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(54) **ELECTRICAL CONNECTING CABLE**

(57) Electrical connecting cable (10), in particular for vehicles, comprising an elongated electrical terminal (20) and an electrical wire (60) aligned along a longitudinal axis (X) and electrically connected to each other, wherein the electrical wire (60) comprises a conductive core (62) and an insulation (64) surrounding the conductive core (62), whereby a part of the insulation is stripped from the electrical wire leaving a stripped end (66), wherein the elongated electrical terminal (20) comprises a contact portion (22) at one end, adapted to connect to a counter terminal, furthermore a cover portion (40) on the opposite end and a main portion (30) in between, wherein the main portion (30) is sleeve shaped and surrounds the bare end (66) of the electrical wire (60), thereby electrically connecting the electrical wire (20) to the elongated electrical terminal (20), wherein the cover portion (40) extends from the main portion (30) along the longitudinal axis (X) opposite to the contact portion (22), thereby surrounding a portion of the insulation (64).

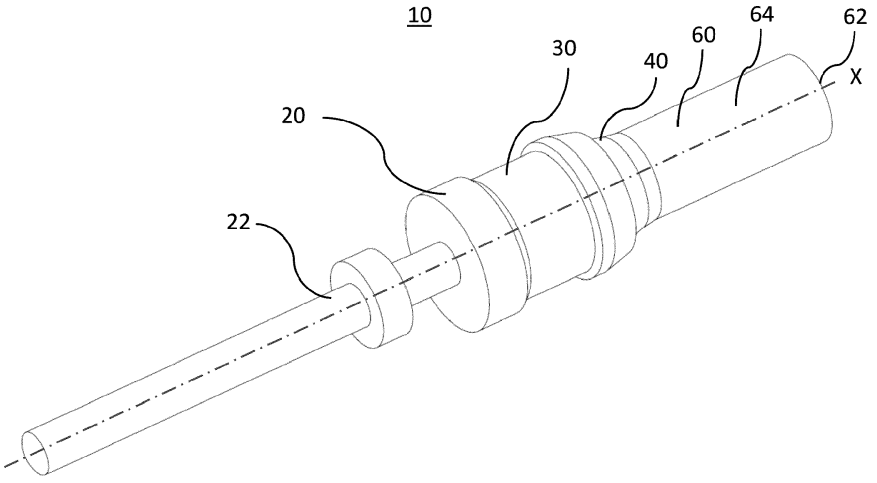

Fig. 1

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Description

TECHNICAL FIELD OF INVENTION

[0001] The invention relates to an electrical connecting cable that connects electrical devices in vehicles and a method to manufacture the electrical connecting cable.

BACKGROUND OF INVENTION

[0002] Safety requirements for vehicles force the industry to improve their products. There are harsh environmental conditions in vehicles. During ageing and numerous extreme temperature change cycles, the wire insulation goes back more and more from the connected terminal, until strands become visible and loose the protection given by the insulation. A solution for this problem is to use shrink tube provided on the wire and a part of the terminal. But this requires an additional part and additional working steps while assembling the wire harness. That increases the costs for material and labor. Furthermore the shrinking tube also changes its properties while aging in the vehicle. The shrinking tube can slip from the correct position and lose its protection.

[0003] Thus, there is a need in the art to provide an electrical connecting cable that works reliable in the harsh environmental conditions in vehicles and is easy and cheap to produce.

[0004] The present invention improves the state of the art by providing an electrical connecting cable that can be assembled in a fast and reliable assembly process and solve the problems of electrical connecting cable disclosed in the prior art.

[0005] These and other objects which become apparent upon reading the following description are solved by an electrical connecting cable according to independent claim 1 and a method to assemble the electrical connecting cable according to independent claim 9.

SUMMARY OF THE INVENTION

[0006] The present application relates to an electrical connecting cable, in particular for vehicles, comprising an elongated electrical terminal and an electrical wire, aligned along a longitudinal axis and electrically connected to each other. The electrical wire comprises a conductive core and an insulation surrounding the conductive core. A part of the insulation is stripped from the electrical wire leaving a stripped end. The elongated electrical terminal comprises a contact portion at one end, adapted to connect to a counter terminal, furthermore a cover portion on the opposite end and a main portion in between. The main portion is sleeve shaped and surrounds the stripped end of the electrical wire, thereby electrically connecting the electrical wire to the elongated electrical terminal. The cover portion extends from the main portion along the longitudinal axis opposite to the contact portion, thereby surrounding a portion of the insulation.

[0007] The inventive electrical connecting cable has a terminal cover portion that is arranged around the area where wire insulation ends. Even if, after aging, the insulation moves away from the terminal, it is still surrounded and protected by the cover portion. The cover portion extends for a distance that is bigger than a possible movement of the insulation away from the electrical terminal. Because the cover portion is made integral with the elongated electrical terminal no additional parts are necessary. The cover portion is made of metal and will not move or change his shape while aging.

[0008] According to a preferred embodiment the cover portion is sleeve shaped. The sleeve shape it is easy to manufacture while producing the electrical terminal.

[0009] Preferably the cover portion is at least partly formed towards the insulation thereby pressing to the insulation. The cover portion can be formed in various shapes towards the insulation. For example the cover portion can be divided in a number of flat areas that are pressed by the tool towards the insulation. This kind of forming is known as hexagonal crimping in the art. Another opportunity is to press bulges into the cover portion that extend towards the insulation. The goal is to reduce the inner diameter of the cover portion so that the cover portion touches the insulation.

[0010] Advantageously, the cover portion has a conical shape and whereby the cross section of the cover portion decreases while extending from the main portion along the longitudinal axis. In case of a main portion with a big diameter a conical shape reduce is the inner diameter of the cover portion along its extension. This brings the cover portion free end close to the insulation, so that only little deformation formation is necessary to touch the insulation.

[0011] Advantageously, the cover portion defines at its free end a blunt edge that surrounds at least a portion of the insulation.

[0012] The edge presses into the insulation thereby partly deforming the insulation. The blunt edge surrounds the insulation thereby pressing the ring-shaped indention into the insulation. The Corporation of the blunt edge and the ring-shaped indention holds the insulation in position and prevents movement of the insulation. Because the blunt edge is blunt cutting into the insulation is prevented.

[0013] Preferably, a groove is located in between the main portion and the blunt edge and wherein at least a portion of the deformed insulation extend into the groove. Dependent on the position where the blunt edge presses into the insulation, the groove can be useful to take the displaced part of insulation.

[0014] The present application further relates to a method to assemble an electrical connecting cable. The method comprises the steps:

providing the elongated electrical terminal and the electrical wire;

aligning the elongated electrical terminal and the

electrical wire along the longitudinal axis with the bare end in the main portion;
electrically connecting the elongated electrical terminal and the electrical wire, thereby connecting the bare end electrically to the main portion;
mechanically connecting the cover portion to the insulation.

[0015] The manufacturing steps of the electrical connecting cable can be done on one machine all in two separate machines. This makes the method flexible. It does not matter how the electrical wire is attached to the electrical terminal (e.g. crimped or welded), the same machine can be used to mechanically connecting the cover portion to the insulation.

[0016] Advantageously, the steps:

electrically connecting the elongated electrical terminal and the electrical wire,
thereby connecting the bare end electrically to the main portion and mechanically connecting the cover portion to the insulation are done at the same time. If the electrical wire is connected to the electrical terminal by crimping, a crimping machine can be equipped to perform the two steps at the same time. That saves time and reduces costs.

Description of the preferred embodiments

[0017] In the following, the invention is described exemplarily with reference to the enclosed figures, in which

Fig. 1 shows a perspective, view of a an electrical connecting cable;

Fig. 2 shows a side view of a an electrical connecting cable;

Fig. 3 shows a cut view the electrical connecting cable shown in figure 2;

Fig. 4 shows a detailed view of the electrical connecting cable shown in figure 3;

[0018] Figure 1 shows an electrical connecting cable 10, comprising an elongated electrical terminal 20 and an electrical wire 60, aligned along a longitudinal axis X and electrically connected to each other. The electrical wire 60 comprises a conductive core 62 and an insulation 64 surrounding the conductive core 62. The elongated electrical terminal 20 comprises a contact portion 22 at one end, adapted to connect to a counter terminal, furthermore a cover portion 40 on the opposite end and a main portion 30 in between.

[0019] Figure 2 shows an electrical connecting cable 10 in a side view.

[0020] Figure 3 shows a cut view of the electrical connecting cable shown in figure 2. The cut is carried out along the longitudinal axis X. A part of the insulation 64 is stripped from the electrical wire 60 leaving a stripped end 66. The main portion 30 is sleeve shaped and surrounds the stripped end 66 of the electrical wire 60, thereby electrically connecting the electrical wire 20 to the elongated electrical terminal 20. The cover portion 40 extends from the main portion 30 along the longitudinal axis X opposite to the contact portion 22, thereby surrounding a portion of the insulation 64. The cover portion 40 is sleeve shaped. The cover portion 40 is at least partly formed towards the insulation 64 thereby pressing to the insulation 64. The cover portion 40 has a conical shape. The cross section of the cover portion 40 decreases while extending from the main portion 30 along the longitudinal axis X. The cover portion 40 defines at its free end 42 a blunt edge 44 that surrounds at least a portion of the insulation 64. The edge 44 presses into the insulation 64 thereby partly deforming the insulation. A groove 46 is located in between the main portion 30 and the edge 44 and wherein at least a portion of the deformed insulation 64 extend into the groove 46.

[0021] Figure 4 shows a detailed view of the electrical connecting cable shown in figure 3. The main portion 30 and the cover portion are shown enlarged.

Claims

1. Electrical connecting cable (10), in particular for vehicles, comprising an elongated electrical terminal (20) and an electrical wire (60) aligned along a longitudinal axis (X) and electrically connected to each other, wherein the electrical wire (60) comprises a conductive core (62) and an insulation (64) surrounding the conductive core (62), whereby a part of the insulation is stripped from the electrical wire leaving a stripped end (66), wherein the elongated electrical terminal (20) comprises a contact portion (22) at one end, adapted to connect to a counter terminal, furthermore a cover portion (40) on the opposite end and a main portion (30) in between, wherein the main portion (30) is sleeve shaped and surrounds the stripped end (66) of the electrical wire (60), thereby electrically connecting the electrical wire (20) to the elongated electrical terminal (20), wherein the cover portion (40) extends from the main portion (30) along the longitudinal axis (X) opposite to the contact portion (22), thereby surrounding a portion of the insulation (64).

2. Electrical connecting cable (10) according to claim 1, wherein the cover portion (40) is sleeve shaped.

3. Electrical connecting cable (10) according to any preceding claim, wherein the cover portion (40) is at least partly formed towards the insulation (64) thereby pressing to the insulation (64).

4. Electrical connecting cable (10) according to any preceding claim, wherein the cover portion (40) has a conical shape.

5. Electrical connecting cable (10) according to the preceding claim, wherein the cross section of the cover portion (40) decreases while extending from the main portion (30) along the longitudinal axis (X).

6. Electrical connecting cable (10) according to any of the preceding claims, wherein the cover portion (40) defines at its free end (42) a blunt edge (44) that surrounds at least a portion of the insulation (64).

7. Electrical connecting cable (10) according to the preceding claim, wherein the edge (44) presses into the insulation (64) thereby partly deforming the insulation.

8. Electrical connecting cable (10) according to the preceding claim, wherein a groove (46) is located in between the main portion (30) and the edge (44) and wherein at least a portion of the deformed insulation (64) extend into the groove (46).

9. Method to manufacture an electrical connecting cable (10) according to any of the preceding claims comprising the steps:

providing the elongated electrical terminal (20) and the electrical wire (60);
aligning the elongated electrical terminal (20) and the electrical wire (60) along the longitudinal axis (X) with the bare end (66) in the main portion (30);
electrically connecting the elongated electrical terminal (20) and the electrical wire (60), thereby connecting the bare end (66) electrically to the main portion (30);
mechanically connecting the cover portion (40) to the insulation (64).

10. Method to manufacture an electrical connecting cable (10) according to the preceding claim, wherein the steps :

electrically connecting the elongated electrical terminal (20) and the electrical wire (60), thereby connecting the bare end (66) electrically to the main portion (30) and
mechanically connecting the cover portion (40) to the insulation (64) are done at the same time.

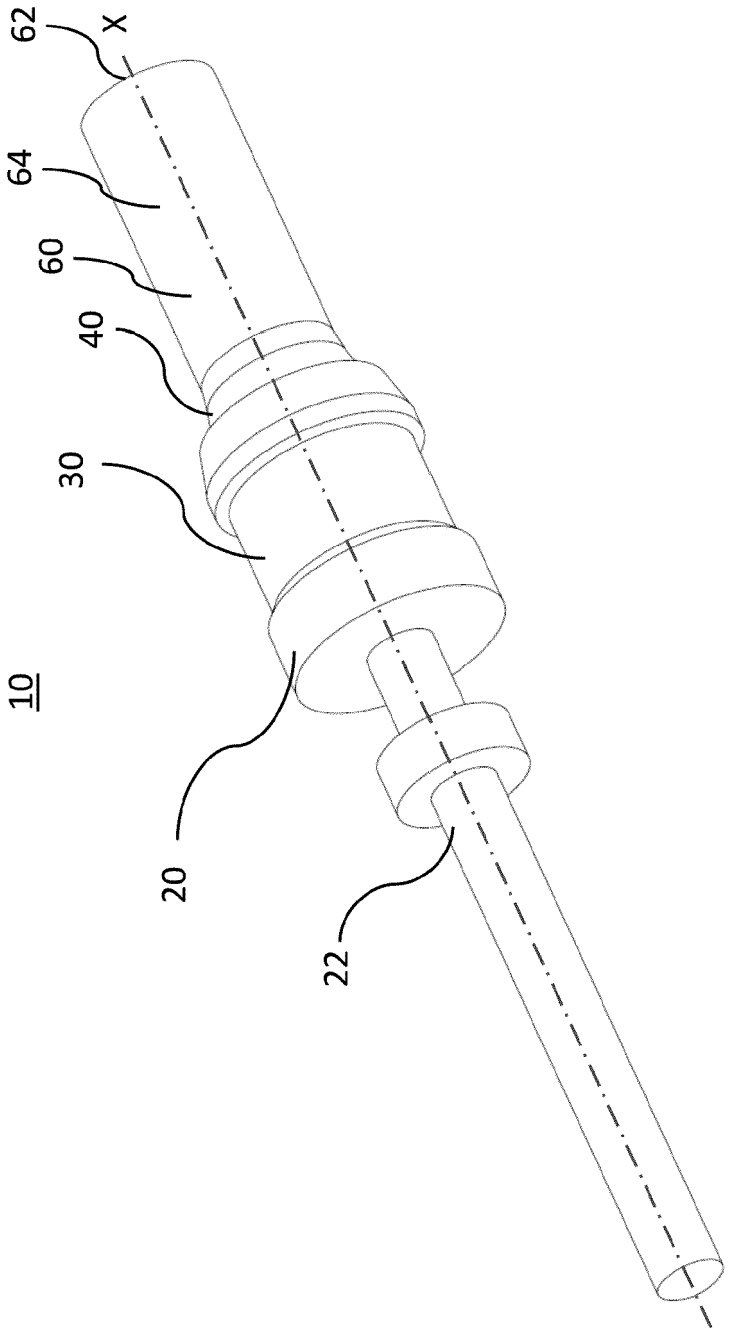

Fig. 1

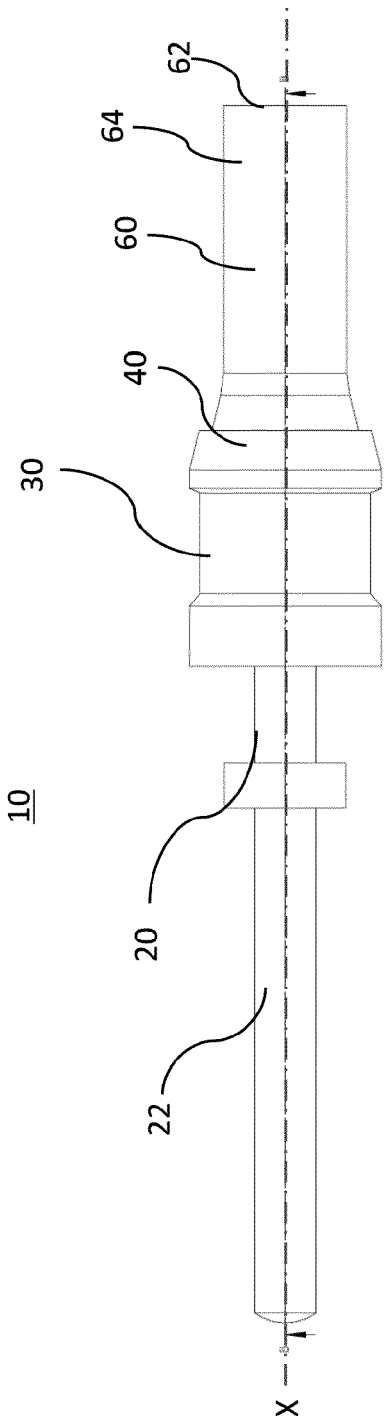

Fig. 2

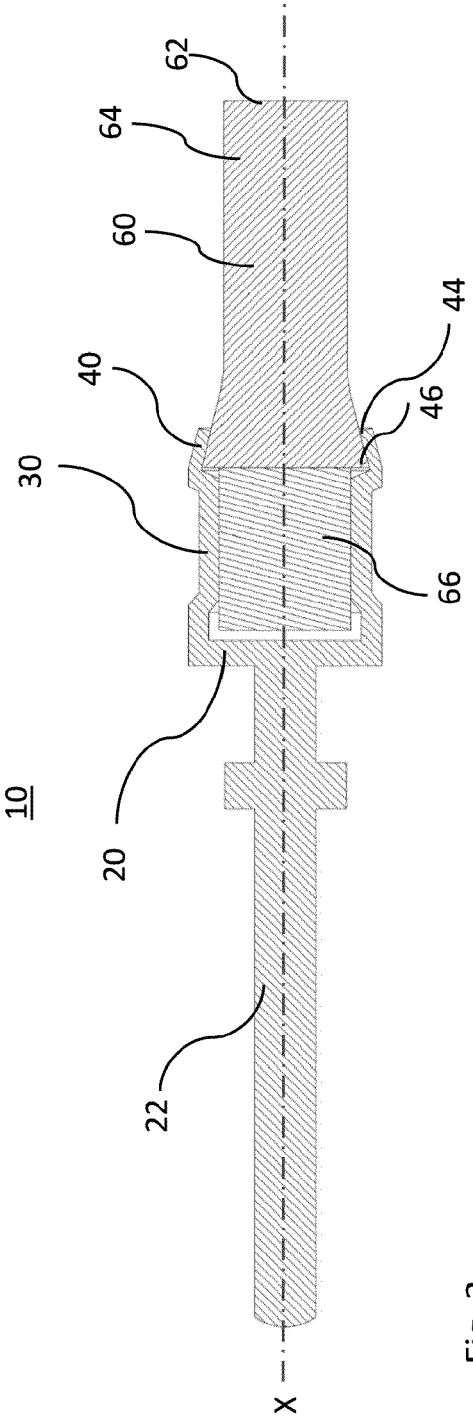

Fig. 3

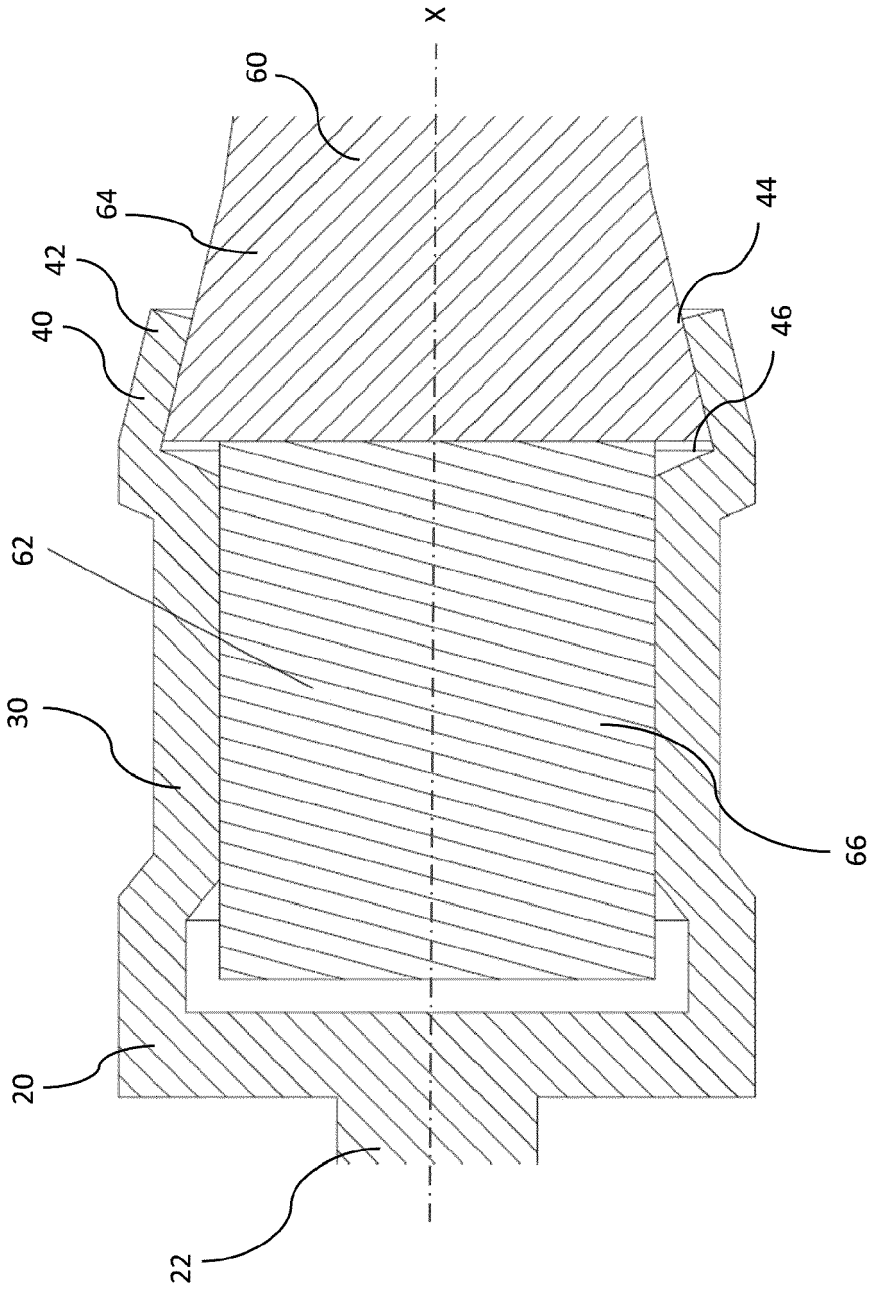

Fig. 4

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EUROPEAN SEARCH REPORT

Application Number
EP 17 19 6099

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 2 280 351 A (PENFOLD CHARLES S ET AL) 21 April 1942 (1942-04-21) * page 2, column 1, line 25 - page 6, column 1, line 65; figures 1-21 *	1-10	INV. H01R4/18 H01R4/20 H01R43/04
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	14 March 2018	Oliveira Braga K., A

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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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