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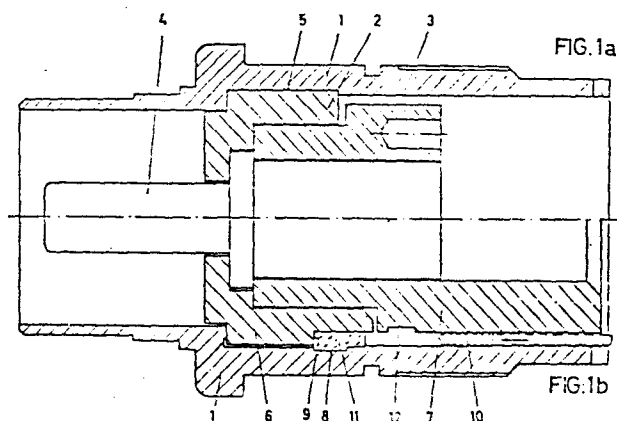
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**Method of producing an electrical connector and resulting connector.**

A method of producing an electrical connector which includes at least one electrical contact (4) retained in a contact retaining plate (7) disposed in a housing (1), and a contact insert (2) also disposed in the housing. In one embodiment, the contact insert (2) is formed of a plastic material and is ultrasonically welded to the housing (1). In

another embodiment, a recess (8) is provided in the housing and a shoulder (9) is formed on the contact insert (2). A plastic element (10) is disposed in recess (8) against shoulder (9) and is ultrasonically welded to the contact insert (2) and housing (1).



METHOD OF PRODUCING AN ELECTRICAL  
CONNECTOR AND RESULTING CONNECTOR

BACKGROUND OF THE INVENTION

Field of the Invention

This invention relates to a method of producing an  
5 electrical connector of the plug or socket type.

Description of the Prior Art

A single- or multi-contact connector comprising a  
housing, a single-part or multiple-part contact insert  
disposed in the housing, and at least one contact re-  
10 siding in the contact insert and fixed by the latter in  
axial and radial directions is known from German Patent  
Application 27 02 827. Connectors of this kind are used  
particularly in the industrial and military areas, but  
are employed also wherever great reliability, hermiti-  
15 city and little susceptibility to interference are  
paramount. The known connector has a contact insert  
whose diameter is considerably smaller than the inside  
diameter of the housing.

When joining the contact insert and the housing, a  
20 laminate is pressed into the space between the parts and  
hardened by heat. Although this production method is  
effective, it is time-consuming, primarily due to the  
heat treatment.

It would be desirable to provide a method of pro-  
25 ducing a plug or a socket connector which is less time-  
consuming and, hence, reduces production costs.

SUMMARY OF THE INVENTION

In accordance with this invention, there is pro-  
vided a method of producing an electrical connector, the  
30 connector comprising a housing, a contact insert dis-  
posed in the housing, and at least one electrical con-  
tact disposed in the contact insert, characterized in  
that the contact insert is formed of a plastic material  
and ultrasonically welding said contact insert to the  
35 housing to thereby connect the contact insert to the  
housing.

In further accordance with the invention, there is

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provided a method of producing an electrical connector, the connector comprising a housing, a contact insert disposed in the housing, and at least one contact disposed in the contact insert, characterized in that a recess is provided in an inner wall of the housing adjacent to the contact insert and a shoulder is provided on the insert adjacent to the recess, and including the steps of inserting a plastifiable plastic element into the recess and abutting against the shoulder, and ultrasonically welding the plastic element to both the housing and the contact insert to join the housing and the contact insert.

Further in accordance with this invention, there is provided in an electrical connector comprising a housing, a contact insert disposed in the housing, and at least one electrical contact disposed in the contact insert, the improvement comprising the contact insert being formed of a plastic material and being ultrasonically welded to the housing to connect the contact insert to the housing.

Also in accordance with this invention, there is provided in an electrical connector comprising a housing, a contact insert disposed in the housing, and at least one electrical contact disposed in the contact insert, the improvement comprising a recess in an inner wall of the housing adjacent to the contact insert and a shoulder on the insert adjacent to the recess, and a plastic element inserted into the recess and abutting against the shoulder, the plastic element being ultrasonically welded to the contact element and the housing to join the contact element and the housing.

The above problem is solved in one embodiment in that the contact insert is formed of plastic and is joined to the housing by means of an ultrasonic welding process.

An alternative process comprises inserting a thermoplastic element by ultrasonic welding into recesses provided on the contact insert and/or housing

to join the contact insert to the housing.

The methods of this invention are less time-consuming than the previous process.

BRIEF DESCRIPTION OF THE DRAWINGS

5 Figure 1a/b shows in cross-section two designs of a plug connector according to this invention.

Figure 2 shows in partial cross-section another embodiment of the connector of this invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

10 The plug connector shown in Fig. 1a includes a housing 1, a contact insert 2, a contact retaining plate 3 and a pin contact 4. Even though the design of a male connector part is described in the following, it goes without saying that the same construction is possible  
15 also for a female connector part, and therefore such part is not specifically described herein.

In such a plug design a strong connection between housing 1 and contact insert 2 is required. To accomplish this, contact insert 2 is fixed in the housing 1  
20 by ultrasonic welding.

To facilitate this, housing 1 is so designed at its inner bearing surface 5 which contacts the contact insert that joining of the contact insert material, plastified during the welding process, is possible. For  
25 instance, the bearing surface 5 may be roughened.

A plastic with thermoplastic properties should be selected as the contact insert material, i.e., a material which is plastically deformable when heated by ultrasound. After the fusion of the two parts, pin 4 is  
30 inserted and fastened to contact retaining plate 3 in a conventional manner. The latter may be connected to the contact insert either in conventional manner or also by ultrasonic welding.

Fig. 1b shows an alternate embodiment which includes housing 1 of a plug connector, with a contact  
35 insert 6, a pin contact 4 and a contact retaining plate 7 disposed in it.

Provided in housing 1 is a recess 8, opposite which is a shoulder 9 in contact insert 6. To join both parts together, a thermoplastic ring 10 is introduced into the housing in the annular hollow space formed by the recess 8 and the shoulder 9 and is plasticized by ultrasound.

5 Ring 10 adapts to the hollow space, thereby forming a connecting element 11 between housing 1 and contact insert 6. This connecting technique has the advantage that any desired material can be chosen for both the housing and the contact insert because welding one of  
10 the parts to the thermoplastic ring 10 is not necessary. If the contact retaining plate 7 is to be fastened ultrasonically at the same time also, this is possible in simple manner by prolonging the length of ring 10 so  
15 that a recess 12 of the contact retaining plate 7 is also filled with the plastified compound. The thermoplastic material is plastified by the ultrasonic method in fractions of seconds; as such, assembly of these plug connectors requires little time.

20 According to Fig. 2, another embodiment of the invention is shown which includes a known plug connector design, for example, a round miniature connector with many contacts, although only one is shown. The contact  
25 16 is fastened in an insert 15 and can be taken apart again with a special tool. In assembly, the insert is inserted into a housing ring 21. Insert 15 is joined to housing ring 21 by means of a plastic ring 22 which is pushed into the space between the insert and the housing ring, plastified ultrasonically and thus caused to adapt  
30 to the contours of a part of the said space. If the outside contour of insert 15 is suitably dimensioned and of appropriate material, the insert can be joined to the housing ring 21 directly by ultrasound. The ultrasound effect plastifies the outer contour of the insert which,  
35 due to its being pushed into the housing ring at the same time, adapts to the latter's contour.

In both cases, a reliable and hermetically tight connection is assured.

To fasten an outer cable sheath to the connector a shield adapter 13 is provided which, together with a cap screw 14, accommodates at the same time the shielding mesh of the cable. Located on the contact side is a coupling nut 17, by means of which the plug can be fastened to a socket (not shown). A locking ring 19 limits the axial mobility of coupling nut 17, and in addition a spring washer 20 is provided to eliminate play between the socket and the plug connectors.

It can be seen that the present invention provides assembly of a connector in a short time and in a simple manner.

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CLAIMS

1. A method of producing an electrical connector, said connector comprising a housing (1), a contact insert (2) disposed in said housing, and at least one electrical contact (4) disposed in said contact insert, characterized in that said contact insert is formed of a plastic material and ultrasonically welding said contact insert to said housing to thereby connect said contact insert to said housing.

2. The method of claim 1, including an internal surface (5) in said housing against which said contact insert is disposed, and including the step of roughening said internal surface prior to ultrasonically welding said contact insert to said housing.

3. The method of claim 1 wherein said plastic material is a thermoplastic material.

4. The method of claim 1 wherein said contact is retained in a contact retaining plate (7), and including the steps of inserting said plate into said housing and connecting said plate to said contact insert.

5. The method of claim 4 wherein said step of connecting said plate to said contact insert comprises ultrasonically welding said parts together.

6. A method of producing an electrical connector, said connector comprising a housing (1), a contact insert (2) disposed in said housing, and at least one contact (4) disposed in said contact insert, characterized in that a recess (8) is provided in an inner wall of said housing adjacent to said contact insert and a shoulder (9) is provided on said insert adjacent to said recess, and including the steps of inserting a plastifiable plastic element (10) into said recess and abutting against said shoulder, and ultrasonically welding said plastic element to both said housing and said contact insert to join said housing and said contact insert.

7. The method of claim 6 wherein said contact is retained in a contact retaining plate (7), and including

the steps of inserting said plate into said housing and connecting said plate to said contact insert.

5 8. The method of claim 7 wherein said contact retaining plate includes a recess (12) adjacent to an inner wall of said housing, and including the steps of inserting said plastic element into said recess in said contact retaining plate, and ultrasonically welding said plastic element to both said contact retaining plate and said housing to join said housing and said contact retaining plate.

10 9. The method of claim 8, wherein said plastic element is a thermoplastic material.

15 10. In an electrical connector comprising a housing (1), a contact insert (2) disposed in said housing, and at least one electrical contact (4) disposed in said contact insert, the improvement comprising said contact insert being formed of a plastic material and being ultrasonically welded to said housing to connect said contact insert to said housing.

20 11. The connector of claim 10, including a contact retaining plate (7), said contact being retained in said contact retaining plate, and said plate being connected to said contact insert.

25 12. The connector of claim 11, wherein said contact retaining plate is ultrasonically welded to said contact insert.

13. The connector of claim 10, wherein said plastic material is a thermoplastic material.

30 14. The connector of claim 13, including a roughened internal surface (5) in said housing against which said contact insert is welded.

35 15. In an electrical connector comprising a housing (1), a contact insert (2) disposed in said housing, and at least one electrical contact (4) disposed in said contact insert, the improvement comprising a recess (8) in an inner wall of said housing adjacent to said contact insert and a shoulder (9) on said insert adjacent to said recess, and a plastic

element (10) inserted into said recess and abutting against said shoulder, said plastic element being ultrasonically welded to said contact element and said housing to join said contact element and said housing.

5 16. The connector of claim 15, wherein said contact is retained in a contact retaining plate (7) disposed in said housing, said contact retaining plate being connected to said housing.

10 17. The connector of claim 16, including a recess (12) in said contact retaining plate adjacent an inner surface of said housing, said plastic element extending into said recess in said contact retaining plate and being disposed against said inner surface, said plastic element being ultrasonically welded to said contact retaining plate and said inner surface of said housing.

15 18. The connector of claim 17 wherein said plastic element is formed of a thermoplastic material.

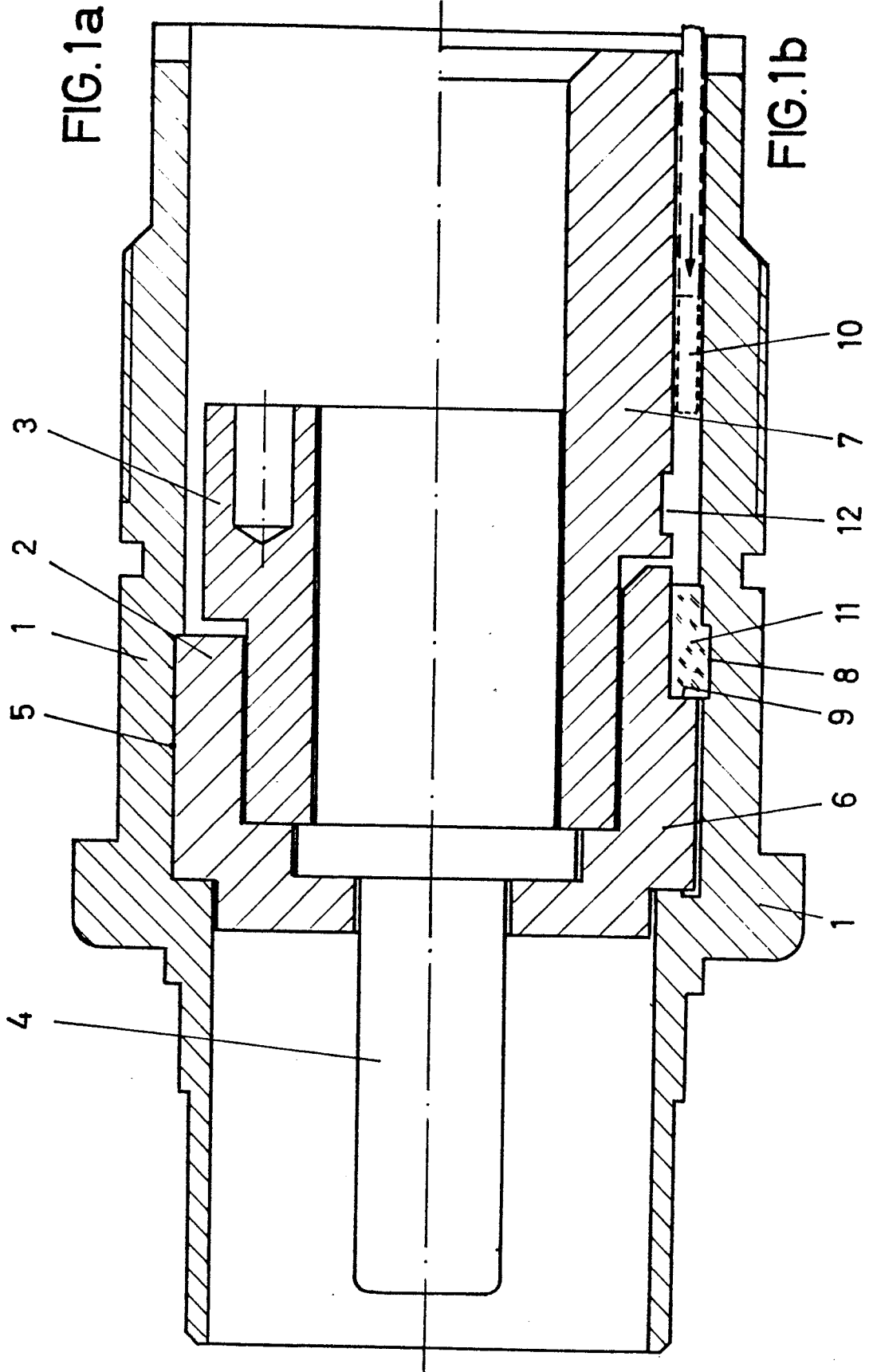
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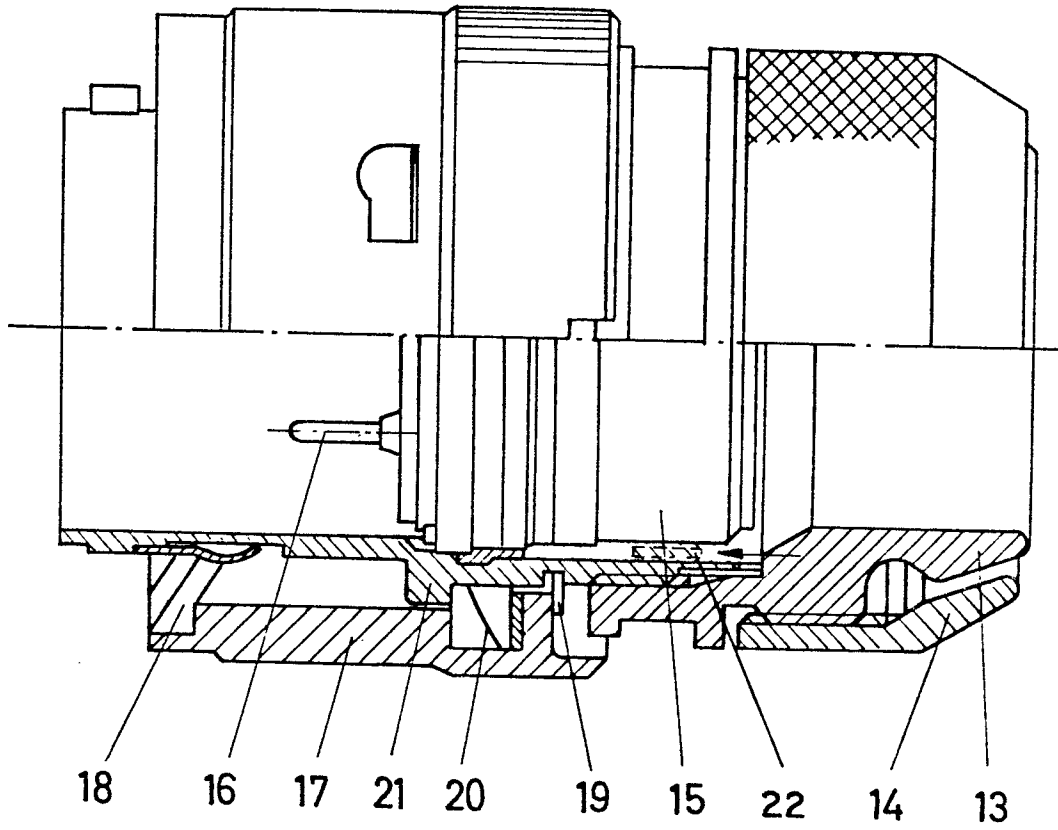


FIG. 2