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2,949,641

ELECTRICAL CONNECTOR MANUFACTURE

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FIG. 2

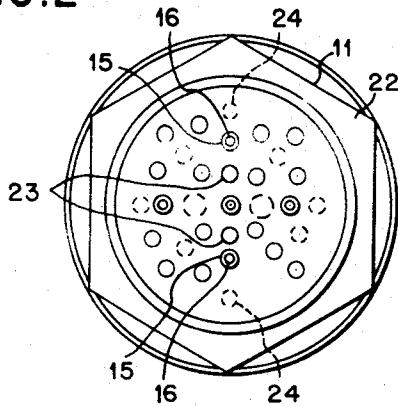


FIG. 1

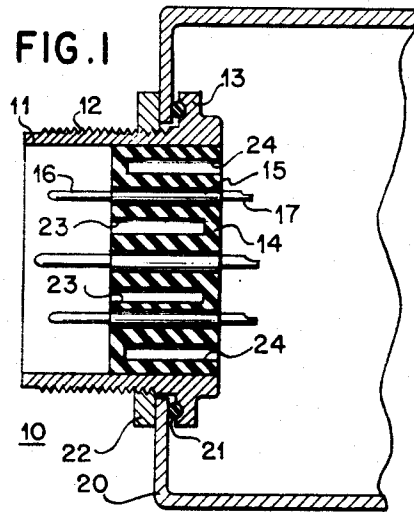


FIG. 3

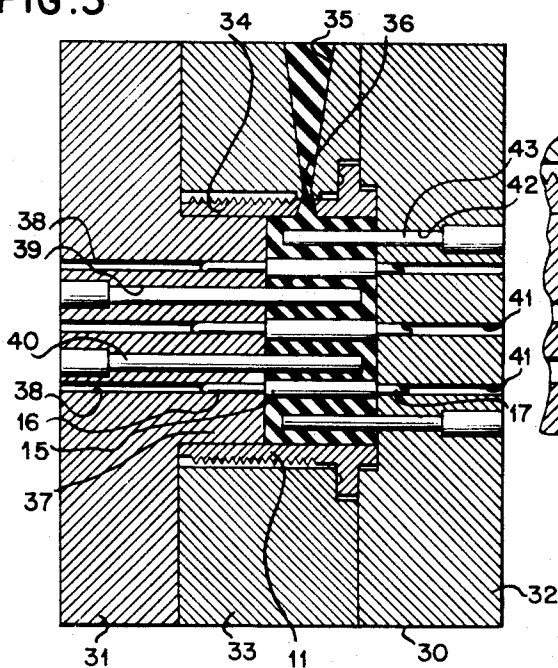
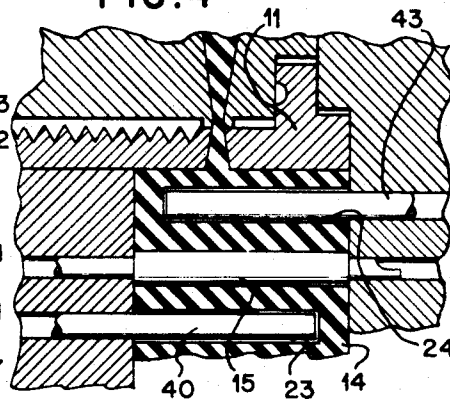


FIG. 4



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## ELECTRICAL CONNECTOR MANUFACTURE

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2 Claims. (Cl. 18—59)

This invention relates to electrical connectors of the axially mating type and in particular provides a novel connector body and method for constructing connector bodies having a rigid shell with a dielectric insert molded therein.

There are obvious advantages in producing electrical connectors of the axially mating type having dielectric inserts molded into rigid shells. Except for very small sizes, however, prior attempts to produce such connectors have been failures because no satisfactory dielectric material has been developed which does not exhibit considerable shrinkage, e.g., from 2% to 4% in volume, during the molding cycle. Such shrinkage sets up enormous stresses which destroy the bond of the dielectric material to the shell or a contact member, if contact members are molded in, or both.

It has now been found connector bodies having molded-in dielectric inserts can satisfactorily be formed by providing one or more metal pins or the like which project into the molding space within the shell and which have highly polished surfaces or have their surfaces treated with a parting agent such that as shrinkage occurs during the molding cycle, such shrinkage can take place about the steel pin. It must be noted that, since the shrinkage is volumetric, external dimensions are maintained and shrinkage about the pin or pins actually results in shrinkage away from each pin to which the molding material cannot adhere. An increase in internal dimensions of the insert thus actually takes place.

For a more complete understanding of the principles of this invention, reference is made to the appended drawings in which:

Figure 1 is a cross-sectional view of a connector receptacle formed in accordance with this invention;

Figure 2 is an end view of the receptacle shown in Figure 1;

Figure 3 is a cross-sectional view of a mold illustrating a typical set up in constructing connector bodies in accordance with this invention; and

Figure 4 is an enlarged fragmentary cross-sectional view similar to that of Figure 3 illustrating shrinkage of the dielectric insert which has occurred at the end of the molding cycle.

In the drawings the reference numeral 10 represents a connector receptacle constructed in accordance with this invention, having a cylindrical, open-ended aluminum shell 11, externally threaded at its mating end as indicated by the reference numeral 12, and provided with an integral, radially-extending flange 13 at its non-mating end. A dielectric insert 14 is molded transversely within shell 11 adjacent the non-mating end of shell 11. A series of bar contact members 15 are imbedded and molded in insert 14 extending parallel to each other and axially of shell 11. At threaded end 12 of shell 11, contacts 15 project beyond dielectric insert 14 to form mating pins 16 for axially engaging the socket contacts of a corresponding connector plug. At flanged end 13 of shell 11

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contacts 15 extend beyond dielectric insert 14 terminating in solder pots 17 for conventional connection to external electric leads.

Receptacle 10 is mounted in an aperture in a suitable junction box 20 with threaded end 12 extending outwardly of box 20 to receive the coupling nut of a corresponding plug. The inside face of flange 13 abuts a resilient O ring 21 and holds ring 21 against the inside wall of box 20 to provide an airtight, waterproof seal between shell 11 and box 20. A threaded nut 22 received on threads 12 is tightened down against the outer face of box 20 drawing flange 13 against the inside wall of box 20 to compress O ring 21 between them.

It will be observed that resilient dielectric insert 14 is provided with a series of bores 23 extending inwardly of the mating end of insert 14 and bores 24 extending inwardly of the non-mating end of insert 14. Bores 23 and 24 are formed during the molding operation as is more fully explained below with reference specifically to Figures 3 and 4.

Referring particularly to Figure 3, there is shown a mold 30 having a pair of confronting mold halves 31 and 32 separated by a plate 33. Plate 33 is provided with a central aperture 34 which receives aluminum shell 11 used in constructing connector 10. Plate 33 is also provided with a sprue channel 35 through which molding composition can be introduced into the center of shell 11. Suitably shell 11 is provided with a small opening 36 which registers with the gate end of sprue channel 35 to permit material to flow from channel 35 into shell 11.

Mold half 31 has a boss 37 which projects into the mating end of shell 11 defining the mating face of the insert 14 to be molded. Boss 37 is provided with a series of bores 38 which are positioned parallel to each other and extend axially of shell 11. Bores 38 receive the mating pins 16 of contacts 15 and hold contacts 15 securely in place in the space within shell 11 which is to be filled with molding composition to form insert 14. Boss 37 is also provided with a series of parallel bores 39 which receive steel pins 40 which project into the space to be filled with molding composition but do not extend therethrough. Steel pins 40 are provided with highly polished surfaces which are non-adhering to the molding composition to be employed. Alternatively, pins 40 could have been provided with a coating of a suitable parting compound. Although pins 40 are shown as cylindrical they of course can assume other shapes not inconsistent with the non-adhering surface requirement.

Mold half 32 is similarly provided with parallel bores 41 which register with bores 38 and receive solder pots 17 of contacts 15, holding contacts 15 securely in place. Mold half 32 is also provided with bores 42 which are out of register with bores 39 and which receive highly polished steel pins 43 which project into the space within shell 11 which is to be filled with molding composition to form insert 14 but do not extend therethrough. The same qualifications with respect to non-adhering surfaces and shape applicable to pins 40 also apply to pins 43.

In operation mold 30 is assembled as shown in Figure 3 with confronting mold halves 31 and 32 held together retaining between them plate 33 in which a suitable shell 11 has been threaded. Contacts 15 are held in position by bores 38 and 41 and steel pins 40 and 43 are held in position by bores 39 and 42.

Dielectric molding compositions such as polychloroprene rubber is then introduced into the molding space through sprue channel 35 and aperture 36 to fill completely the space between mold halves 31 and 30 enclosed by shell 11. Heat and pressure are applied in the normal manner to cure the molding material by heating mold 30 and by holding pressure on the material in chan-

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nel 35. Suitably a conventional hydraulic press is used to hold the mold closed and is supplied with heated platens which provide the necessary heat for mold 30.

After the molding cycle is completed, referring specifically to Figure 4, it will be observed that the dielectric insert 14 thus molded bonds to shell 11 and contacts 15 but shrinks away from pins 40 and 43 to form bores 23 and 24 in dielectric insert 14.

Thereafter, mold 30 is broken open and the finished receptacle 10 removed from plate 33.

While the molding operation is illustrated with reference to a receptacle having pin contact members, it will be evident that the same molding operation is equally adaptable to form plugs and receptacles having socket contact members. It will be also evident that the general method of molding a connector body illustrated can be used to form a connector body without molded-in contacts and in which suitable contacts are later inserted in the insert. By extending pins 40 and 43 entirely through the body to be molded, suitable bores for receiving contact members can thus be formed.

I claim:

1. A method for forming connector bodies which comprises enclosing a rigid, open-ended connector shell in a mold having a pin projecting therefrom into the space within said shell, introducing dielectric molding composition into said mold to fill the space within said shell and about said pin, curing the said molding composition in said mold under suitable conditions of heat and pressure to form a solid dielectric insert within said shell, the surface of said pin being non-adherent to said molding composition whereby under said curing conditions the inherent volumetric shrinkage of said molding composition is predetermined to take place about said pin and said molding composition bonds to said shell.

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2. A method for forming connector bodies which comprises enclosing a rigid, open-ended connector shell in a mold having a pin projecting therefrom into the space within said shell and having a contact member supported in said mold within the space enclosed by said shell, introducing dielectric molding composition into said mold to fill the space within said shell and about said pin and contact member, curing the said molding composition in said mold under suitable conditions of heat and pressure to form a solid dielectric insert within said shell, the surface of said pin being non-adherent to said molding composition whereby under said curing conditions the inherent volumetric shrinkage of said molding composition is predetermined to take place about said pin and said molding composition bonds to said shell and to said contact member.

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