United States Patent

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[54] **ELECTRICAL CONNECTORS**
4 Claims, 4 Drawing Figs.

[52] **U.S. Cl.** ..... **339/59 M,** 339/217 S
[51] **Int. Cl.** **H01r 13/40**
[50] **Field of Search** 339/59–63, 217

[56] **References Cited**
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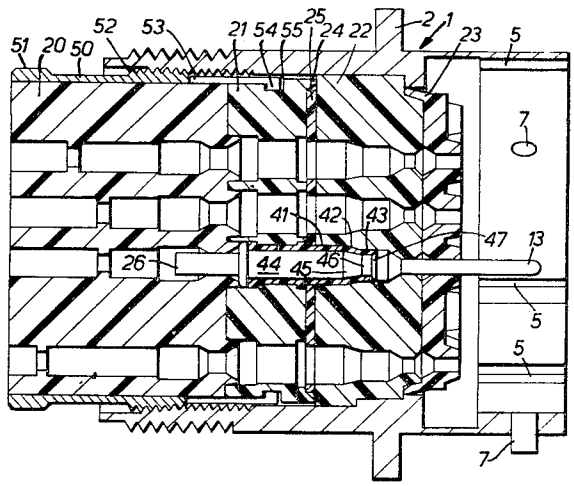
ABSTRACT: The specification describes a multiway electrical connector in which the individual contacts are retained in individual collet members which in turn are retained in a first retainer member and are compressed on to the contacts by a second retainer member.



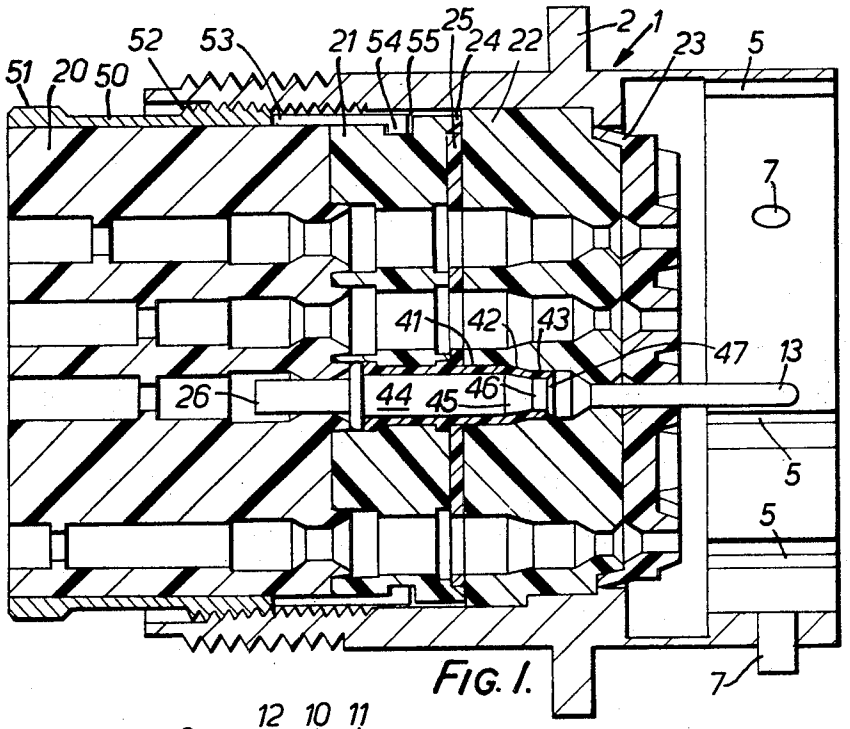


FIG. 1.

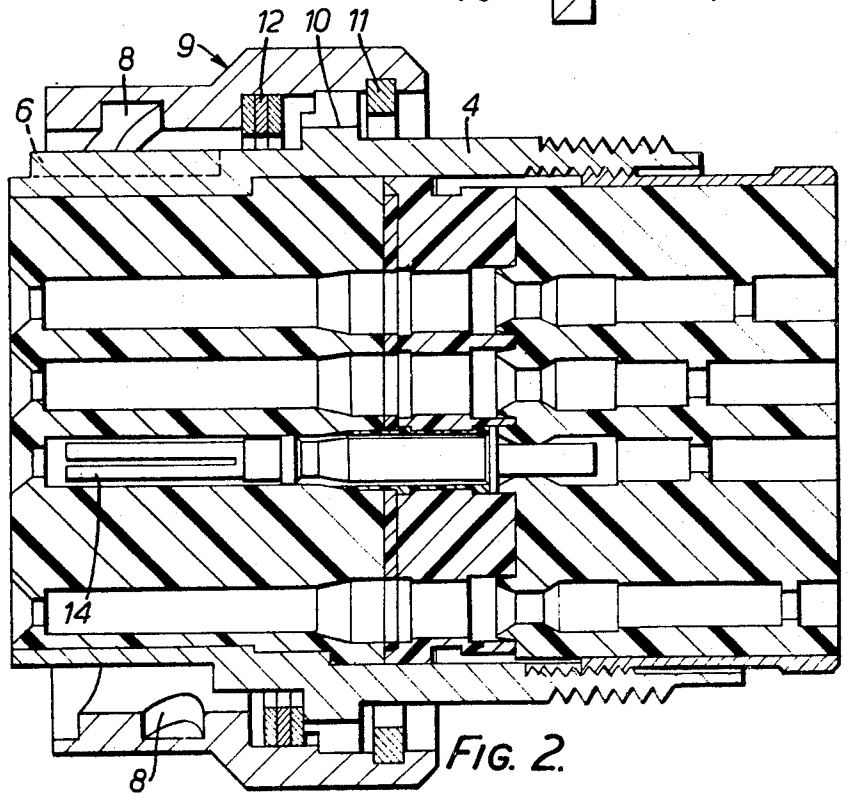


FIG. 2.

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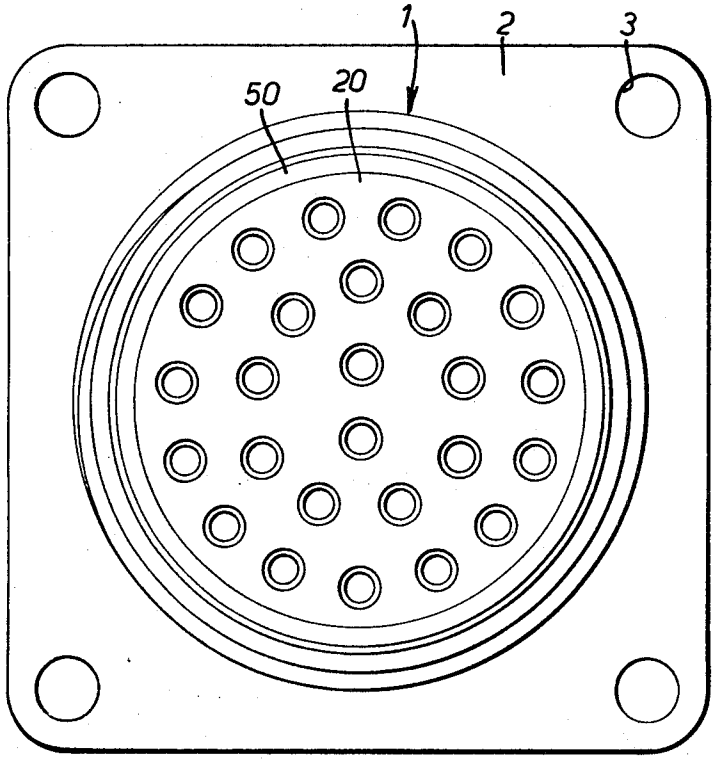

FIG. 3.

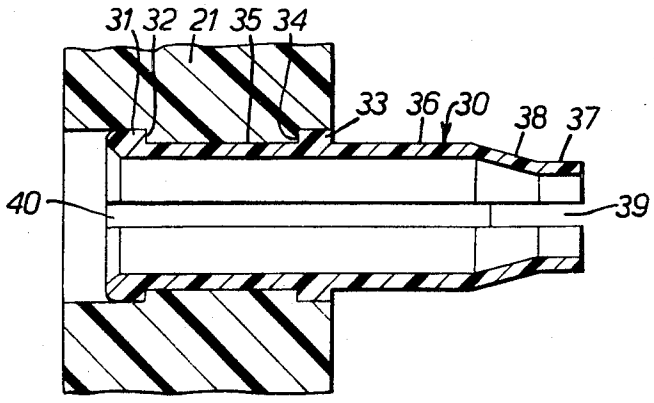

FIG. 4.

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ELECTRICAL CONNECTORS

This invention relates to multiway electrical connectors of the kind comprising a plug member and a socket member each having a plurality of contacts, either plug or socket, retained in a body of some kind. In the commonest construction, the body is in the form of a shell, usually of metal, and the individual contacts are retained in an insert in the shell. Various means have been proposed for retaining the contacts in the inserts ranging from simply making the insert resilient and gripping the contacts in undersized bores in the insert to complex releasable metal collets cooperating with a number of separate inserts. A recent proposal described in U.S. Pat. No. 3,477,061 to C. D. Stephenson issued Nov. 4, 1969 has been to provide a contact retention insert which has a bore for each contact which bore passes through a respective projection or nose on one face of the insert. The body contains a second insert which also has bores for the contacts, the bores having enlarged mouths partially to receive the noses. The method of operation is that the two inserts are movable axially relative to one another within the body. The contacts are passed through the bores in the first insert so that they project beyond the noses and the projecting portions are passed into the bores in the second insert. The two inserts are then moved towards each other so as to enter the noses into the bores in the second insert. The mouths of the bores and the noses are so shaped that as the noses are pushed into the mouths the noses are compressed onto the contacts in the nature of collets, and grip the contacts firmly. The contacts may be released by moving the two inserts apart again. This arrangement has a number of advantages over what had been done before but nevertheless has certain disadvantages. In most cases the dimensions of the individual noses will be extremely small. This means that the manufacture of the insert, which may need to have upwards of 60 noses, to the necessary accuracy will be extremely difficult and expensive and in particular it will be difficult to produce the necessary accuracy of alignment between all of the many noses and the mouths of the bores into which they are to be pushed. It also means that the noses will be fragile and so easily damaged. Damage to only one of the many noses may mean that the whole insert has to be scrapped.

It is accordingly an object of the present invention to provide an electrical connector which reduces or avoids such disadvantages.

According to the present invention, a multiway electrical connector member comprises a first retainer element having a number of bores each containing a collet element affording a projecting nose, an electrical contact passing through the bore of each collet element, a second retainer having bores to receive the contacts and the noses, and means for moving the retainer elements towards one another to cause the noses to be compressed on to the contacts by engagement with the bores in the second retainer element.

Thus, by contrast with the previously proposed arrangement, each nose is afforded by an individual collet element retained in the first retainer element. This facilitates the manufacturing operation since a large number of accurately dimensioned noses do not have to be formed on a single component. Also, if a nose becomes damaged proof to or during assembly of the connector member or during initial connection or later alteration in the connection of the contacts to a cable, the collet member affording that nose can be replaced without replacement of the first retainer element or the remaining collet members. Preferably the collet members have a small degree of float in the first retainer element in directions perpendicular to the axes of the bores so that accuracy of alignment with the bores in the second retainer element is less acute.

Preferably either the collet members or the first retainer element or both are made of resilient material and the collet members are a snap fit in the bores in the retainer member. Thus each collet member may have a pair of circumferential flanges which are larger than the minimum diameter portion of the bore in the first retainer member in which it is retained, at least one of the flanges being capable of being forced through said minimum diameter portion.

The invention may be carried into practice in various ways, but one electrical connector embodying the invention will now be described by way of example with reference to the accompanying drawings, in which:

FIG. 1 is a longitudinal section through the member of the connector which carries pin contacts;

FIG. 2 is a similar longitudinal section through the member of the connector which carries socket contacts;

FIG. 3 is an end elevation of the connector member shown with FIG. 1 viewed from the left of FIG. 1; and

FIG. 4 is a fragmentary view to an enlarged scale showing the mounting of one of the collet members of the connector shown in FIGS. 1 and 3.

The connector member shown in FIG. 1 comprises a metal shell 1 having a retaining flange 2 with fixing holes 3. The right hand end of the shell 1 is adapted to receive the left hand end of the shell 4 of the connector part shown in FIG. 2. The bore of the shell 1 contains keyways 5 to receive mating keys 6 formed on the outside of the shell 4 and also carries pins 7 which are received in grooves 8 in a coupling nut 9 which is held captive on the shell 4 by means of a flange 10 on the shell, a circlip 11 and wavy washer springs 12. The shell 1 contains dielectric inserts in which are supported 26 pin contacts 13 and the shell 4 likewise contains dielectric inserts which support 26 socket contacts 14. For the sake of clarity only one pin contact and only one socket contact are shown in FIGS. 1 and 2, but it will be understood that each of the 26 bores will contain a contact. As so far described, the connector is of conventional construction and it will be understood that the two members of the connector shown in FIGS. 1 and 2 are brought together so that the pin portions of the contacts 13 enter the socket portions of the contacts 14 and the two members of the connector are retained together by the coupling nut 9.

Retained within the sleeve 1 is a grommet 20 of relatively soft dielectric material, a collet-retaining insert 21 of relatively hard dielectric material, a front insert 22 of the same material as the collet-retaining insert, and an interfacial seal insert 23 of soft dielectric material. The collet-retaining insert 21 has a recess 24 on one end face to receive a sealing gasket 25 which is squeezed between the insert 21 and the insert 22. It will be seen that the grommet 20, the inserts 21, 22 and 23 and the gasket 25 have aligned bores of varying diameter to receive the contact pins 13. The rear end of each contact pin 13 is formed as a solder well 26 to which one core of a multicore cable is connected the cable extending to the left in FIG. 1. Means will be provided for encapsulating the part of the cable immediately to the left of the connector part shown in FIG. 1 or each individual core will be sleeved in accordance with conventional practice.

In each bore of the collet-retaining insert 21 there is a collet 30 shown to a larger scale in FIG. 4. The collet which is of resilient material has a rear flange 31 which engages against a shoulder 32 in the collet-retaining insert 21, a flange 33 which engages against a shoulder 34 facing in the opposite direction to the shoulder 32, a first cylindrical portion 35 between the flanges 31 and 33, a second cylindrical portion 36 forward of the flange 33 and a forward cylindrical portion 37 which is of smaller diameter than the two portions 35 and 36 and which is connected to the portion 36 by a tapering portion 38. Diametrically opposite slits 39 are formed in the forward cylindrical portion 37 and the tapering portion 38, the slits being formed as continuations of grooves 40 formed in the wall of the bore through the collet. As can be seen in FIG. 1, each bore in the front insert 22 has a rear cylindrical portion 41, a tapering portion 42 and a front cylindrical portion 43 which correspond to and can receive respectively the portions 36, 38 and 37 of the collet. Likewise, the pin contact 13 has a cylindrical portion 44 received in the cylindrical bore of the collet, a tapering portion 45 corresponding to the tapering portion 38 of the collet and a cylindrical portion 46 corresponding to the forward cylindrical portion 37 of the collet. At the forward

end of the cylindrical portion **46** on the pin contact there is an inclined shoulder **47**.

The collet-retaining insert **21** and the grommet **20** are contained within an insert control screw **50** which is in the form of a sleeve and has a knurled flange **51** at the rear end, a central external screw thread **52** which mates with an internal screw thread on the sleeve **1**, and a series of forwardly projecting fingers **53** having inturned lugs **54** at their forward ends, the lugs engaging in a circumferential groove **55** in the collet-retaining insert **21**.

The mode of assembly is as follows. The front insert **22** and the interfacial seal member **23** are secured in the shell **1**. The cores of the cable are passed through the respective bores in the grommet **20** and a contact pin **13** is soldered to each core. A collet **30** is snapped into place in each of the bores of the collet-retaining insert **21** and the gasket **25** is passed over the collets into the recess **24**. The contacts **13** are then passed through the collets until the reduced diameter portions **37** of the collets lie in the waists formed by the portions **45, 46, 47** of the contacts. The contacts with the collets surrounding them are then entered into the bores in the front insert **22** and the interfacial seal member **23**. The insert control screw **51** is rotated manually with the assistance of the knurled flange **51** and the lugs **54** press the collet-retaining insert **21** and the grommet **20** forwardly until the gasket **25** is in contact with the front insert **22**. As the leading ends of the collets move into the bores in the front inserts the tapering portions **38** on the collects will engage the tapering portions **42** of the bores of the front insert and the collets will therefore be squeezed tightly on to the waisted regions **45, 46, 47** of the contacts **13** thus retaining the contacts firmly in position.

If, for any reason, it should be necessary to replace a contact pin, the insert control screw **50** is rotated in the opposite direction to draw the collet-retaining insert **21** to the left in FIG. **1** and thus to withdraw the pin contacts from the front insert **22**. Once the collets are clear of the front insert they are free to expand and accordingly any required contact can be withdrawn to the left through the respective collet, the inclined shoulder **47** on the contact camming open the forward end of the collet to allow the contact to pass through.

Although this is not shown in the drawing, there is a very small clearance amounting to perhaps two to four thousandths of an inch between each contact and the bore in the collet-retaining insert in which it is mounted. This clearance provides a limited degree of float for each collet so that the contacts may adjust themselves into accurate alignment with the bores in the front insert **22**.

The connector member shown in FIG. **2** is of very similar construction to that shown in FIG. **1** and will not be described in detail: suffice it to say that the interfacial seal **23** is omitted and instead of the pin contacts **13** socket contacts **14** are provided.

What I claim as my invention and desire to secure by Letters Patent is:

1. A multiway electrical connector member comprising a first retainer element having a number of bores, a collet element mounted in each said bore, each collet element including a nose projecting from said first retainer element, an electrical contact passing through the bore of each said collet element, a second retainer element having bores to receive said contacts and said noses, means for moving said first and second retainer elements towards one another for compressing each of said noses on to a respective contact by engagement with the bores in said second retainer element, and the diameter of each bore in said first retainer element is greater than the diameter of each collet member to provide a clearance therebetween whereby said collet members float in said first retainer element in directions perpendicular to the axes of the bores.

2. A connector member according to claim **1** wherein said collet members are a snap fit in the bores of said first retainer element.

3. A connector member according to claim **1** wherein each collet member has a pair of circumferential flanges which are larger than a minimum diameter portion of the bore in the first retainer member, and said collet is retained by engagement of each of said flanges with a respective end of said minimum diameter portion.

4. A connector member according to claim **1** wherein each contact has a waist which is embraced by one of said noses.

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