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N. F. DAMON ETAL

3,145,069

ELECTRICAL CONNECTOR

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Fig. 1.

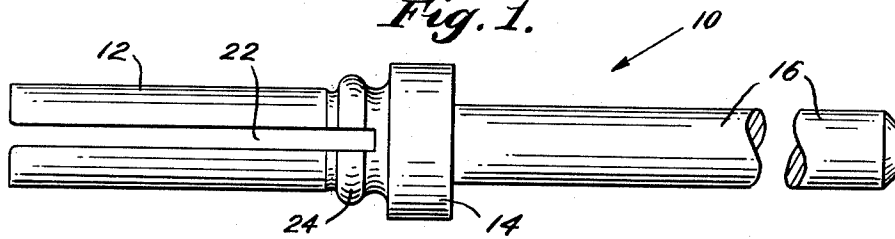


Fig. 2.

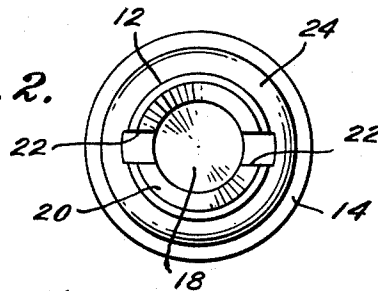


Fig. 3.

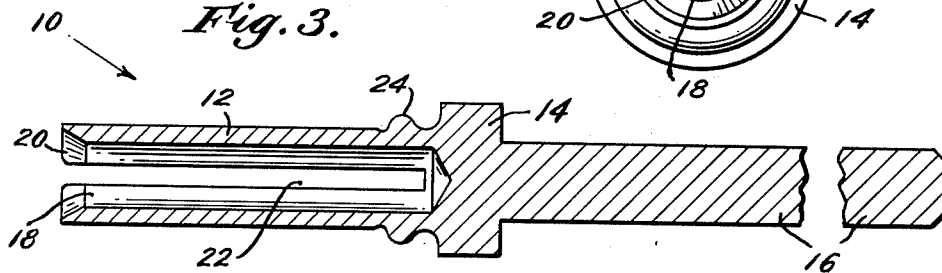
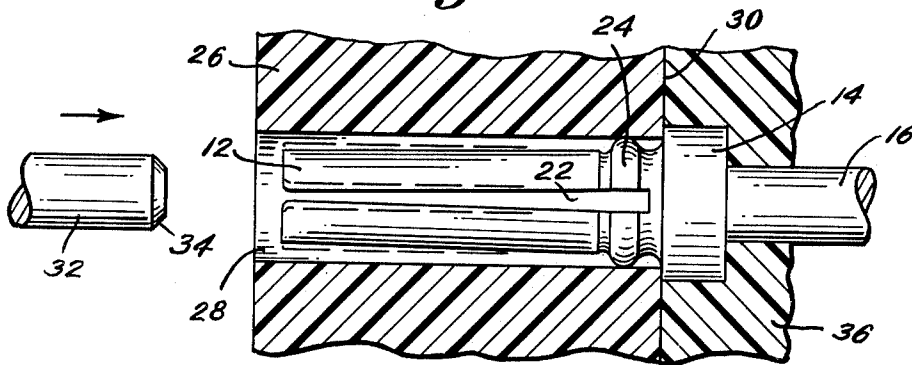


Fig. 4.



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ELECTRICAL CONNECTOR

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1 Claim. (Cl. 339-218)

The present invention relates generally to electrical apparatus and is more particularly concerned with the provision of a novel and improved electrical connector of the type embodying a female socket for receiving a male prong.

It is well known in the electrical art to provide an electrical socket connector having a hollow elongated shank portion for receiving a male prong slidably therein to establish an electrical contact. Since it is desirable that the male prong be resiliently gripped by the socket connector when it is slid therein, the usual practice has been to slot the connector so as to impart resilience thereto and then crimp the connector slightly inwardly whereupon the male prong will be resiliently gripped so as to insure proper electrical contact and at the same time frictionally maintain the male prong in its contact position. Certain disadvantages exist in this type of conventional construction, however. First of all, the crimping step, being a separate operation, raises the cost of the socket connector. Secondly, engagement of the male prong in the socket connector for extended periods of time may sometimes result in the connector losing its resilience, whereupon a good contact is not insured, and furthermore, the likelihood of the male prong becoming inadvertently detached is heightened.

In addition to the above, it will be understood that connectors of the type herein described normally have a radially extending flange which abuts against one surface of a plastic housing, with the shank portion of the connector extending through a bore specially provided in the housing for this purpose. The normal procedure is to imbed the flange and the rearwardly extending solder tail of the connector, as well as the electrical leads connected thereto, in an epoxy resin in order to hold the connector against longitudinal movement when a male prong is inserted therein. During this operation, it is important that no epoxy resin seep into the bore of the plastic housing since such resin would then be able to infiltrate through the slots of the shank portion of the connector to the inner surface thereof, thereby lessening or completely destroying the electrical contact capacity of the connector. It is therefore important that when the rear portion of the connector is being imbedded in the epoxy resin, as above described, the flange of the connector be in tight engagement with the wall of the plastic housing. Maintaining the connector properly positioned in this manner has proven to be a problem in the prior art connectors of this type.

Accordingly, it is a primary object of our invention to provide an electrical socket connector which does not require a separate crimping operation in order to condition the shank portion of the connector so as to resiliently receive a male prong, but rather the connector is automatically crimped when inserted in the bore of its mounting housing.

A further object of our invention is the provision of a socket connector of the character described which, when positioned in the bore of its mounting housing, will be frictionally maintained in position with the flange of the connector in tight abutment against the surface of the housing, so that when the rear portion of the connector is imbedded in an epoxy resin, no resin will seep into the bore so as to destroy the electrical capacity of the contact.

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Another object of our invention is the provision of an electrical socket connector of the character described which is simple and economical to manufacture, which is easily installed, and which makes good electrical contact with a male prong slidably positioned in said connector, said good electrical contact being maintained for extended periods of time.

Another object of our invention is the provision of a socket connector of the character described which, when positioned in the bore of its mounting housing, will be frictionally maintained therein with a sufficient grip so as to enable a male prong to be inserted in the connector without moving the latter longitudinally in the housing bore, even where the connector is not otherwise held in position, as by imbedding the rear portion thereof in an epoxy resin.

Other objects, features and advantages of our invention will become apparent as the description thereof proceeds when considered in connection with the accompanying illustrative drawings.

In the drawings which illustrate the best mode presently contemplated by us for carrying out our invention:

FIG. 1 is a side elevational view of a connector constructed in accordance with our invention;

FIG. 2 is a left-hand end view of the connector shown in FIG. 1, on an enlarged scale;

FIG. 3 is a longitudinal section of the connector shown in FIG. 1; and

FIG. 4 is a fragmentary elevational view, partly in section, showing our connector mounted for use.

Referring now to the drawings, an electrical socket connector embodying our invention is shown generally at 10, said connector preferably being of integral, one-piece construction and comprising an elongated shank portion 12, a marginal flange 14, and a rearwardly extending solder tail 16. It will be understood that the connector 10 may be constructed of any material having the required resilience and electrical properties, such as Phosphor bronze or beryllium copper, although we prefer to utilize the former since it is easier to machine. As will be seen most clearly in FIGS. 2 and 3, the shank portion 12 is an elongated cylindrical tube, open at its outer extremity as at 18. For reasons hereinafter to become apparent, the inner edges of shank portion 12 are beveled as at 20.

In order to impart a desired degree of resilience to shank portion 12, diametrically opposed elongated slots 22 are provided, said slots extending longitudinally for the length of said shank portion, but terminating short of flange 14. A peripheral, circumferential rib 24 is provided on the shank portion 12, it being noted that said rib is located adjacent to the flange 14 but spaced therefrom. It is important to note that the slots 22 extend beyond said rib, and it is of further importance to note that the outer diameter of rib 24 is somewhat less than the outer diameter of flange 14.

In operation and use, the connector 10 is mounted in an electrically nonconductive plastic housing 26, said housing having a bore 28 extending therethrough which receives the shank portion 12 of connector 10. More specifically, it is important to note that the diameter of bore 28 is just slightly less than the outer diameter of peripheral rib 24, but is substantially less than the outer diameter of flange 14. Thus, when shank portion 12 is inserted into bore 28, the rib 24 will wedge therein so as to frictionally maintain the connector 10 properly positioned in the bore with flange 14 in tight abutment with the edge 30 of housing 26. At the same time, the frictional engagement of rib 24 within bore 28 will result in a radially inward thrust being imparted to shank portion 12, which thrust, in cooperation with the elongated slots

22, will cause the shank portion 12 to be crimped radially inwardly from the dotted-line position shown in FIG. 4 to the full-line position shown therein. As a result, when a male prong 32 is slid into connector 10, it will be resiliently gripped therein so as to insure good electrical contact and at the same time frictionally maintain the prong in its contact position. The leading end of male prong 32 will normally be beveled, as at 34, which bevel cooperates with the internal bevel 20 in shank portion 12 so as to facilitate entrance of the prong into the socket connector. By the same token, it will be noted that rib 24 is gently rounded so as to facilitate full insertion of shank portion 12 in bore 28 until the position illustrated in FIG. 4 is obtained.

It is important to note that rib 24 not only functions as a means for automatically crimping shank portion 12 when connector 10 is mounted in the housing 26, but said rib also functions to frictionally maintain the connector properly positioned with flange 14 in abutment with surface 30. This is important since the usual procedure is to imbed flange 14 and solder tail 16 in an epoxy resin 36, and it is important that this resin be prevented from seeping into bore 28, since if this were allowed to happen, some of said resin might infiltrate through slots 22 to the inner surface of shank portion 12 so as to decrease or destroy its electrical contact capacity. It is also for this reason that slots 22 must terminate short of flange 14, since if said slots extended into the flange, this would provide a path for the epoxy resin 36 to seep into the working part of the connector 10. Actually, it is not essential that slots 22 terminate in spaced relation from the flange 14, as illustrated, but since our connector 10 is preferably a screw-machine part and must be made with normal machine tolerances, it follows that if the slots 22 were shown as terminating exactly at the inner edge of flange 14, the normal tolerances would in some cases result in the slots extending slightly into the flange. For this reason, we prefer to terminate the slots 22 in spaced relation from the inner edge of flange 14. On the other hand, it is absolutely essential that the slots 22 extend at least through the peripheral rib 24, since if they did not, then the desired automatic crimping of shank portion 12 would not be effected when the connector 10 is inserted in bore 28.

It will be understood that housing 26 is preferably constructed of a relatively hard thermosetting plastic, since if the housing were of a relatively resilient plastic, it might give sufficiently so as to relieve the pressure on rib 24, which pressure is essential to the achievement of the automatic crimping action which forms a salient part of our invention.

Thus it will be seen that there has been provided in accordance with our invention an electrical socket connector which may be used for establishing any desired make-and-break electrical connection, such as, for example, the type of connection normally found for energizing relays in electrical circuits. No separate crimping operation of our connector is required, but rather this is accomplished automatically when the connector is

mounted. At the same time, the connector is frictionally maintained in proper position. While there is shown and described herein certain specific structure embodying the invention, it will be manifest to those skilled in the art that various modifications and rearrangements of the parts may be made without departing from the spirit and scope of the underlying inventive concept and that the same is not limited to the particular forms herein shown and described except insofar as indicated by the scope of the appended claim.

It will further be understood that one of the primary purposes of imbedding the flange and solder tail in the epoxy resin is to hold the connector secure against longitudinal movement when the male prong is forced therein. It has been found, however, that in view of the frictional grip which bore 28 exerts on rib 24, it is not always necessary to provide additional means for preventing longitudinal movement of the connector, since this frictional grip in itself is often sufficient to hold the connector secure.

What is claimed is:

In combination, a housing of substantially rigid electrically nonconductive material, a cylindrical bore extending through said housing, an electrical connector mounted in said bore, said connector being constructed of relatively resilient, electrically conductive material and comprising a hollow cylindrical shank portion, the outer diameter of which is less than the diameter of said bore, said shank portion being open at one of its ends for slidably receiving a male prong, a solid circular flange at the other end of said shank portion, the outer diameter of which is substantially greater than that of said bore, a peripheral, circumferential rib on said shank portion located adjacent to but spaced from said flange, the outer diameter of said rib being just slightly greater than the diameter of said bore, and a pair of diametrically opposed slots extending longitudinally along said shank portion to a point beyond said rib but terminating short of said flange, said shank portion being maintained in said bore by the frictional engagement of said rib therein with said flange in abutting relation with one end of said bore, said bore, said rib, and said slots cooperating to cause said shank portion to be automatically crimped, whereby a proper size male prong that is slid into said shank portion is resiliently gripped therein.

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