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H. R. DOTY

2,332,483

ELECTRICAL CONNECTOR

Filed March 4, 1941

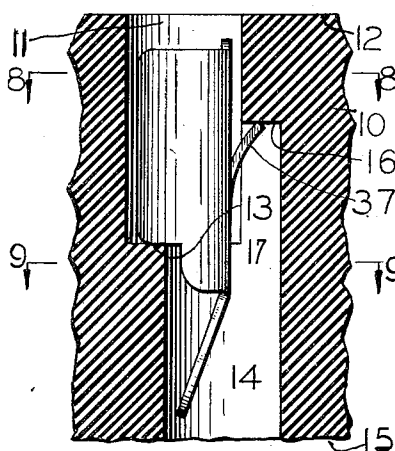


Fig. 4.

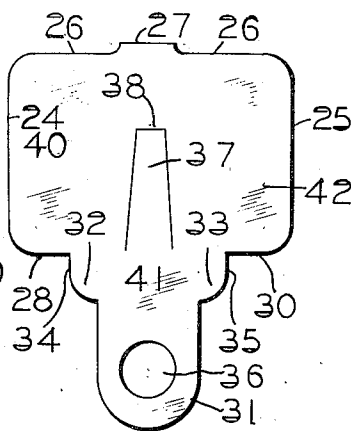


Fig. 1.

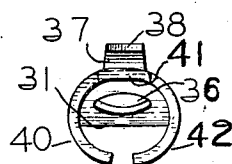


Fig. 3.

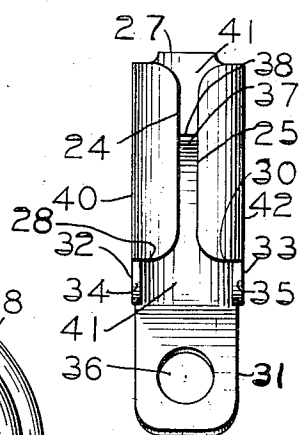


Fig. 2.

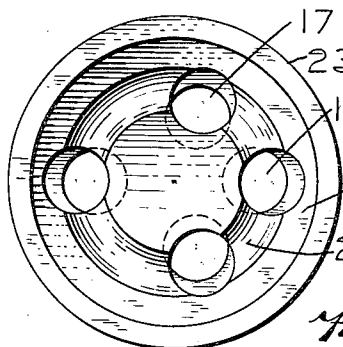


Fig. 5.

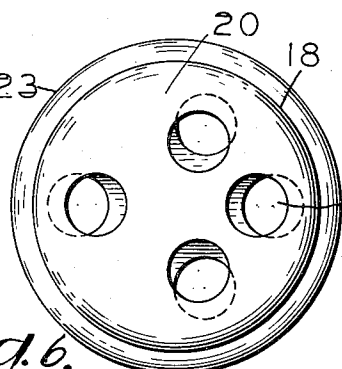


Fig. 6.

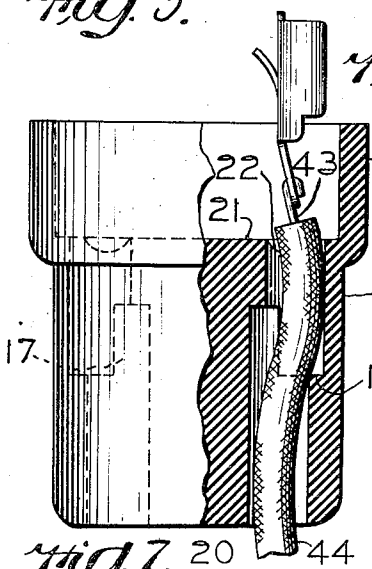


Fig. 7.



Fig. 8.

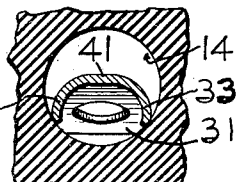


Fig. 9.

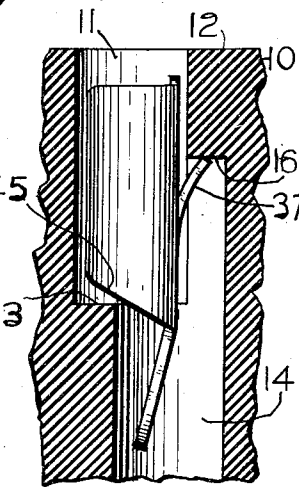


Fig. 10.

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ELECTRICAL CONNECTOR

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5 Claims. (Cl. 173—328)

This invention relates to electrical connectors, pertaining particularly to prong receiving socket devices of electrical connectors.

Although the art of connectors has been carefully cultivated and has developed by increasingly smaller steps over the years, there are certain disadvantages pertaining to the prior art that have not yet been obviated. The cost factor both of production and of assembly remains rather high, the contact resistance of the parts is frequently unduly high, the devices in the main are assemblages of a plurality of portions involving assembly difficulties and not infrequently the contacts of the socket device are dislodged in use.

It is among the objects of this invention to provide a unitary molded base of a single component; to provide a socket base and an improved contact therefor which is assembled and anchored by mere axial insertion into the appropriate aperture in the socket; to provide a prong receiving socket device with a female contact so anchored within the socket base that neither tension on the attached connector cord nor push or pull from the inserted prong member can dislodge or displace the contact; to provide a component unitary molded socket base with an inserted contact having a resilient locking lug so arranged that all undesired movement of the contact within the socket in any direction is obviated; to provide a molded socket base with suitable contact apertures such that connectors may be threaded through the apertures and attached contacts may be pulled into permanently anchored aperture-mounted relation in said base by tension on said cords; to provide an electrical connector device comprising a unitary base structure having a contact receiving aperture, a wire connector, and a female contact element having a soldering connection for the connector so arranged that anchored association of the connector and of the contact apart from the socket base is facilitated to obviate the difficulty and labor cost of soldering a plurality of connectors to a plurality of female contacts in a restricted space; to provide a socket assembly of an insulating molded base having a shielding prong-supporting aperture arranged entirely to house a female contact and the exposed portion of a connector soldered thereto; to provide a connector comprising a socket receptacle of such complete shielding and insulation value as to enable the contacts of the socket to carry relatively high voltages with impunity; to provide a socket assembly with a plurality of contacts and connectors anchored thereto such that capacity factors between adja-

cent contacts are minimized; to provide a simplified electrical connector of ornamental appearance; and many other objects and advantages will become more apparent as the description proceeds.

In the accompanying drawing forming part of this description.

Fig. 1 represents a plan form of blank from which the preferred form of contact of this invention is made up.

Fig. 2 represents a front elevation of the preferred form of contact.

Fig. 3 represents a top plan thereof.

Fig. 4 represents a fragmentary vertical section through a molded socket base suitably apertured to receive the contact shown in side elevation in anchored position therein.

Fig. 5 represents a top plan of an illustrative form of socket base in which suitable apertures are provided as to resume the contacts of this invention.

Fig. 6 represents a bottom plan thereof.

Fig. 7 represents a side elevation partially in section of the socket element of Fig. 5 with a coupled contact and connector in a stage of progress toward permanent anchorage.

Fig. 8 represents a fragmentary transverse section through the assembly of Fig. 4, on line 8—8 thereof.

Fig. 9 represents a similar section on line 9—9 of Fig. 4 and

Fig. 10 represents a member similar to that of Fig. 4 with a modified form of contact mounted therein.

The basic concept of the socket construction is indicated in Figs. 4 and 10, in each of which a solid body 10 has a preferably cylindrical bore or aperture 11 opening in the upper surface 12, and which may be designated as the prong contact aperture. The prong aperture extends only partially through the base and terminates in a shoulder 13 formed by the abutment of a semi-cylindrical die member with the plastic of the base. As will be seen the shoulder is substantially crescent in contour in plan form because of the formation of a connector aperture 14 extending from the lower surface 15 and terminating in the similarly crescent contoured shoulder 16 closer to the prong entrance surface 12 than the shoulder 13. The connector aperture is made by a sub-cylindrical die member overlapping but extending in parallelism with the first mentioned die member so that the respective shoulders 16 and 13 are parallel and spaced both axially of the socket, but also on opposite sides of the com-

posite through opening 17 extending completely through the socket base. The composite opening 17 comprises preferably the upper cylindrical channel or aperture 11, the intermediate enlarged portion partaking of the contour of both upper and lower apertures, as in a general figure 8 outline, and the lower portion, of course comprising the channel or aperture 14.

While the disclosed channels may be formed as a single bore in a base, and the base may be anything desired, it is preferred that a phonconnector plug socket be used as illustratively shown in Figs. 5, 6 and 7, and so far as the disclosure of a base section alone is concerned the sections comprising Figs. 4 and 10 may be assumed to have been taken radially through the left hand aperture of Fig. 5.

A connector plug according to this invention comprises a substantially cylindrical body 18 having an end surface 20 corresponding to lower surface 15 of Fig. 4, and having a parallel top surface 21, corresponding to surface 12 of Fig. 4, although it is preferred that end surface 21 be provided with a shallow annular groove 22, not shown in Fig. 4. An enlarged open ended cylindrical shielding skirt portion 23 is provided preferably integral with base 18 and coaxial therewith so as to shieldingly receive the prongs and base of a male connector member (not shown). Obviously the skirt 23 can be omitted if desired. The base 18 has a plurality of through channels 17, formed as described and preferably disposed with their longest transverse diameter radial of the base.

From the blank of Fig. 1 is formed the contacts for mounting in the respective sockets, as noted, and the blank comprises a stamping having preferably parallel side edges 24 and 25 of suitable length, connected at the upper end by a substantially linear edge 26 normal to the side edges and having the median lip 27 formed by a neck which is ruptured to separate adjacent blanks, although said lip obviously may be omitted. The blank has left and right short lower edges 28 and 30, parallel to the top edge 26, and merging into side edges 24 and 25 respectively by rounded corners. A soldering tail extension 31 extends perpendicular to the aligned lower edges 28 and 30, and merges into those surfaces by the left and right rounded protuberances 32 and 33, having respectively the straight side edges 34 and 35 substantially parallel to the side edges 24 and 25. The soldering tail 31 may be formed as desired for convenience of attachment of a wire connector, as by an aperture 36. A resilient tongue 37 is provided having the edge of the free end 38 struck out of the body of the blank with the free edge 38 presenting in a direction opposite to that of the aligned lower edge surfaces 28 and 30.

The portions of the blank defined by side edge 24 and end edges 26 and 28 and protuberance 32 and by side edge 25, and end edges 26 and 30 and protuberance 33, comprise wings or arms 40 and 47, respectively bendable as a whole relative to the backing portion 41 in substantial alignment with the forwardly bent soldering tail 31, with the free ends of the arms, outwardly of the protuberances, defined by the parallel end surfaces reentrantly bent to overlie the backing portion 41. This structure provides a prong receiving channel formed by the backing portion 41 and the respective side arms 40 and 42 with which an inserted prong has plural line contact. Preferably the centers about which the side arms

are bent are laterally spaced apart so that in profile the contact is substantially oval with its widest lateral extent such as to have substantially sliding fit in the prong receiving aperture 11 of the composite aperture 17, as shown in Fig. 8.

Preferably also the degree of bend imparted to the respective protuberances 32 and 33 is such that the latter form short substantially parallel legs, in transverse section, so that their side edges 34 and 35 respectively about the arcuate surface of the lower-most or connector aperture 14 below the level of shoulder 13, to prevent contact rotation as shown in Fig. 9.

It is to be understood that a connector 43 having insulation 44 has a free end engaged and soldered in the soldering tail hole 36 after the tail preferably has been bent forwardly to partially overlie the prong channel, as shown. As the soldering is accomplished apart from the socket and therefore out of a sharply constricted space, it may be very expeditiously accomplished. Each contact bearing wire is threaded through the appropriate composite holes as indicated, from the top, with the resilient extended tongue 37 projecting rearwardly toward the side of the opening having the upper shoulder 16, and with the outer contours of the respective side arms 40 and 42 guided slidably between the diametrically opposite arcuate portions of the upper aperture 11.

As the contact is drawn inwardly the resilient tongue 37 is engaged by the wall of aperture 11 and compressed toward the contact to permit the contact to move inwardly into the composite hole, while the soldering tail has been guided past the shoulder 13 until just about as the tongue 37 clears the edge of shoulder 16 so that the free end 38 thereof engages beneath shoulder 16, the lowermost edges 28 and 30 engage and rest upon shoulder 13 and the contact is then anchored in place. When so anchored, it will be understood that the axis of the contact centrally of the arms and backing portion is disposed and held in substantial coincidence with the axis of upper or prong receiving opening 11 by the diameter extension of the side arms in substantial contact with the opposite sides of the aperture 11. The resilient tongue 37 prevents retraction of the contact during withdrawal of the male prong member, while a positive inward axial stop is secured by the engagement of the arm lower edges 28 and 30 on shoulder 13.

It is important that the alignment of stops and shoulders be maintained, and to this end rotation of the contact in the composite hole is limited and stopped by the engagement of the inner surface of lower aperture 14 by the vertical edges 34 and 35, of the protuberances, as shown in Fig. 9.

A modification is disclosed in Fig. 10 in which all of the parts are as discussed, and all have the same numbers, except that the lower flat edges 28 and 30, the protuberances 32 and 33 and their edges 34 and 35 are all replaced by the substantially linear slanting edges 45, disposed at about 30°, preferably, to the surface of shoulder 13. It will be clear that at the points of contact between the slanting or inclined edges 45 and the edge of shoulder 13, axial downward motion, as well as rotational motion of the contact is obviated.

The simplicity, economy, and efficiency of the connector described will be manifest.

I claim:

1. A socket connector comprising in combination a base and a female contact, said base having a composite hole extending completely through the base and comprising a contact aperture extending from the top surface of the base to an internal lower contact stop shoulder, a connector aperture extending from the lower surface of the base to an internal upper contact anchoring shoulder, the stop shoulder being closer to the lower surface than the anchoring shoulder, and the apertures being substantially parallel, overlapping and intercommunicating, the respective apertures being each substantially cylindrical and the respective shoulders being substantially crescent-shaped in profile and symmetrically diametrically oppositely disposed in the composite hole, a contact comprising a substantially barrel-shaped transversely oval contact element having a long diametrical axis in transverse section and having an axial slot in one wall forming spaced arms having lower stop surfaces substantially on one side of the transverse long diametrical axis of the contact in position to engage the stop shoulder, a resilient tongue on the element on the opposite side thereof from the stop surfaces projecting away from said stop surfaces in position to engage the anchoring shoulder to anchor the element against axial dislodgment from the apertures, and spaced continuations of the spaced stop surfaces on the element disposed for bearing laterally against the inner wall of the lower aperture adjacent to the stop shoulder preventing rotation and dislodgment of the element from the respective shoulders.

2. A socket connector comprising a base, said base having a composite hole extending completely through the base and comprising a substantially cylindrical contact aperture formed in and extending downwardly from the top surface of the base as the only part of said hole in said upper surface, said aperture terminating in a solid transverse wall of base material forming a contact stop shoulder, said hole further comprising a substantially cylindrical connector aperture formed in and extending upwardly from the lower surface of the base as the only part of the hole in the lower surface and terminating in a solid transverse wall of base material forming a contact anchoring shoulder, said respective apertures being staggered, substantially parallel, and overlapping so that each passes through the portion of the solid terminal wall of the other to the extent of the overlapping only, to cause the respective shoulders each to assume a substantially crescent shaped profile, said shoulders being oppositely disposed symmetrically of the long diameter of the composite hole in the median plane of the base.

3. A socket connector comprising the combination of a base and a female contact, said base having a composite hole extending completely through the base and comprising a substantially cylindrical contact aperture formed in and extending downwardly from the top surface of the base as the only part of said hole in said upper surface, said aperture terminating in a solid transverse wall of base material forming a contact stop shoulder, said hole further comprising a substantially cylindrical connector aperture formed in and extending upwardly from the lower surface of the base as the only part of the hole in the lower surface and terminating in a solid transverse wall of base material forming a

contact anchoring shoulder, said respective apertures being staggered, substantially parallel, and overlapping so that each passes through the portion of the solid terminal wall of the other to the extent of the overlapping only, to cause the respective shoulders each to assume a substantially crescent shaped profile, said shoulders being oppositely disposed symmetrically of the long diameter of the composite hole in the median plane of the base, said female contact being disposed in the composite hole and comprising a backing portion and side arms having a prong receiving channel disposed in the contact receiving aperture, said side arms having lower edge portions engageable upon the crescent shaped stop shoulder to limit axial movement of the contact downwardly of the base, and a resilient tongue on said contact extending away from the contact stop shoulder engageable with the crescent shaped anchorage shoulder to anchor the contact against axial movement upwardly of the base.

4. A socket connector comprising the combination of a base and a female contact, said base having a composite hole extending completely through the base and comprising a substantially cylindrical contact aperture formed in and extending downwardly from the top surface of the base as the only part of said hole in said upper surface, said aperture terminating in a solid transverse wall of base material forming a contact stop shoulder, said hole further comprising a substantially cylindrical connector aperture formed in and extending upwardly from the lower surface of the base as the only part of the hole in the lower surface and terminating in a solid transverse wall of base material forming a contact anchoring shoulder, said respective apertures being staggered, substantially parallel, and overlapping so that each passes through the portion of the solid terminal wall of the other to the extent of the overlapping only, to cause the respective shoulders each to assume a substantially crescent shaped profile, said shoulders being oppositely disposed symmetrically of the long diameter of the composite hole in the median plane of the base, said female contact being disposed in the composite hole and comprising a backing portion and side arms having a prong receiving channel disposed in the contact receiving aperture, said side arms having lower edge portions engageable upon the crescent shaped stop shoulder to limit axial movement of the contact downwardly of the base, and a resilient tongue on said contact extending away from the contact stop shoulder engageable with the crescent shaped anchorage shoulder to anchor the contact against axial movement upwardly of the base, and means engageable at a plurality of peripherally spaced points against the inner surface of the said second aperture adjacent to the stop shoulder to prevent rotation of the contact in said hole.

5. A socket connector comprising the combination of a base and a female contact, said base having a composite hole extending completely through the base and comprising a substantially cylindrical contact aperture formed in and extending downwardly from the top surface of the base as the only part of said hole in said upper surface, said aperture terminating in a solid transverse wall of base material forming a contact stop shoulder, said hole further comprising a substantially cylindrical connector aperture formed in and extending upwardly from the

lower surface of the base as the only part of the hole in the lower surface and terminating in a solid transverse wall of base material forming a contact anchoring shoulder, said respective apertures being staggered, substantially parallel, and overlapping so that each passes through the portion of the solid terminal wall of the other to the extent of the overlapping only, to cause the respective shoulders each to assume a substantially crescent shaped profile, said shoulders being oppositely disposed symmetrically of the long diameter of the composite hole in the median plane of the base, said female contact being disposed in the composite hole and comprising a backing portion and side arms having a prong receiving channel disposed in the contact receiving aperture, said side arms having lower edge

portions engageable upon the crescent shaped stop shoulder to limit axial movement of the contact downwardly of the base, and a resilient tongue on said contact extending away from the contact stop shoulder engageable with the crescent shaped anchorage shoulder to anchor the contact against axial movement upwardly of the base, and means engageable at a plurality of peripherally spaced points against the inner surface of the said second aperture adjacent to the stop shoulder to prevent rotation of the contact in said hole, said tongue and last means being symmetrically disposed relative to the transverse axis of the contact to maintain balanced support of the contact relating to the oppositely disposed shoulders of the base.

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