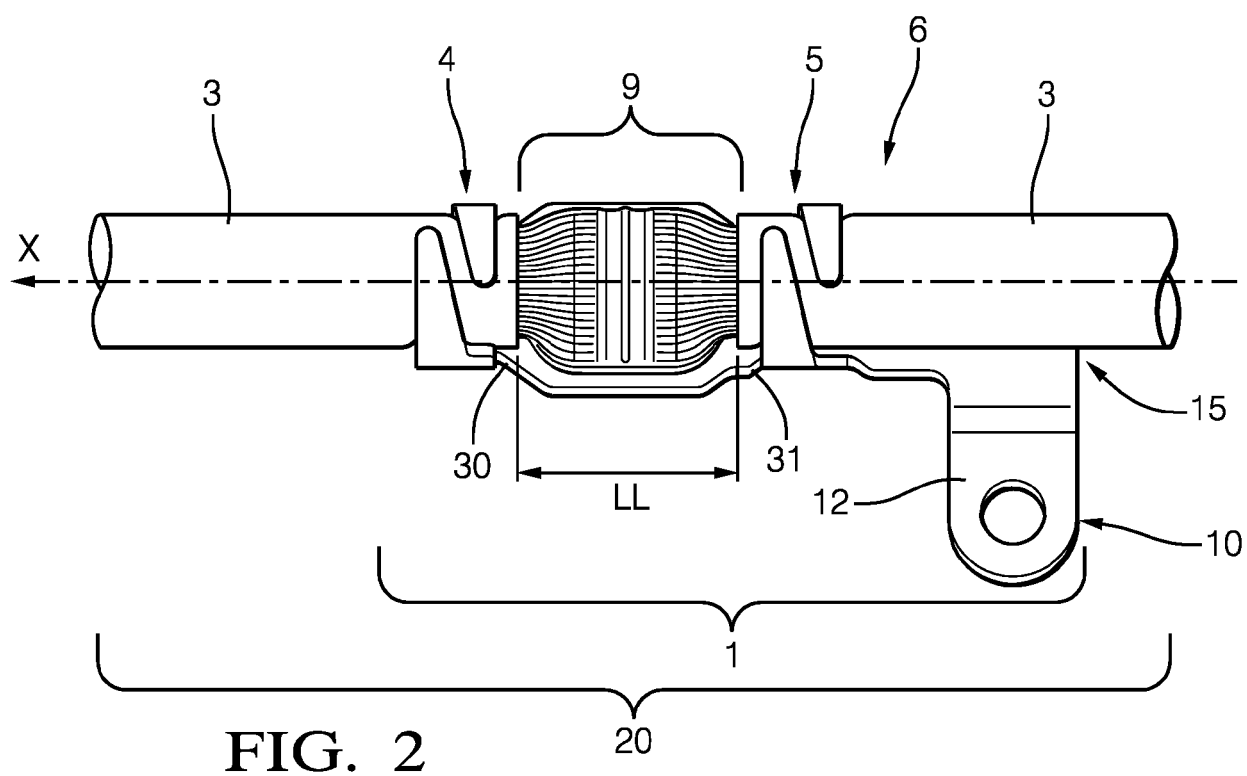
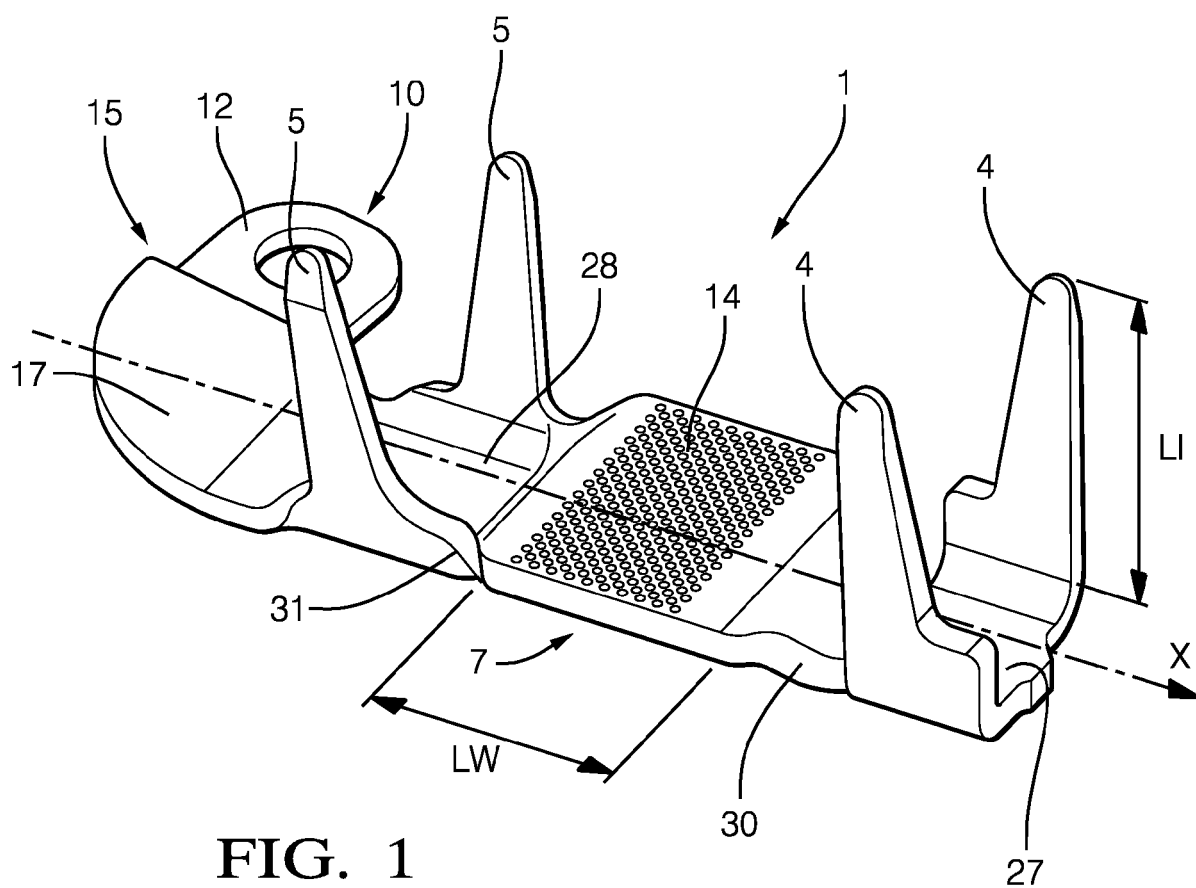
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EUROPEAN SEARCH REPORT

Application Number
EP 16 19 4696

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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 15 February 2017	Examiner Henrich, Jean-Pascal
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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EPO FORM 1503 03/82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 16 19 4696

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82