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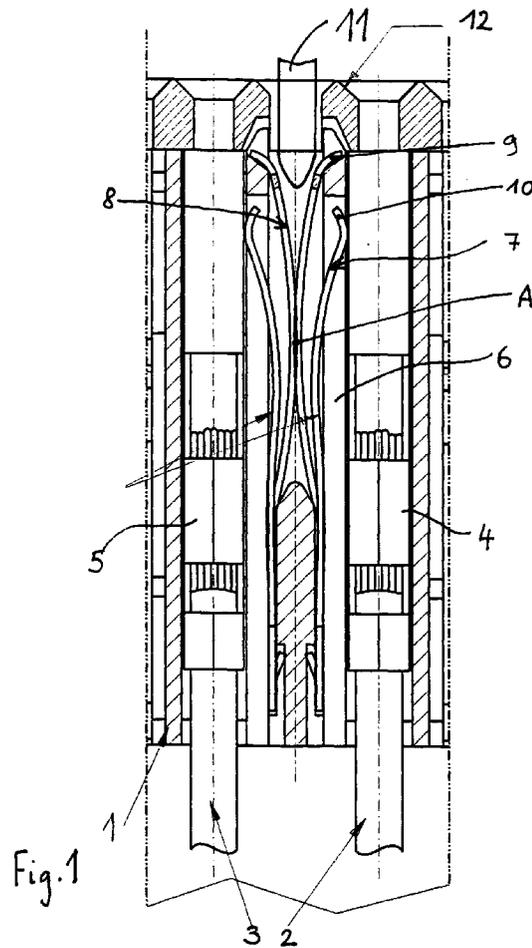
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(54) **Connector with shorting bar**

(57) The invention relates to a connector with shorting bar. Electrical connections for high security standards must include a shorting bar which is normally constructed of one single planar, generally U-shaped piece of metal forming two springs each of which touching one of the terminals to be shorted. This requires a relatively large amount of package space. The design according to the invention includes two separate pieces of conductive material to form the shorting bar.



EP 0 860 898 A1

Description

The invention relates to a connector with shorting bar especially for electrical connections in vehicles.

Electrical connections in environments where high security is necessary in view of explosion hazards e.g. vehicles or airplanes must include shorting bars for selected terminals.

A shorting bar is an electrical connector feature which shorts two terminals together when the connector is not mated. After mating, the shorting bar is deactivated by a deactivation feature on the mating part (i.e. after mating, the terminals are no longer shorted together).

Normally shorting bars are constructed of one single planar generally U-shaped piece of metal forming two springs each of which touching one of the terminals to be shorted. After mating the deactivation feature on the mating part has pushed one or both of the springs away from the electrical terminals, thus breaking the conductive connection between the terminals.

As the same shorting bar spring which contacts the terminals is also deflected by the deactivation feature, a relatively large overall spring deflection is necessary. This generally requires a very long, elastic spring design to guarantee function after connector unmating (i.e. during connector service).

As the shorting bar spring often has a sizeable „lead-in“ feature at its tip and as the deactivation feature must be placed between the terminals and the shorting bar, a relatively large amount of package space is required.

Package space required for shorting bar designs often can be minimized by locally eliminating features on the connector which lead in the mating terminal. The new shorting bar design requires no such design compromises to reduce package size.

According to the invention the connector consists of a housing, terminals, and at least one shorting bar. The shorting bar includes a first and a second separate piece of conductive material, usually stainless steel, and which are essentially planar.

Each of the two pieces of conductive material comprises at least two essentially separate elements i.e. the elements are separated from each other by an opening along most of their surface (contour) but joined at the rest.

Said elements are deformed (bent) perpendicular to the plane of the first piece of conductive material thus forming two sets of springs, one of which contacts the terminal, the other set contacting the corresponding element of an adjacent second piece of conductive material.

On the contrary to the usual design, in which the deactivation device is received between the terminal and the shorting bar, with the connector according to the invention, the deactivation device is received between the first and the second piece of conductive material of the shorting bar itself.

The deactivation device (deactivation rib) when inserted between the springs of adjacent pieces of conductive material breaks the contact without large spring deflections.

The incremental space needed to package the shorting bar only approaches the thickness of the deactivation feature plus twice the thickness of the piece of conductive material plus one terminal cavity wall thickness.

In a preferred embodiment of the invention, separate elements are formed by stamping a U-shaped opening in the piece of conductive metal. Subsequently, the elements are bent to opposite directions of the plane of the piece of conductive material.

One element consists of a single cantilever spring attached at one end whose purpose is to contact the terminal. The free end of the center spring points in the direction of terminal insertion into the cavity to provide for smooth terminal insertion.

The second element consists of two springs attached to each other at both ends which contact two corresponding springs on the adjacent half of the shorting bar. Having two outside springs provided for redundant electrical points of contact between the two halves of the shorting bar for greater electrical reliability and lower electrical resistance.

A preferred embodiment of the invention is described in connection with the schematic figures:

fig. 1 is a sectional view a connector with shorted terminals;

fig. 2 is a sectional view a connector with deactivated shorting bar.

In fig. 1, part 1 of the housing assembly of the connector terminals 4 and 5 are shown together with connecting wires 2 and 3. In an opening 6 part 1 of the housing assembly of the connector contains a first piece 7 of conductive material and a second piece 8 of conductive material each of which comprise separate elements 9 and 10. Elements 9 serve as springs for electrically connecting the adjacent pieces 7,8 of conductive material at point „A“. Elements 9, 10 are separated from each other by an opening which is generally U-shaped (in the plane perpendicular to the drawing) thus supplying two points or areas of contact „A“ to the elements 9 of adjacent pieces 7,8 of conductive material. Elements 10 serve as springs for electrically connecting the pieces 7,8 of conductive material to the terminals 4, 5. The deactivation rib 11 is shown in a disengaged position. The housing assembly preferably has lead-in features 12.

In fig. 2 the deactivation rib 11 is shown in the engaged position.

The connector according to the invention additionally to the advantages already described could provide greater mechanical stability and vibration damping as, after mating, the deactivation feature fits firmly between

the shorting bar elements securing the mated connectors more tightly together than generally possible with traditional connectors with shorting bars.

Claims

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1. Connector consisting of a housing, terminals, and at least one shorting bar, characterized in that, the shorting bar includes a first and a second separate piece of conductive material (7,8) which are essentially planar and each of which comprises at least two essentially separate elements (9,10) which are deformed perpendicular to the plane of the piece of conductive material (7) thus forming two sets of springs, one set of which (10) contacts a terminal (2,3), the other one (9) contacts the corresponding element (9) of an adjacent second piece of conductive material (8).

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2. Connector according to claim 1, characterized in that, the elements (9) of said pieces of conductive material (7,8) have curved cross section with an increasing curvature at the free ends.

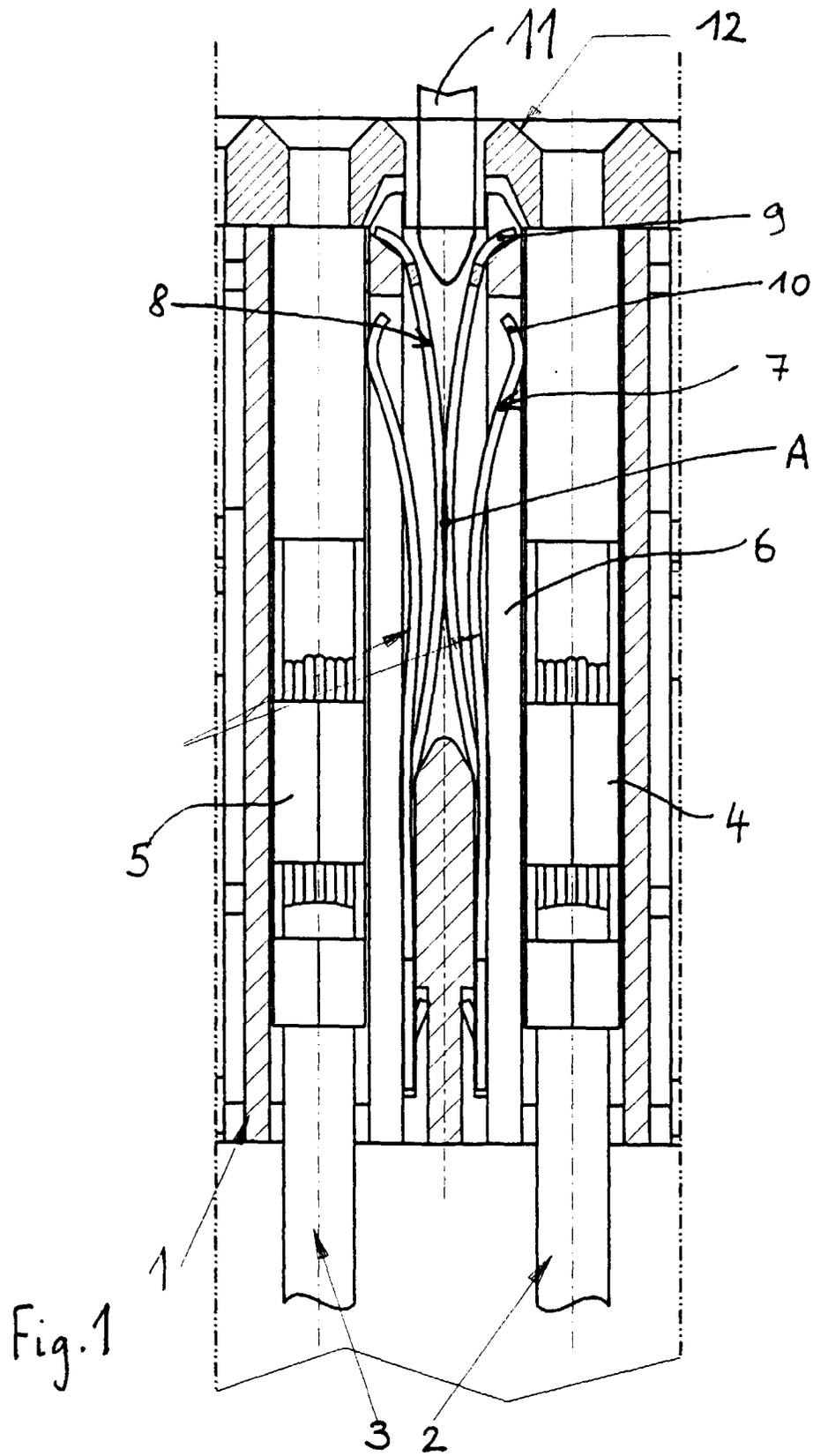
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3. Connector according to claim 1 or 2 characterized in that, the elements (9,10) are separated from each other by a generally U-shaped opening.

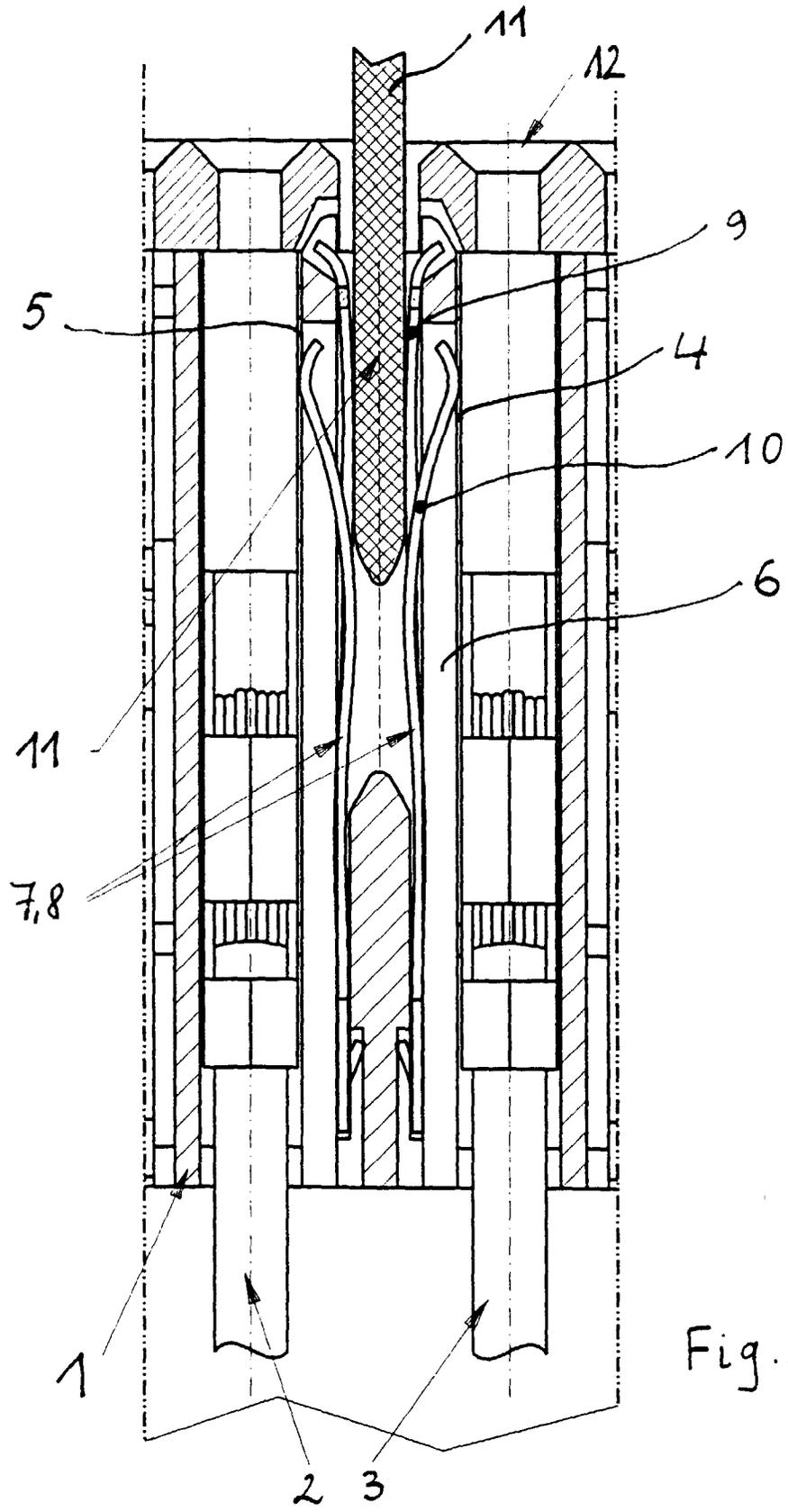
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4. Connector according to claim 3, characterized in that, the elements (9,10) are deformed perpendicular to the plane of the pieces of conductive material (7,8) in the same direction.

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5. Connector according to claim 1 or 2 characterized in that, the elements (9,10) are separated from each other by a generally N-shaped opening.

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6. Connector according to claim 5, characterized in that, the elements (9,10) are deformed perpendicular to the plane of the pieces of conductive material (7,8) in opposite directions.

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EUROPEAN SEARCH REPORT

Application Number
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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	DE 90 10 565 U (SIEMENS AG) * page 1, last paragraph - page 3; figures 1-3 *	1-3	H01R3/00 H01R13/703
A	DE 92 09 900 U (PULSOTRONIC MERTEN GMBH & CO KG) 24 September 1992 * page 8, paragraph 5 - page 13; figures 1-6 *	1-4	
A	US 5 516 299 A (FUKUDA MASARU ET AL) 14 May 1996 * column 3, line 15 - column 5, line 33; figures 1-11 *	1-3	
A	US 1 825 208 A (ALEX C. RUMBLE) 29 September 1931 * page 1, column 1, line 47 - page 2, column 2, line 126; figures 1-3 *	1-3	
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			H01R
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
THE HAGUE		4 April 1997	Tappeiner, R
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