

(19)



(11)

EP 2 728 675 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
07.05.2014 Bulletin 2014/19

(51) Int Cl.:
H01R 13/11 (2006.01) H01R 13/18 (2006.01)

(21) Application number: **13189238.2**

(22) Date of filing: **18.10.2013**

(84) Designated Contracting States:
**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB
GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO
PL PT RO RS SE SI SK SM TR**
Designated Extension States:
BA ME

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(30) Priority: **06.11.2012 BR 102012028429**

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(54) **Female electrical terminal**

(57) A female electrical terminal, comprising a portion (40) that allows the connection thereof with an electrical conductor cable, a portion provided for the connection with a blade type male terminal and at least one

internal contact element (11), the terminal being devoid of at least one sidewall, comprising in addition a sleeve (30) that performs the function of sidewall in lieu of the at least one absent sidewall of the terminal.

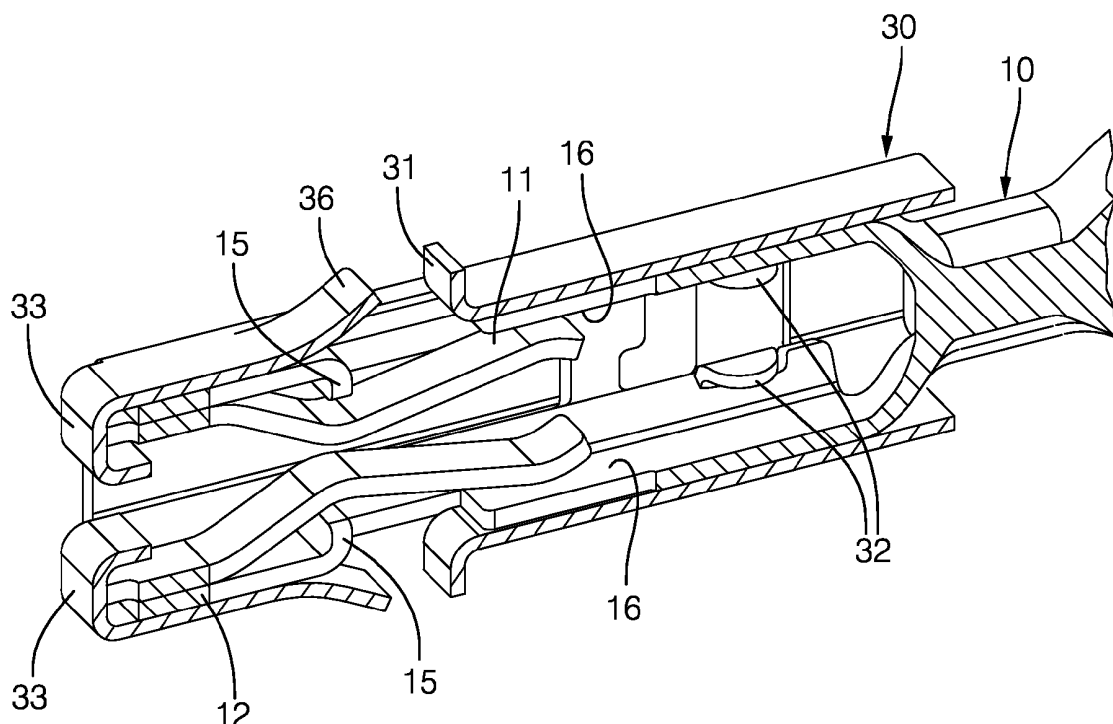


FIG. 11

EP 2 728 675 A1

Description

TECHNICAL FIELD OF THE INVENTION

[0001] The present invention relates to a female electrical terminal that is intended for connection with a blade-type male terminal.

BACKGROUND OF THE INVENTION

[0002] In Figure 1 there is depicted a female electrical terminal as known from the prior art. Those terminals are characterized by comprising a portion that allows the connection with electrical cables 7 and a portion that allows the connection with a male terminal 8, normally of the blade type.

[0003] The portion that allows the connection with a male terminal comprises a bottom, sidewalls, and internally, contact elements that provide the electrical connection with the blade of the male terminal to be connected. Those contact elements have a shape such that upon insertion of the blade they apply the necessary pressure to warrant the required efficiency in electrical transmission between the male terminal and the female terminal.

[0004] In the known configurations of those terminals, the same have one or two contact elements in the shape of internal tabs for provision of electrical connection with the blade of the male terminal.

[0005] In Figure 2 there is depicted a terminal 5 in which the contact elements are manufactured such as to warrant that the fixed end 3 of the contact element 1 be located at the region of entry of the blade of the male terminal and the overhung end 4 be located inside the terminal. The arrow indicates the direction of insertion of the male terminal blade. Figure 2a shows a lateral section view of another terminal of that type, however with only one internal contact element 1. In this manner, the contact element 1 guides the insertion of the blade, thereby minimizing the stress required for establishment of the connection.

[0006] In Figures 3 and 3a there are depicted terminals whose contact elements have their fixed ends 3 located in the rear region while the overhung ends 4 are located near the front region. That characteristic entails the risk that the blade of the male terminal might damage the female terminal at the time of connection if the same is introduced at certain angles of inclination. In order to obviate this type of damage there is used a protective barrier 2 at the entry of the terminal. Figure 3a shows a sectional view of a terminal of this type, where it may be clearly noted that without the protective barrier 2 the blade of the male terminal would not be guided towards a correct insertion into the female terminal.

[0007] There is further noted, in all prior art terminals, the existence of sidewalls along the transversal directions x and y, as illustrated in Figure 4, wherein are the shown cross sections of 4 different terminals. When those terminals are connected side by side, the presence

of sidewalls poses a serious problem to the industry, since those sidewalls entail a significant increase of the final dimension of the set of terminals.

[0008] Thus, there is a need in the art of a female electrical terminal having reduced dimensions in at least one direction.

[0009] The subject matter discussed in the background section should not be assumed to be prior art merely as a result of its mention in the background section. Similarly, a problem mentioned in the background section or associated with the subject matter of the background section should not be assumed to have been previously recognized in the prior art. The subject matter in the background section merely represents different approaches, which in and of themselves may also be inventions.

BRIEF SUMMARY OF THE INVENTION

[0010] In light of the problems having been set forth above, the object of the present invention consists in the provision of a female electrical terminal having small dimensions without thereby affecting either its mechanical integrity or its electrical transmission characteristics.

[0011] In order to achieve the above objects, the present invention provides a female electrical terminal devoid of at least one sidewall and which comprises a protective sleeve that fulfills the role of sidewall in lieu of the absent at least one sidewall

[0012] In accordance with one embodiment of this invention, a female electrical terminal is provided. The female electrical terminal includes a portion that allows connection of the female terminal with an electrical conductor cable, a portion provided for connection with a blade type male terminal, and at least one internal contact element. The female terminal is devoid of at least one sidewall. The female terminal additionally includes a sleeve that performs the function of sidewall to substitute for the at least one absent sidewall of the terminal.

[0013] Further features and advantages of the invention will appear more clearly on a reading of the following detailed description of the preferred embodiment of the invention, which is given by way of non-limiting example only and with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING

[0014] The present invention will now be described, by way of example with reference to the accompanying drawings, in which:

[0015] Figure 1 shows a female terminal as known in the art;

[0016] Figure 2 shows a female terminal comprising contact elements that have a fixed end located at the point of entry, as known in the art;

[0017] Figure 2b shows a cross sectional view of a female terminal that comprises contact elements that have a fixed end located at the region of entry of the blade of

the male terminal, as known in the art;

[0018] Figure 3 shows a female terminal, which comprises contact elements that have a fixed end located inside the terminal as known in the art;

[0019] Figure 3a shows a sectional view of the terminal of Figure 3;

[0020] Figure 4 shows cross sectional views of four different terminals as known in the art;

[0021] Figure 5 shows a perspective view of a preferred embodiment of the female terminal according to the present invention;

[0022] Figure 6 shows a side view of the female terminal depicted in Figure 5;

[0023] Figure 7 shows a cross sectional view of the female terminal depicted in Figure 4, with a sleeve and with a blade inserted therein;

[0024] Figure 8 shows the female terminal with a sleeve affixed thereto;

[0025] Figure 9 shows a front view of the female terminal with a sleeve affixed thereto in its preferred embodiment;

[0026] Figure 10 shows a section along line A-A of the female terminal of Figure 7 with a blade inserted therein;

[0027] Figure 11 shows a section along line B-B of the female terminal of Figure 7; and

[0028] Figure 12 shows a complete female terminal with the portion thereof that provides the connection to an electrical cable.

DETAILED DESCRIPTION OF THE INVENTION

[0029] The description to follow will be based on a preferred embodiment of the invention. As will be evident to any technician skilled in the art, however, the invention is not limited to such particular embodiments.

[0030] The female terminal is of the type that comprises at least one internal contact element. Figure 5 shows a perspective view of a preferred embodiment of the female terminal 10, where the arrow indicates the direction of insertion of the blade 17 of the male terminal to be connected. In that image one may note the existence of two contact elements 11, positioned facing one another, that have their fixed ends 12 located at the region of insertion of the blade 17 of the male terminal, therefore leaving it clear that the contact elements guide the blade 17, eliminating the risk of damage at that time. That same characteristic may be seen in Figure 6, which shows a side view of the same embodiment of the female terminal 10 according to the present invention. Alternatively, the contact element may have its fixed end located inside the terminal and may comprise a protective element at the point of entry in order to prevent the occurrence of damage.

[0031] Additionally, it is observed that each contact element 11 is preferably provided with a protective element 15 against fatigue and/or inelastic deformation. That element may be formed and positioned, preferably, in alignment with the point of contact II of the contact ele-

ment 11. Optionally, the said protective element 15 may be positioned at any point of the sidewalls 16. However, it is preferable that the same be positioned near the fixed end 12 of the contact element 11, without interfering with its bending amplitude.

[0032] On observing Figure 6, it is noted that each contact element 11 preferably has three inflexions (numbered from I to III) that cause the same to act as a spring, applying pressure on the blade 17 of the male terminal to be connected, in order to warrant the required quality of the electrical connection. Inflexions I and III, located next to the ends, act as springs, and inflection II constitutes the point whereon is provided the contact with the blade 17 of the male terminal. At the time of insertion of the blade 17, the same applies pressure on the contact element 11, displacing the latter towards the sidewall 16, up to a point in which the moving end, wherein is located inflexion III, comes into contact with the sidewall 16 whereupon this inflexion starts to act as a spring, increasing the pressure against the blade 17 and improving the electrical connection therebetween. Figure 7 shows a female terminal according to this preferred embodiment with a blade 17 inserted therein, where there can be clearly seen what has been described above. Optionally, the contact element 11 may have only two inflections, and thereby only the first spring would apply pressure on the blade 17, which could be sufficient in some applications.

[0033] Furthermore, it is possible to observe, in Figures 5 and 6, that the female terminal 10 has no sidewalls in direction A. In that direction, the absence of the sidewalls does not interfere with the quality of the electrical connection. In order to warrant enhanced stability in the connection between the male and female terminals and to avoid displacement in the direction of the width A of the blade of the male terminal, there is used a protective sleeve 30 around the female terminal 10, as illustrated in Figure 7. Such sleeve 30 is usually made of a material with a mechanical performance that is superior to that of the terminal to allow the thickness thereof to be reduced. In a preferred embodiment, the selected material is stainless steel.

[0034] Optionally, the number of absent sidewalls may be as many as might be deemed necessary for the application in each case, and the absent sidewall may be any sidewall of the terminal, considering the direction in which it is intended to have reduced dimensions.

[0035] Figure 9 shows a front view of the female terminal 10 encased by the sleeve 30 with the representation, in dotted line, of a blade 17 inserted therein. In that figure it is possible to note that the terminal has no sidewalls in the width direction of the blade 17. Since the thickness of the sleeve 30 is less than the thickness of the female terminal 10, it is ensured that the dimension of the assembly (female terminal 10 and sleeve 30), in the width direction of the blade 17, is less than the thickness of a female terminal equipped with all the sidewalls, as known in the art. In that situation, the sleeve 30, in addition to performing the function already known in the

art, also performs the function of the absent sidewalls.

[0036] Figure 10 shows a sectional view along the line A-A of Figure 9, wherein there may be more clearly observed the inexistence of sidewalls of the female terminal 10, with the blade 17 being protected by the sleeve 30. In this manner, the proposed terminal has reduced dimensions in one of its directions, allowing the connection of more terminals side by side, if such terminals are adequately positioned.

[0037] In Figure 11 there is shown a sectional view along the line B-B, where it is possible to note the existence of assembly retainers 36 on the outer face of the sleeve 30. Those assembly retainers 36 are provided to assist the retention of the sleeve 30 in the cavity of a plastic insulator wherein the same may be optionally inserted. Further optionally, such retainers 36 may be provided together with retainer protectors 31. The function of such protectors is to avoid the occurrence of damage to the retainer at the time of insertion or removal of the terminal with sleeve from the plastic insulators. Those retainers and protectors may consist in mere protuberances, or any other element that allows the retention of the sleeves within cavities of plastic insulators without damaging the same.

[0038] Additionally, it is possible to note that the female terminal 10 optionally has two openings 13 at the rear portion thereof. Those openings 13 are intended to provide the retention of the sleeve 30, by means of fastening retainers 32 or tabs, present in the sleeve 30, that are bent towards the inside of the female terminal 10 and fit into the openings 13.

[0039] In Figure 9 it is also possible to observe the optional presence of a guide element 33 to guide the insertion of the male blade 17 towards each contact element 11. That guide element 33 is additionally intended for protection against direct impact on the terminal at the time of insertion of the blade 17. It is additionally noted that beside the guide elements 33 there exist two optional body positioning elements 34 that assist in securing the sleeve 30 to the female terminal 10. The utilization of those body positioning elements 34 together with the fastening retainers 32 assists the assembly to remain static.

[0040] Once again, on examining Figure 8, there is noted the existence of optional clips 35 to close the sleeve 30. Those clips 35 have a shape such that they fit snugly around the female terminal 10 on all lateral dimensions and provide an effective protection against impact. Such clips 35 may have any shape that might warrant the immobilization of the engagement in the directions x and y (indicated in the figure).

[0041] In order that the engagement between the female terminal 10 and the sleeve 30 be effected in a secure manner, it is important that no gap/clearance exists between those two elements.

[0042] In that embodiment as described there has been chosen an octagonal cross section shape of the assembly formed by the sleeve 30 and the female terminal 10, since this shape renders the assembly more ef-

fective when using a plastic insulator. However, other shapes may be chosen, such as a rectangular shape.

[0043] Finally, it is important to point out that any female terminal having the characteristics described herein will further have, at the rear portion 40 thereof, means for connection to electrical cables. Optionally, that element is comprised of a conductor wing 41 and an insulator wing 42, as depicted in Figure 12. However, the type of clamp that is actually used should be the most appropriate for the use for which the terminal is intended.

[0044] While this invention has been described in terms of the preferred embodiments thereof, it is not intended to be so limited, but rather only to the extent set forth in the claims that follow. Moreover, the use of the terms first, second, etc. does not denote any order of importance, but rather the terms first, second, etc. are used to distinguish one element from another. Furthermore, the use of the terms a, an, etc. do not denote a limitation of quantity, but rather denote the presence of at least one of the referenced items.

Claims

1. A female electrical terminal (10) comprising a portion (40) that allows connection thereof with an electrical conductor cable, a portion provided for connection with a blade type male terminal and at least one internal contact element (11), the terminal (10) being devoid of at least one sidewall, **characterized by** additionally comprising a sleeve (30) that performs the function of sidewall to substitute for an absent at least one sidewall of the terminal (10).
2. The female electrical terminal (10) according to claim 1, **characterized in that** the at least one internal contact element (11) is shaped such that it acts as a spring on insertion of a blade (17) of the male terminal.
3. The female electrical terminal (10) according to claim 1, **characterized in that** the at least one internal contact element (11) has three inflections (I, II, III).
4. The female electrical terminal (10) according to any one of claims 1 to 3, **characterized by** comprising at least one protective element (15) on the sidewall (16) against inelastic deformations of the contact element (11).
5. The female electrical terminal (10) according to any one of claims 1 to 4, **characterized by** comprising at least one opening (13) at a rear portion thereof to retain the sleeve (30).
6. The female electrical terminal (10) according to any one of claims 1 to 5 **characterized in that** the material used to make the sleeve (30) is stainless steel.

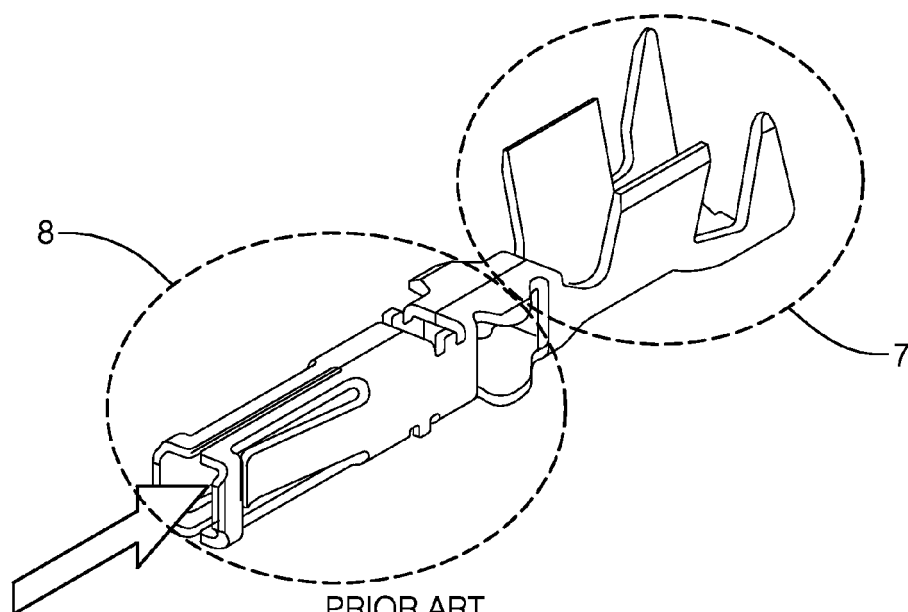
7. The female electrical terminal (10) according to any one of claims 1 to 6, **characterized in that** the thickness of the sidewalls of the sleeve (30) is less than the thickness of the terminal sidewalls (16). 5
8. The female electrical terminal (10) according to any one of claims 1 to 7, **characterized in that** an assembly comprising the terminal (10) and the sleeve (30) has an octagonal-shaped cross section. 10
9. The female electrical terminal (10) according to any one of claims 1 to 8, **characterized in that** the sleeve has at least one impact protection element (33) for the at least one internal contact element (11) at an end near a point of entry of the blade (17) of the male terminal. 15
10. The female electrical terminal (10) according to any one of claims 1 to 9, **characterized in that** the sleeve (30) has two body positioning elements (34), one on each side of the at least one impact protection element (33). 20
11. The female electrical terminal (10) according to any one of claims 5 to 10, **characterized in that** the sleeve (30) has at least two tabs (32) for retention in the at least one opening (13) at the rear portion of the terminal (10). 25
12. The female electrical terminal (10) according to any one of claims 1 to 11, **characterized in that** the sleeve (30) has at least one clip (35) to close the sleeve (30). 30
13. The female electrical terminal (10) according to any one of claims 1 to 12, **characterized in that** the sleeve (30) has at least one set of assembly retainer (36) and retainer protection element (31) on opposed walls externally to the terminal (10). 35

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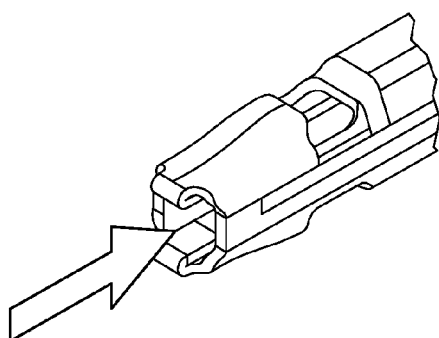
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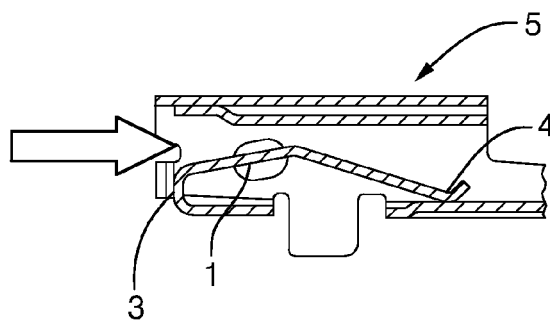
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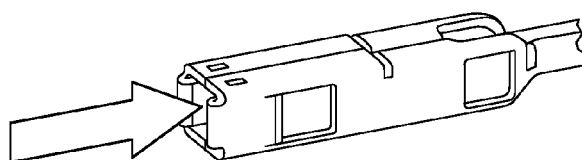
PRIOR ART
FIG. 1



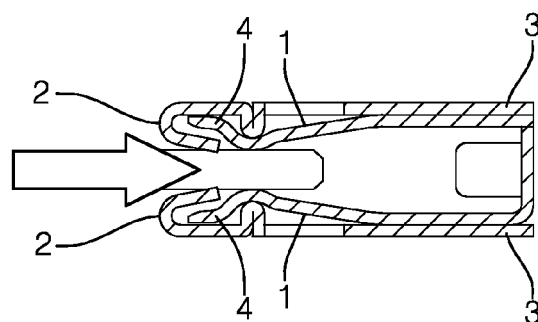
PRIOR ART
FIG. 2



PRIOR ART
FIG. 2A



PRIOR ART
FIG. 3



PRIOR ART
FIG. 3A

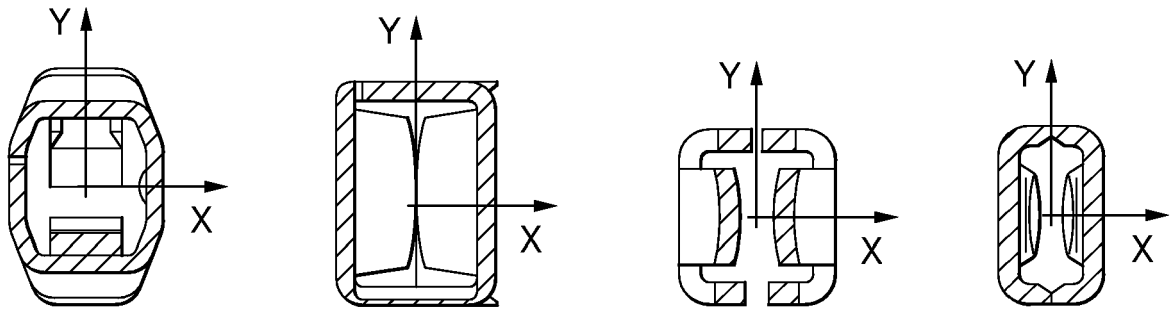


FIG. 4

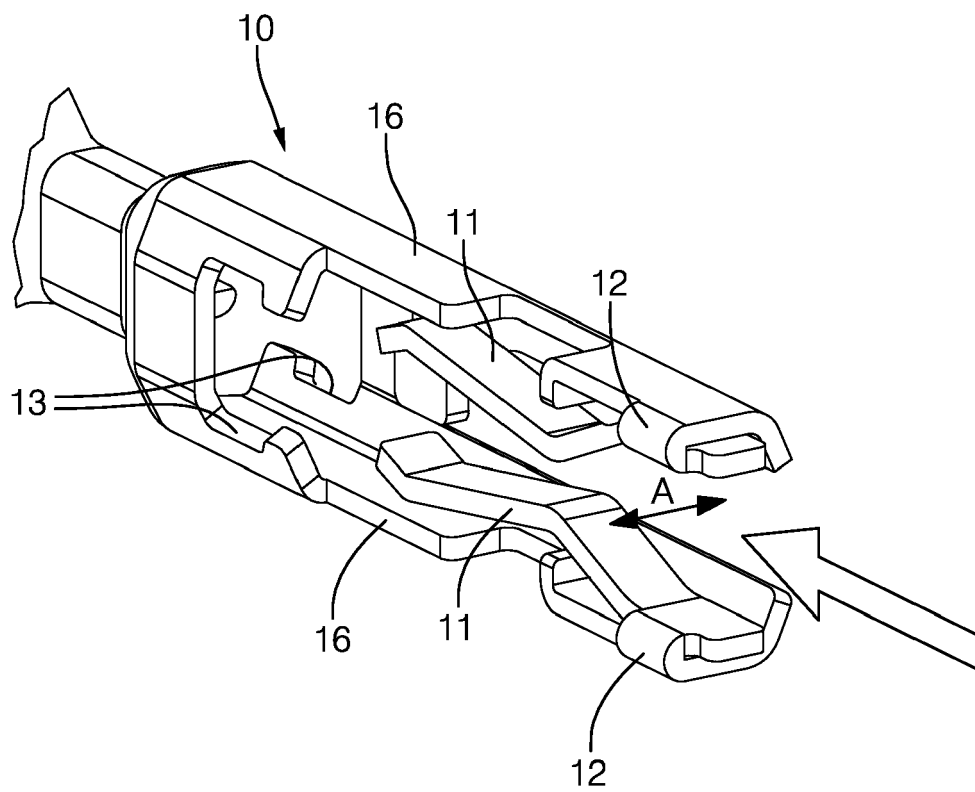


FIG. 5

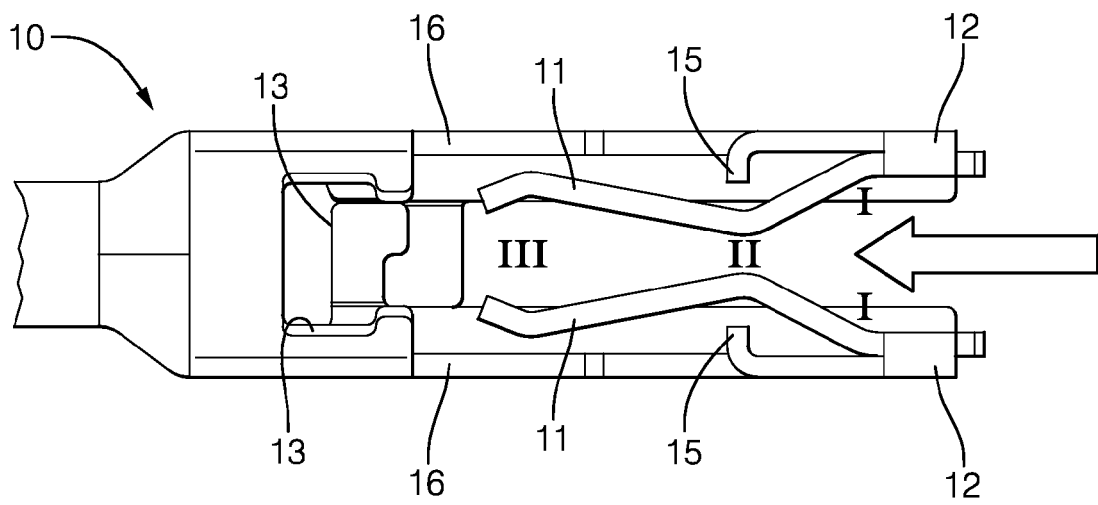


FIG. 6

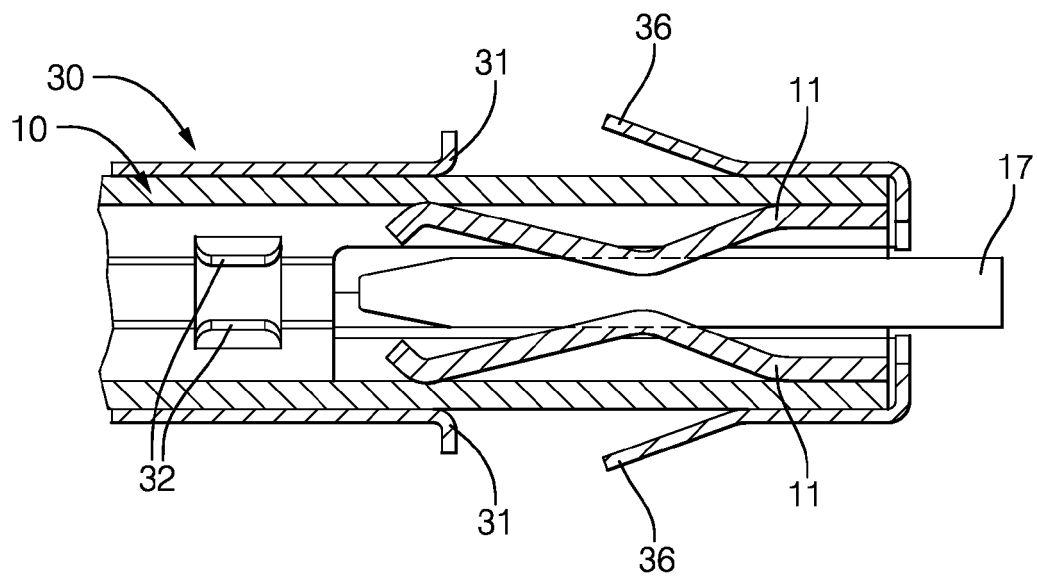


FIG. 7

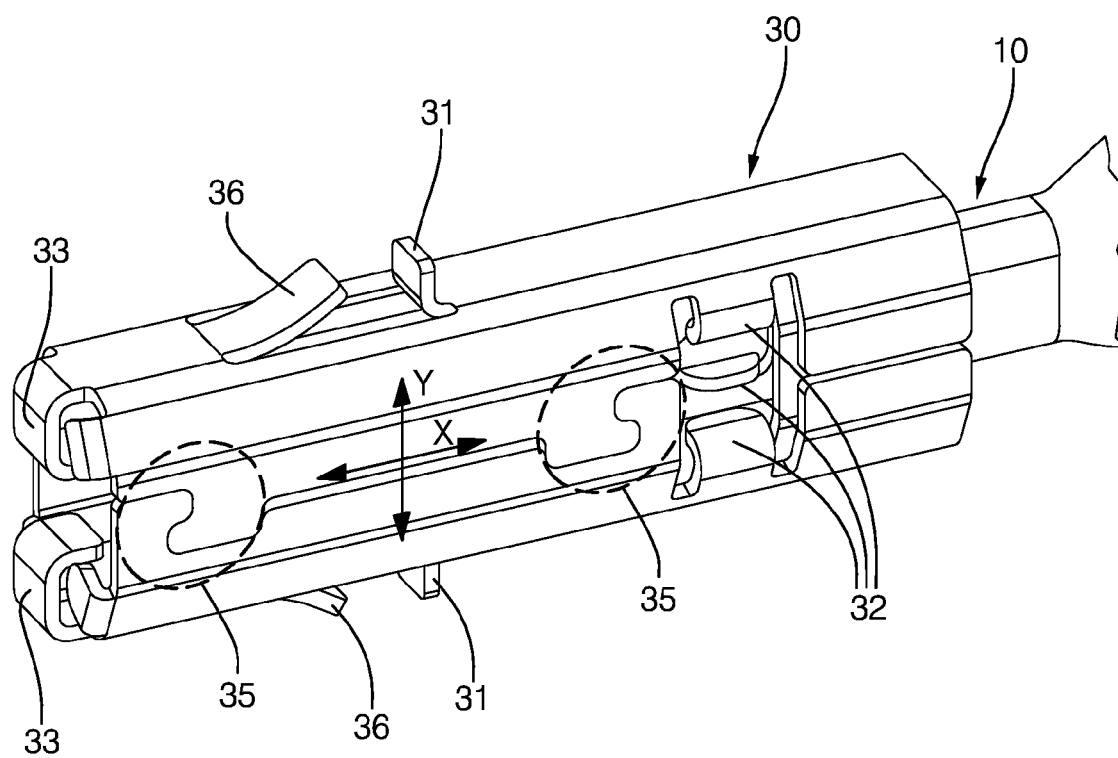


FIG. 8

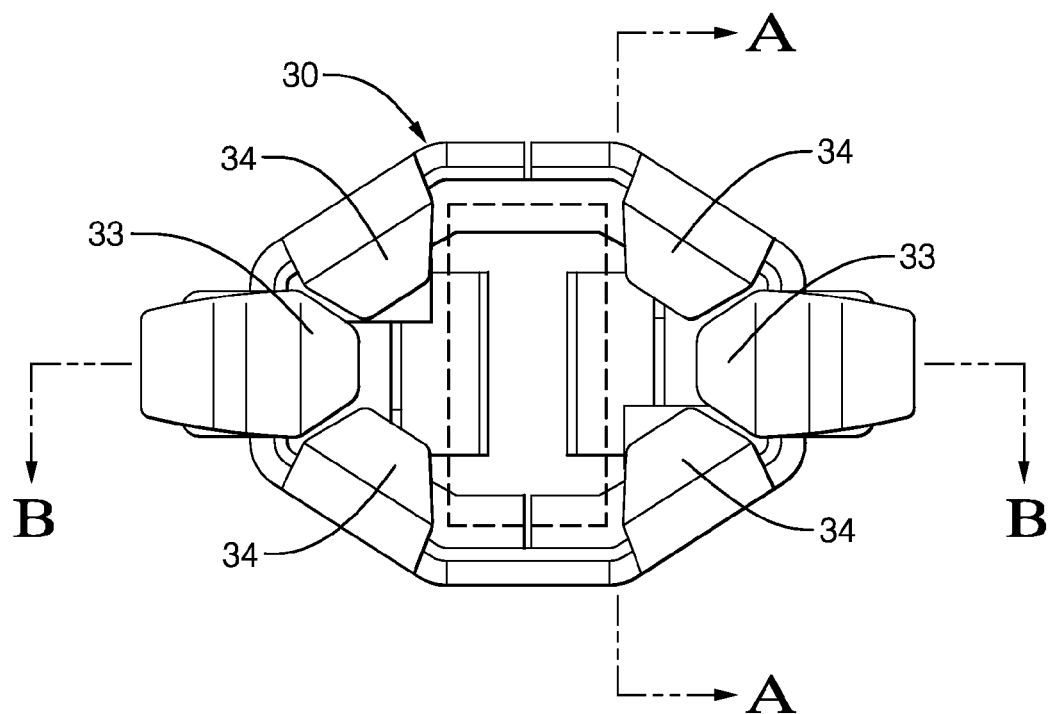
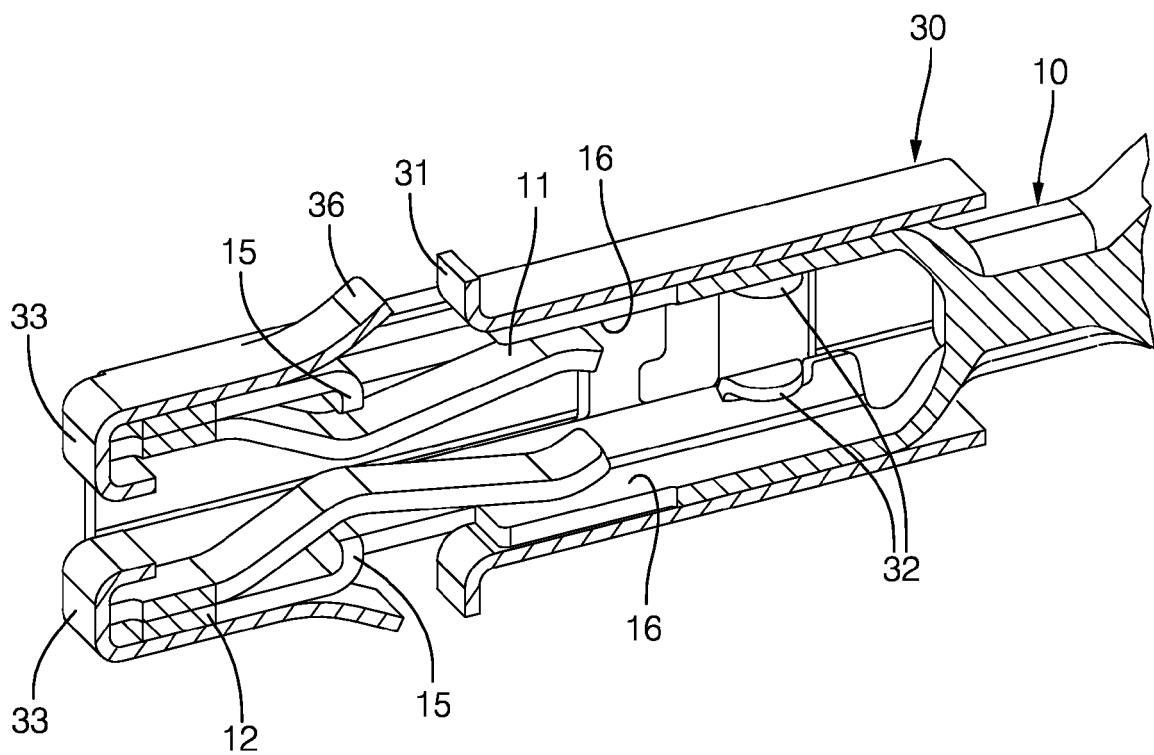
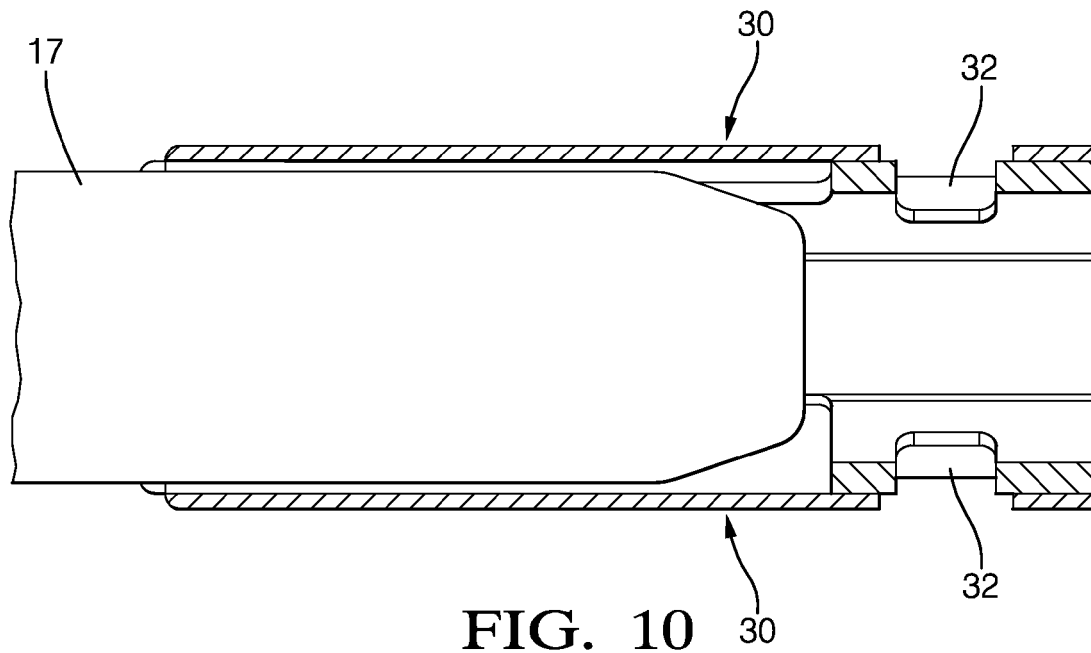


FIG. 9



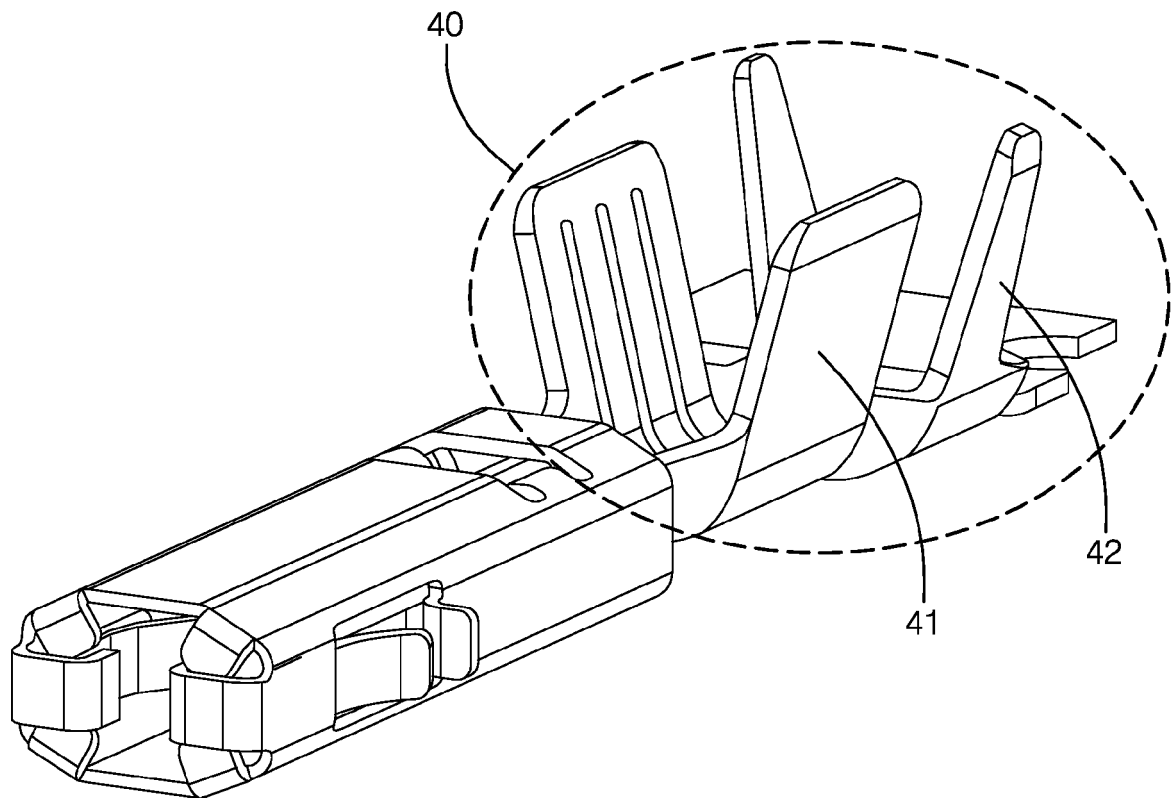


FIG. 12



EUROPEAN SEARCH REPORT

Application Number
EP 13 18 9238

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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Y	* column 1, paragraph 15 - column 2, paragraph 20; figures 1-8 *	10	
A	* column 2, paragraph 21; figures 1-8 * * page 1, paragraph 15 * * figure 8 * * column 2, paragraph 24; figure 2 * * page 3, paragraph 28 - paragraph 30; figures 2-4,6,8 *	4,8	
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A	* column 2, line 54 - column 3, line 25; figures 1-3 * * column 4, line 16 - line 19; figures 6,7 * * figures 5,8 * * figure 2 * * column 4, line 35 - line 42; figures 2,8 *	3,4,10	
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A	* column 3, line 6 - line 30; figures 1-6 * * column 3, line 46 - line 67; figures 3a,3b * * column 4, line 24 - line 27; figures 3a,3b *	5,7,8, 10,11	
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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 28 November 2013	Examiner Gomes Sirenkov E M.
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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EUROPEAN SEARCH REPORT

Application Number
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A	* column 3, line 20 - line 60; figures 1,2,3A,3B * * column 3, line 61 - column 4, line 11; figures 1,2 * * figure 3B * * column 4, line 12 - line 19; figures 1,2 * -----	3,4,8, 10,13	
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Place of search The Hague		Date of completion of the search 28 November 2013	Examiner Gomes Sirenkov E M.
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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**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 13 18 9238

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