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(54) Electrical connector.

(57) An electrical connector member includes a cylindrical outer shell (1) which encloses a bonded insulating insert assembly (2) having a plurality of axial passages (7) for electrical contacts. The insert assembly includes a rigid main insert (3), a rigid wafer (4), a rubber grommet (6) and a rubber seal (5). The shell has an internal shoulder (8) which provides a stop for a collar (9) provided on the insert (3). A dish shaped resilient beryllium copper retention ring (11) having a plurality of axially directed slots (12) is placed in an internal annular recess (10) in the shell before the insert assembly is inserted into the shell. When the insert assembly is inserted, the smaller diameter edge (16) of the retention ring slides over the collar (9) until, on full insertion, the edge (16) snaps firmly against the shoulder (14) of the collar. The insert is then firmly supported in the shell by the spring force of the retention ring and requires no encapsulation.

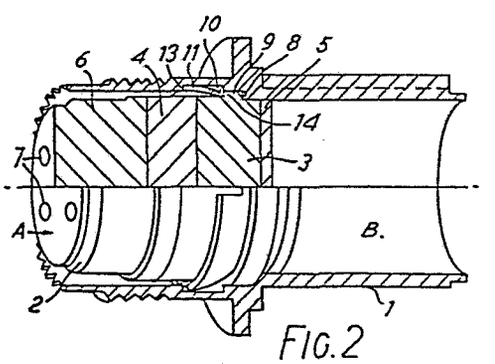

FIG.2

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ELECTRICAL CONNECTOR

This invention is concerned with cylindrical electrical connectors, and more particularly with connectors in which a plurality of electrical contacts are supported in axially directed bores in an insulating insert assembly, the insert assembly being fixed in a substantially cylindrical shell. Such connectors may be required to withstand adverse environmental conditions, and epoxy resins are commonly used to encapsulate the insert into the shell before inserting the electrical contacts. British Patent Specification No.1503478, for example, describes an electrical connector in which a deformable laminate coated with an epoxy resin, is fixed by means of a pressure tool into an annular space between the insert assembly and the shell. Such use of epoxy resins to satisfactorily fix the insert into the shell involves the optimisation of pressure and temperature conditions for insertion and curing of the resin, which is costly in terms of both tooling and process time.

It is an object of the invention to provide an improved electrical connector which has no need for resin encapsulation.

According to the invention there is provided an electrical

connector member including a tubular shell within which there is mounted a cylindrical insert member having a plurality of passages for electrical contacts, said insert having an external shoulder and said shell having an internal shoulder, said connector member further including a resilient element for securing said insert member within said shell by means of resilient forces exerted by said resilient element on said external shoulder and said internal shoulder.

One embodiment of the invention will now be described, by way of example, with reference to the accompanying drawing in which:-

Figure 1 shows a perspective view of an insert assembly, a shell and a retention ring for a connector member according to the invenion,

Figure 2 shows in part section the insert assembly fixed into the shell by means of the retention ring,

Figure 3 shows an alternative retention ring formed from continuous strip.

Referring to Figures 1 and 2, the connector member includes a substantially cylindrical shell 1 which encloses an insulating insert assembly 2. The insert assembly is comprised of a main insert member 3, a wafer member 4, a seal 5 and a grommet member 6. The insert member 3 and the wafer member 4 are of a rigid dielectric plastics material, while the seal 5 and the grommet member 6 are of a resilient material such as silicone rubber. The components of the insert assembly are bonded to form a substantially cylindrical assembly having a plurality of axially directed through holes which are provided to support a plurality of contacts (not shown) which may be inserted after the insert assembly has been fixed into the shell. Internal retention towers (not shown) are provided on the wafer member 4 to prevent axial movement of the contacts, as is decribed, for example, in British Patent No.1503478.

The shell has an internal shoulder 8 which when the insert assembly is inserted in the shell, provides a stop for collar 9

provided on the insert member 3. An internal annular recess 10 is provided in the shell and a retention ring 11 is placed in the recess 10 before inserting the insert assembly into the shell. The retention ring is of a resilient material such as beryllium copper and is substantially dish shaped, having edges of unequal diameters. A plurality of evenly spaced axially directed slots 12 in the retention ring extend from the edge 15 of larger diameter. The retention ring is dimensioned such that it may rest with its edge 15 against the shoulder 13 of the recess 10. The insert assembly is inserted into the shell with an axial pressure, the smaller diameter edge 16 of the retention ring sliding over the collar 9 until, when fully inserted, the edge 16 snaps firmly against the shoulder 14 of the collar 9. The insert is now firmly supported in the shell by the spring force of the retention ring acting against, at one edge, the shoulder 13 of the shell and, at the other edge, the shoulder 14 of the insert. The construction is such that this spring force is sufficient for the connector member to resist high pressure forces under adverse environments, the construction requiring no encapsulation and no use of resins or adhesives beyond those used in the initial bonding of the components of the insert assembly.

Contacts are inserted into the bores 7 after fixing the insert assembly into the shell in known manner. The assembly as shown is suitable for use with pin type male contacts which would be inserted into the insert assembly to be retained by means of retention towers in known manner.

A complete connector would have a second mating connector member having female contacts. The invention can equally well be used on connector members having female contacts such that complete connectors can be assembled without the need for resins or encapsulation.

While Figure 1 shows the retention ring in the form of a continuous ring, which may be formed in any convenient, known manner, the retention ring may be formed from flat strip

material as shown in Figure 3. A strip of resilient material 17, typically 0.2mm thick beryllium copper, is first formed with suitably spaced slots 18. A slight longitudinal fold is applied, shown in the view along the line AA. The strip is then formed into a ring, the fold causing the strip to be substantially dish shaped, with different edge diameters. It will be appreciated that this form of retention ring may be produced for substantially lower cost than a solid continuous ring.

Although, as described hereinbefore, there is provided a construction of connector member which provides protection against the majority of adverse environments, it will be appreciated that further environmental protection may be readily incorporated, if required, by the application of further sealants after the assembly of the component parts of the assembly, by methods well known to those skilled in the art.

It will be appreciated that the above description represents only one embodiment of the invention, and other embodiments will be apparent to those skilled in the art.

CLAIMS

1. An electrical connector member including a tubular shell (1) within which there is mounted a cylindrical insert member (3) having a plurality of passages for electrical contacts, said insert having an external shoulder (14) and said shell having an internal shoulder (13), characterised in that said connector member further includes a resilient element (11) for securing said insert member within said shell by means of resilient forces exerted by said resilient element on said external shoulder and said internal shoulder.

2. An electrical connector member according to Claim 1 in which said resilient element is of a beryllium copper material.

3. An electrical connector member acording to Claims 1 or 2 in which said shell is formed with an internal annular recess (10) and said resilient element is substantially ring shaped and rests in said recess, said internal shoulder being provided by a side wall of said recess.

4. An electrical connector member according to any preceding claim in which said insert is provided with a collar (9) positioned such that one side wall of said collar provides a stop which defines the full insertion of said insert and the other side of said collar (14) provides said external shoulder on said insert.

5. A connector member according to claims 3 or 4 in which said resilient element is substantially dish shaped, having edges of different diameters, said element having a plurality of axially directed slots (12) extending from the edge of larger diameter.

6. A connector member according to Claim 5 in which said resilient element is a continuous ring member.

7. A connector member according to Claim 5 in which said resilient member is formed from a slotted strip of material (17), said slotted strip being formed into a substantially dish shaped ring.

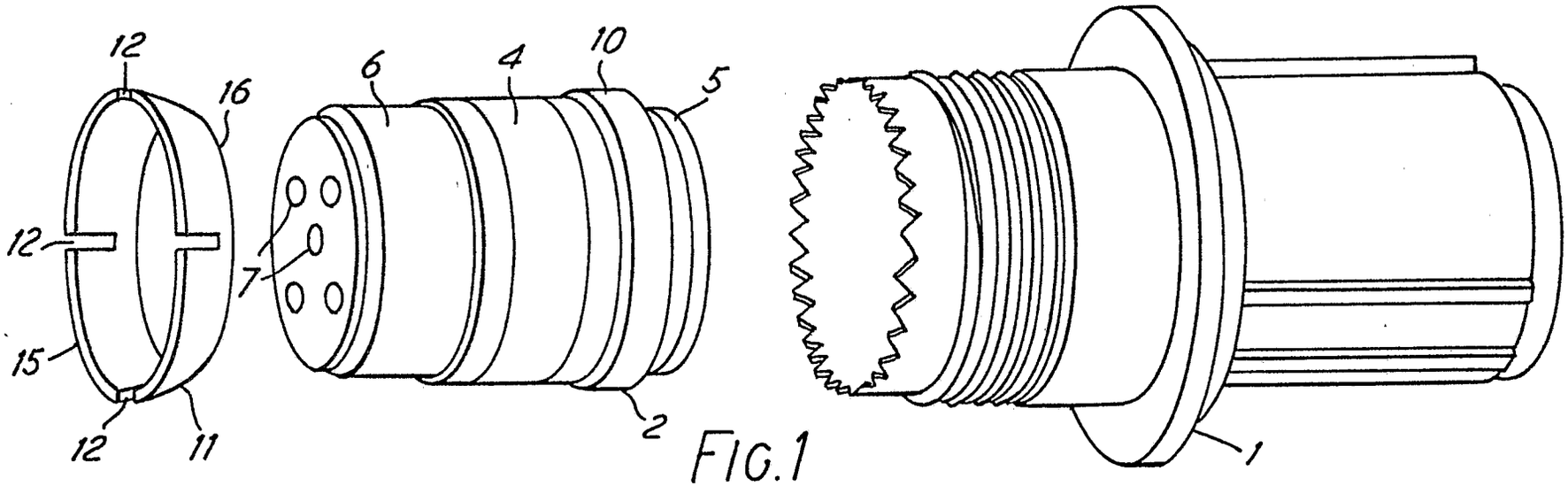

FIG.1

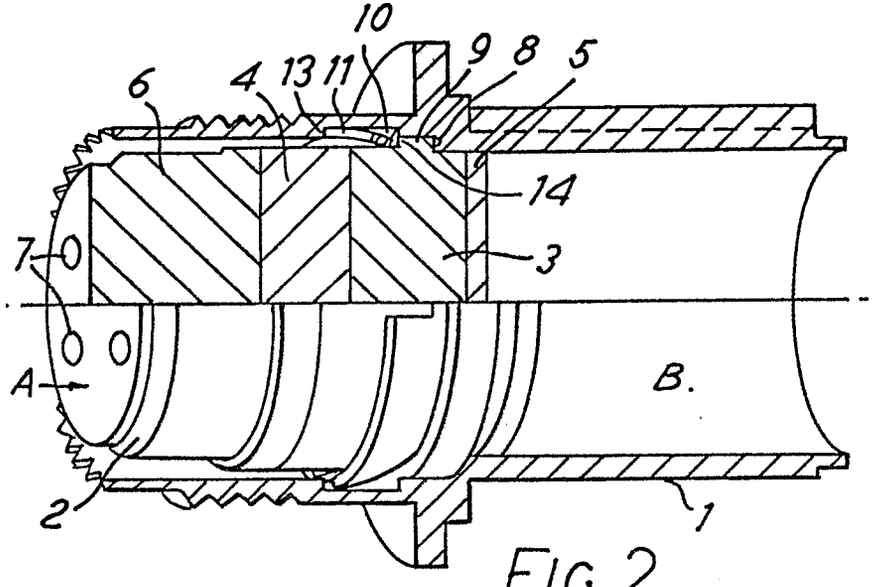

FIG.2

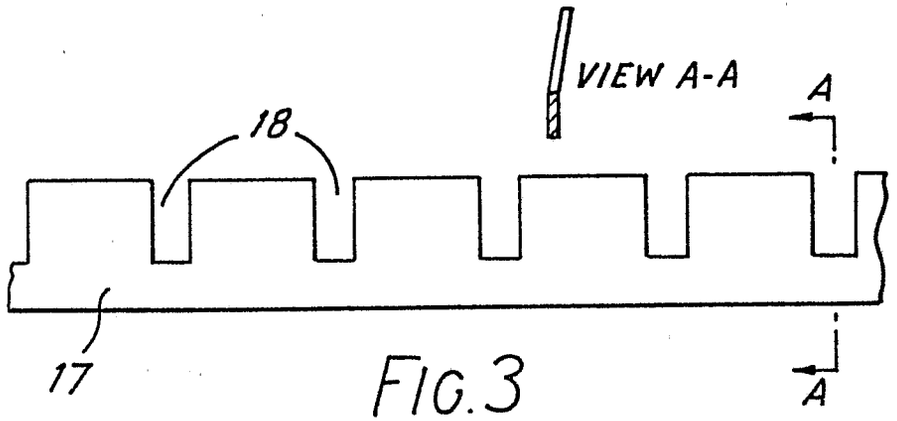

FIG.3

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