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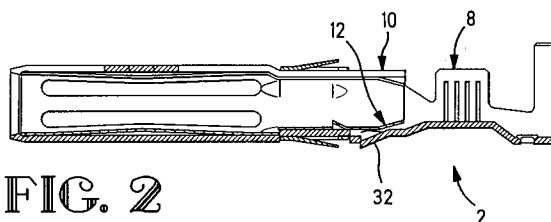
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(57) An electrical socket contact (2) is comprised of an outer contact body (10) which is integral with a wire crimp portion (8), and an inner contact spring (12). The inner contact spring (12) is interference fit within the outer contact body (10) between the surfaces (21, 59) to provide a low resistance electrical interconnection between the outer contact body (10) and the inner contact spring.

**FIG. 2****EP 0 568 927 A1**

The subject invention relates to a high current electrical socket terminal for such uses as in automotive high current connectors.

Electrical socket terminals for use in high current connection systems, particularly for use in truck connectors are presently available to carry such high currents as are required in these applications. These contacts are however, made in the form of screw machined sockets and include a machined bore for the interconnection with the electrical insulated conductor to be terminated. Aside from the cost disadvantage of the above mentioned terminals, the socket terminals have also proven to be disadvantageous in that it is not adaptable for various wire sizes.

In the known connector, a solid brass material is machined to include either a pin and socket at one end, and a wire connecting bore at the opposite end. A wire to be terminated is first stripped and then inserted in the bore, whereupon the wire connecting portion is crushed to crimp the material forming the bore around the wire. Thus as the wire size varies the crimp quality could be affected by the increase or decrease of the void within the wire crimp area by the wire. Said differently, for given size wire crimp bore, the smaller the conductor, the more thoroughly the wire crimp area must be crushed in order to terminate the wire.

An object of the invention then is to provide a more inexpensive electrical socket terminal which can also be used with such high current applications.

It is a further object of the invention to provide such a high current contact which can be crimped to the insulated conductors.

The objects of the invention have been accomplished by providing an electrical socket terminal for high current applications, where the terminal comprises a front socket portion for mating with the pin and a wire connecting portion at the rear thereof. The socket terminal is characterized in that the terminal is comprised of an inner spring contact having a lower constricted portion, interfittingly inserted into a constricted portion of the outer contact body, whereby electrical contact is made between the spring contact and the contact body.

The invention will now be described by way of reference to the drawing figures, where;

Figure 1 is a top plan view of the subject socket terminal;

Figure 2 is a cross-sectional view through lines 2-2 of Figure 1;

Figure 3 is a top plan view of the outer socket terminal portion prior to the insertion of the inner socket portion;

Figure 4 is a cross-sectional view through lines 4-4 of Figure 3;

Figure 5 is a top plan view of the inner socket portion;

Figure 6 is a cross-sectional view through lines 6-6 of Figure 5;

Figure 7 is a diagrammatical view showing a mating pin portion which can be used to electrically connect with the socket terminal shown in Figures 1-5; and

Figure 8 is a diagrammatical view of the socket terminal shown in Figures 1-6 positioned in a housing cavity.

With reference first to Figure 1, an electrical socket terminal is shown generally at 2 comprised of a front contacting section 4 an intermediate section 6 and a wire terminating section 8. As shown in Figure 2, the socket terminal 2 is comprised of an outer contact body 10 integral with the wire contacting section 8, together with an inner spring contact 12 which forms the electrical connection with the pin portion.

As best shown in Figures 3 and 4, the outer contact body 10 is stamped from a flat sheet of material and rolled into a cylindrical configuration having an axially extending seam at 14. The cylinder is held in a closed position by way of interlocking tabs 16 and 18 which prevent the radial expansion of the cylindrical body. As shown in Figure 3, the outer contact body 10 includes a constricted portion at 20 formed by a transition at 22. The outer contact member 10 further includes 3 raised sections 24 (only two of which are shown in Figure 3) formed by a sheared portion at 25 which forms a stop edge at 26, as shown in Figure 4. The raised sections 24 are formed to be radially equidistant with the outer diameter of the front section 11, as best shown in Figure 4. The terminal further comprises a sheared band portion 28 which is formed to be radially equidistant with the front section 11, as best shown in Figure 4, and includes a sheared edge 30 in opposing relation to the edge 26.

The outer contact member 10 further includes three raised sections 32, which as shown in Figure 4 are formed to extend outside the radius of the cylindrical portion 11 such that a forwardly facing edge 34 extends beyond the band portions 28 for locking the terminal within a corresponding housing, as will be explained in greater detail herein. With respect still to Figure 4, the outer terminal portion 10 includes a plurality of locking fingers 36 having sheared side edges 38, the sheared edges 38 allowing the fingers to be formed inwardly towards the center line of the contact as will be described in greater detail herein. Each of the fingers 36 is formed with a peripherally extending groove 40, thereby defining a locking shoulder 42, as shown in Figure 4.

With respect now to Figures 5 and 6, the inner spring contact 12 will be described in greater detail. As shown best in Figure 5, the spring contact 12 is formed from a flat sheet of material and rolled into a generally cylindrical configuration having a longitudinal seam at 45. The spring contact 12 further includes a plurality of contact arms 46 inwardly directed at 48 to form an inner contact surface at 50. The individual contact arms 46 are generally suspended between a forward band portion 52 and a rearward band portion 54, the forward band portion 52 including a front edge at 56. The band portion 54 is integrally connected with a constricted portion 58 via a transition section 60 as best shown in Figure 5. Three raised sections generally shown at 62 are located at the transition section 60 and are raised to an outward extent equal to the outer diameter of the band portion 54 as best shown in Figure 6. The raised portion 62 is defined by a sheared portion 63 thereby forming a locking edge 64 as best shown in Figure 6. Sections 66 are located within the constricted portion and are directed inwardly as best shown in Figure 6. Finally the inner contact portion 12 includes a conical lead-in section shown generally at 70.

With the inner spring contact 12 formed as shown in Figures 5 and 6, and with the outer contact body 10 formed as shown in Figures 3 and 4, the assembly of the finished socket contact will be described in greater detail. The inner spring contact 12 is inserted with the conical lead-in portion 70 inserted through the individual fingers 36 of the cylindrical portion 11 (Figure 4). The inner spring contact 12 includes an outer surface 59 (Figure 6) on the constricted portion 58 which interferes with an inner surface 21 (Figure 4) of the constricted portion 20 and further movement of the inner socket portion 12 is by way of interference longitudinal movement between the surfaces 59 and 21. It should be appreciated that the inwardly directed portions 66 on the inner socket contact 12 can be used with an insertion tool positioned inside of the socket contact 12 for moving the spring contact 12 into its fully inserted position.

The inner spring contact 12 is inserted to a position where the edge 64 (Figure 6) abuts the forwardly facing edges 27 (Figure 4) whereby the inner spring contact is prevented from further rearward movement by way of the contact between the edges 64 and 27. When the inner spring contact 12 is in this fully loaded position, the individual fingers 36 are crimped downwardly, radially inwardly to the position shown in Figure 2, which positions the locking edge 42 over the front edge 56 of the forward band portion 52 of the inner spring contact 12, as shown in Figure 2. As shown in Figure 1, an outer locking band 80 can now be snapped over the assembled socket contact, the band 80 being

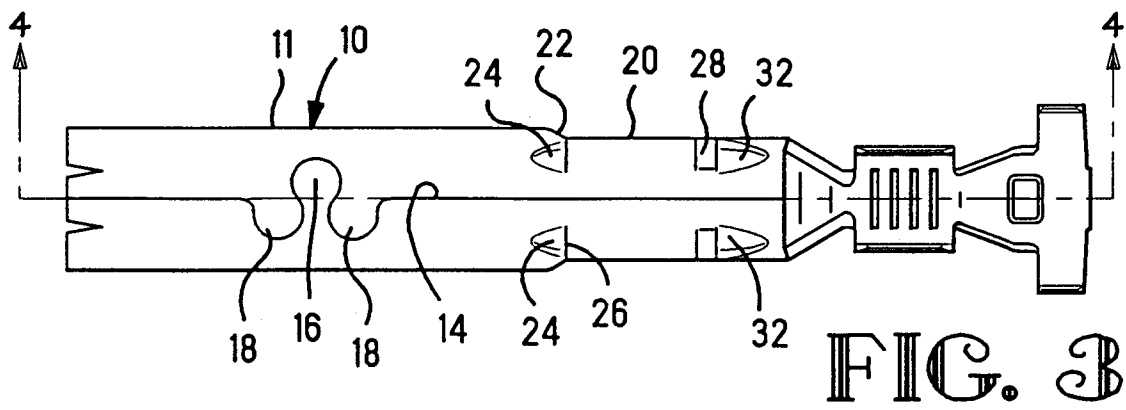
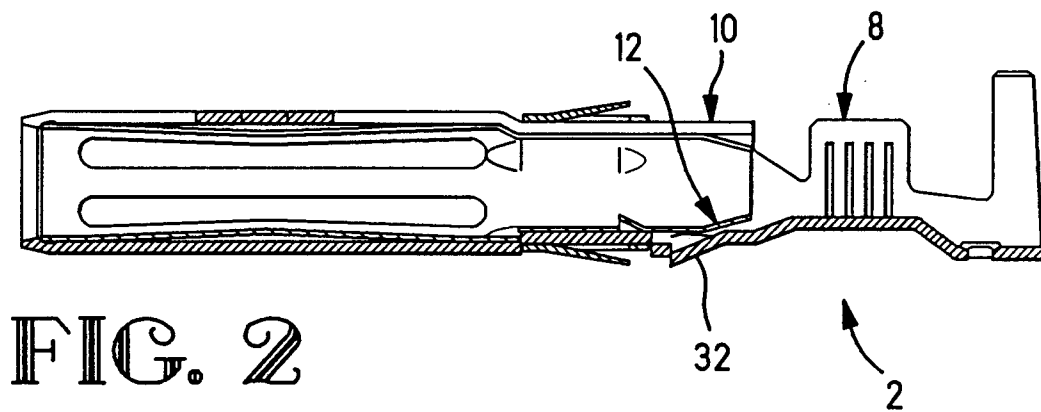
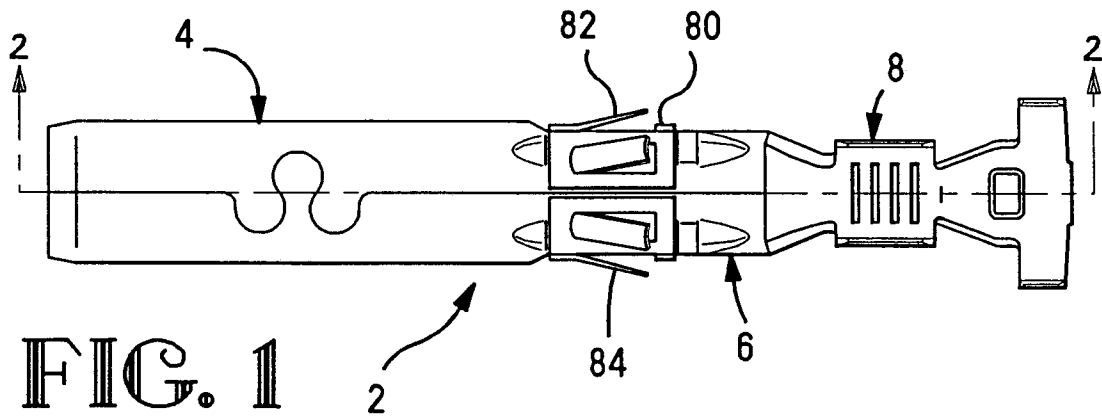
locked on the transition section 20 of the outer contact portion between edges 26 and 30 (Figure 4). The locking band 80 includes a plurality of locking lances 82 having end locking edges 84. Thus the socket terminal 2 can be locked in a connector housing such as 100, shown in Figure 8, with the socket terminal locked about a inner peripheral ring 102 by way of the locking lances 82 and the outward directed portions 32.

Advantageously then, the socket terminal can be formed with a wire insulation crimping portion 8 and yet still be used with high current applications. Advantageously the outer band portion 10 can be formed of a relatively thick material preferably a copper alloy, whereas the inner contact spring 12 can be formed from a thin material such as a copper-nickel. As the inner contact spring 12 and the outer contact body are interferringly fit between the surfaces 21 and 59, little electrical resistance is encountered between the inner socket contact and the outer contact body 10, as the assembly of the contacts cleans the surfaces 21, 59, thereby allowing the socket contact to be used in high current applications. Also advantageously, the band portions 52 and 54 are radially held in position within the outer contact body thereby providing rigidity to the inner contact spring. Finally, the individual contact arms are also provided with a rigidity in that they are suspended between surfaces 27 and 42 (Figure 4) thereby resisting the inner movement of the individual contact arms.

Claims

1. An electrical socket terminal (2) for high current applications, the terminal comprising a front socket portion (4) for mating with a pin, and a wire connecting portion (8) at the rear thereof, the socket terminal (2) being characterized in that the terminal (2) is comprised of an inner spring contact having a lower constricted portion (58), interferringly inserted into a constricted portion (20) of the outer contact body (10), whereby electrical contact is made between said spring contact (12) and said contact body.
2. An electrical terminal (2) according to claim 1, characterized in that said outer contact body (10) is formed from a flat sheet of metal and formed into a cylindrical portion (11) having a generally axially extending seam (14).
3. An electrical terminal (2) according to claim 1 or 2, characterized in that said outer contact body (10) includes means (36) to retain said cylindrical portion (11) in a closed condition.

4. An electrical terminal according to claim 2 or 3, characterized in that said outer contact body (10) includes interlocking means (16, 18) along said seam (14) to retain the outer contact body (10) in a closed condition. 5
5. An electrical terminal (2) according to claim 3 or 4, characterized in that said retaining means (36) are crimped over the front edge (56) of the inner spring contact (12). 10
6. An electrical terminal (2) according to claim 5, characterized in that the inner surface of the outer contact body (10) includes an inner edge (42) which is crimped over the front edge (56) of the inner spring contact (12). 15
7. A high current electrical socket contact, comprising:
 - an outer contact body (10) having a front cylindrical section (11), an intermediate constricted portion (20) connected to said cylindrical section (11) via a transition section (22), and a rear wire contacting section (8), at least one outwardly projecting section (24) being formed adjacent the transition section (22), formed at a peripherally extending slit (25), the projecting section being formed outwardly to form an inner forwardly facing edge (27) and an outer rearwardly facing edge (26), the outer contact body further comprising retaining means (26) adjacent to a front edge thereof; 20
 - an inner contact spring comprising a plurality of individual contact arms (46) suspended between a forward (52) and rearward (54) band portion, the rear band portion being connected to a constricted portion (58) via a transition section (60), the transition section including at least one outwardly projecting section (62) thereby forming an engaging edge (64), the inner contact spring being inserted within said outer contact body, such that said at least one outwardly projecting section (62) engages said inner edge (27), and retaining means (36) grip the forward band portion (52). 25 30 35 40 45
8. A socket contact according to claim 7, wherein the retaining means (36) are defined by individual locking fingers (36) which are crimped radially inwardly over the forward end of the inner contact spring (12). 50
9. A socket contact according to claim 8, wherein said individual fingers (36) have an inner edge (42) which locks over the front edge (56) of the inner contact spring (12) when in the crimped position. 55
10. A socket contact according to any of claims 7-9, wherein a peripherally extending band portion (28) is stamped outwardly from said constricted portion (20) thereby forming a forwardly facing edge (30), opposing said edge (26), and a retaining band (82) is positioned on said constricted portion (20) intermediate said edges (26,30), said retaining band (82) having a plurality of locking lances (84).
11. A socket contact according to any of claims 7-10, wherein the inner spring (12) is electrically connected to the outer contact body (10) by way of interference fit between the two constricted portions (20, 58).
12. A method of forming a high current socket contact (2), comprising the steps of:
 - forming an outer contact body (10) having a generally closed cylindrical body portion (11), with a wire engaging rear section (8);
 - forming an inner spring contact (12) having a front pin receiving area; and
 - interferringly inserting said inner spring contact (12) into said outer contact body (10) to establish an adequate electrical connection between said contact body (10) and said inner spring contact (12).



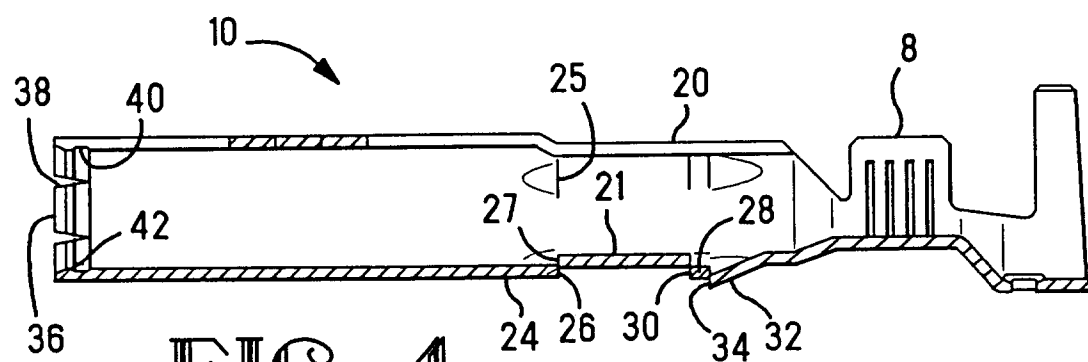


FIG. 4

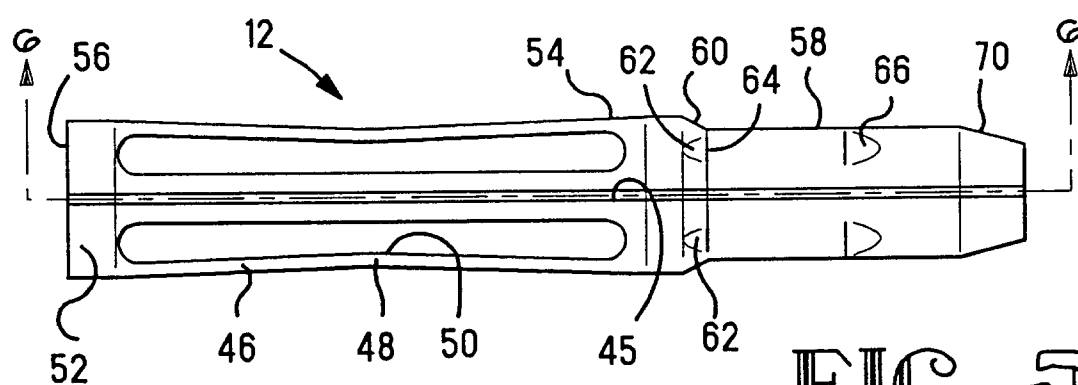


FIG. 5

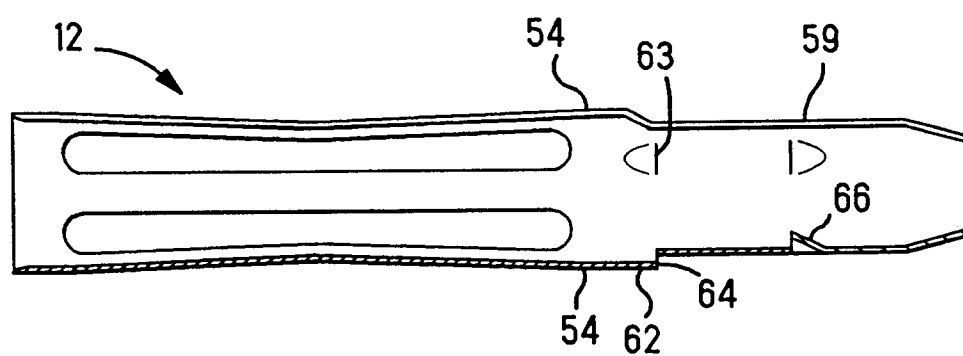


FIG. 6

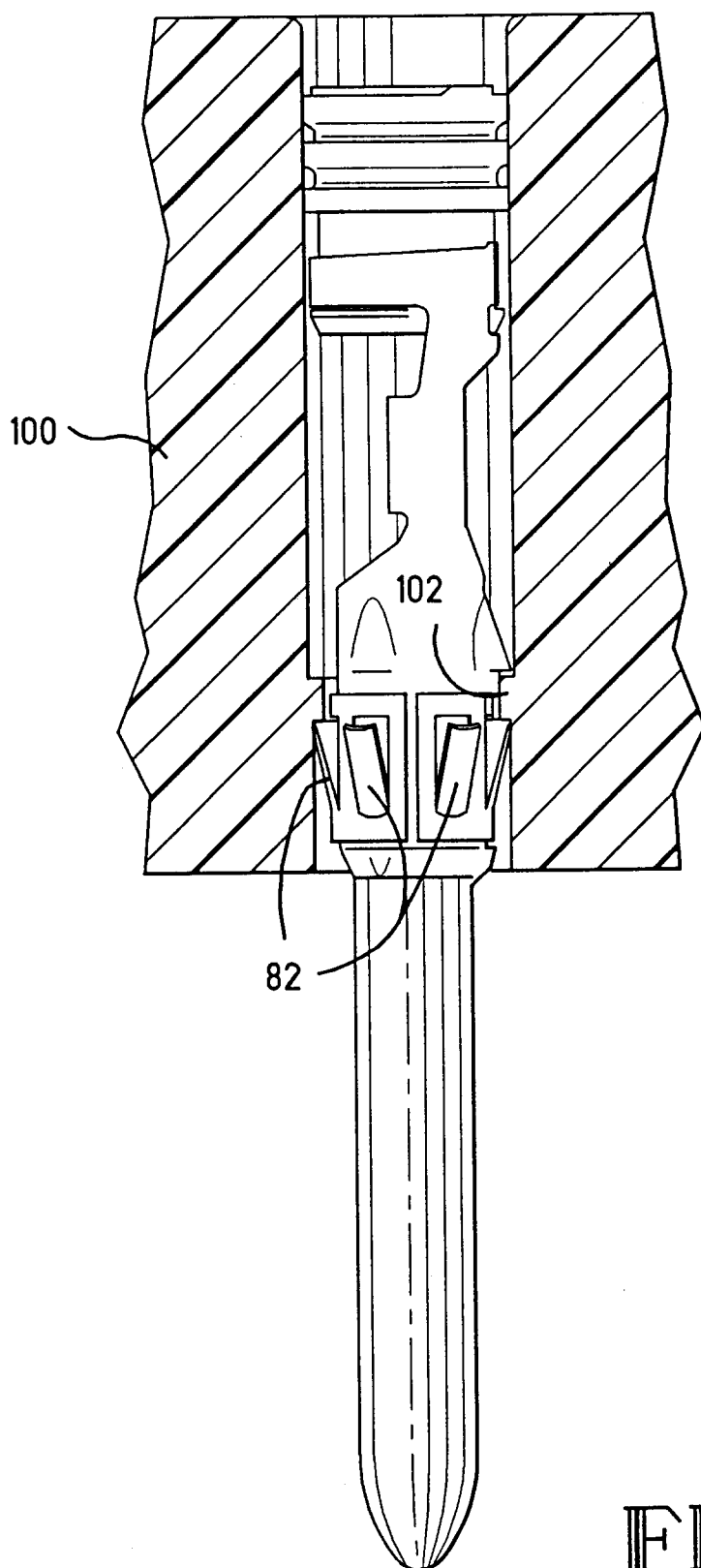


FIG. 7

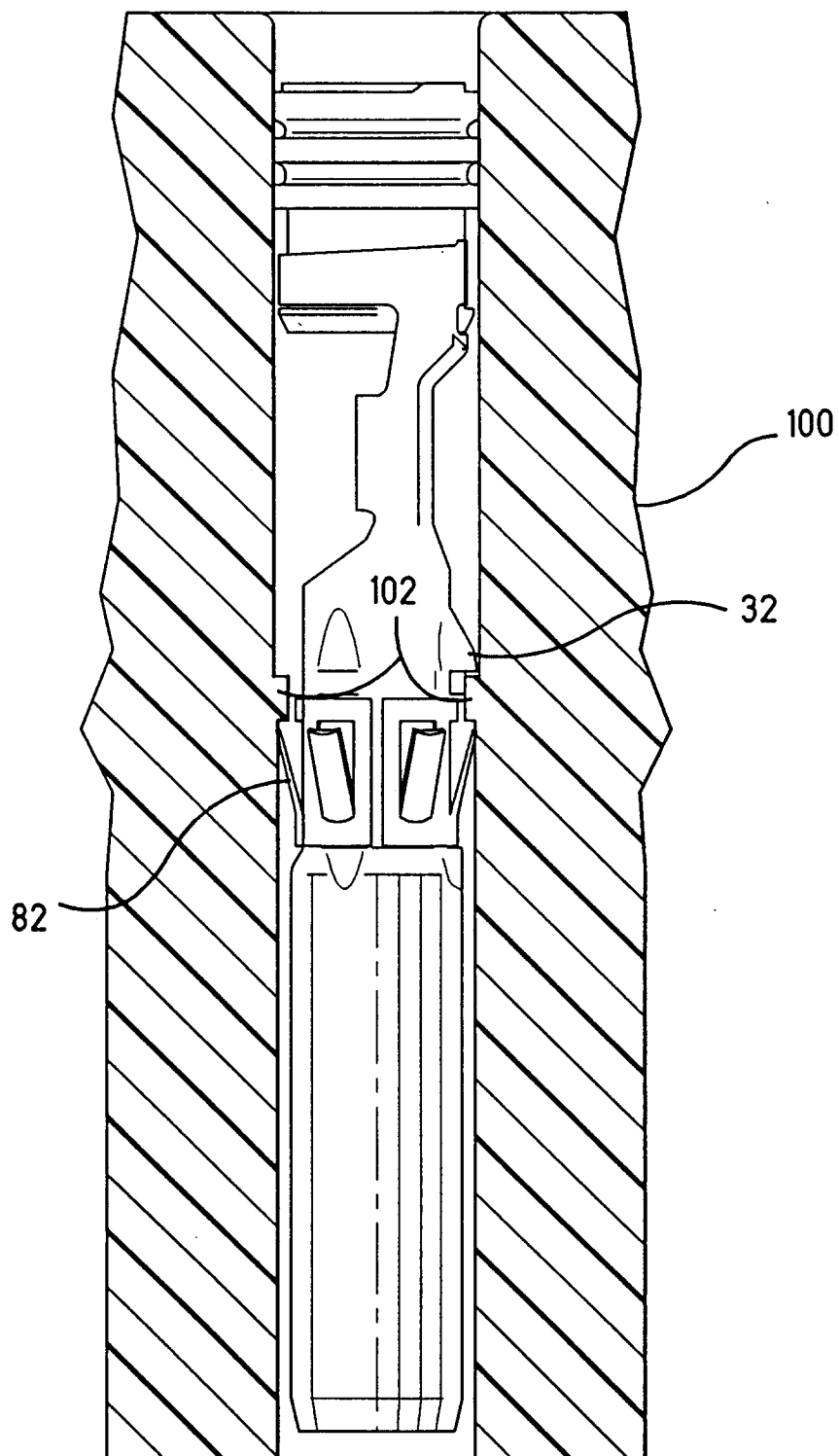


FIG. 8



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EUROPEAN SEARCH REPORT

Application Number

EP 93 10 7016

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.5)
X	EP-A-0 188 751 (BRINTEC SYSTEMS CORP.) * column 4, line 28 - line 34; figure 4 * ---	1-12	H01R13/187
X	EP-A-0 283 768 (CONNEI S.P.A.) * column 3, last paragraph * ---	1,12 2,7,11	
A	EP-A-0 254 986 (KABELWERKE REINSHAGEN GMBH) * figure 2 * ---	1,5,7,12	
A	EP-A-0 476 848 (ITT INDUSTRIES INC.) * figure 9 * -----	1-2,7,12	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			H01R
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 09 AUGUST 1993	Examiner SIBILLA S.
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