

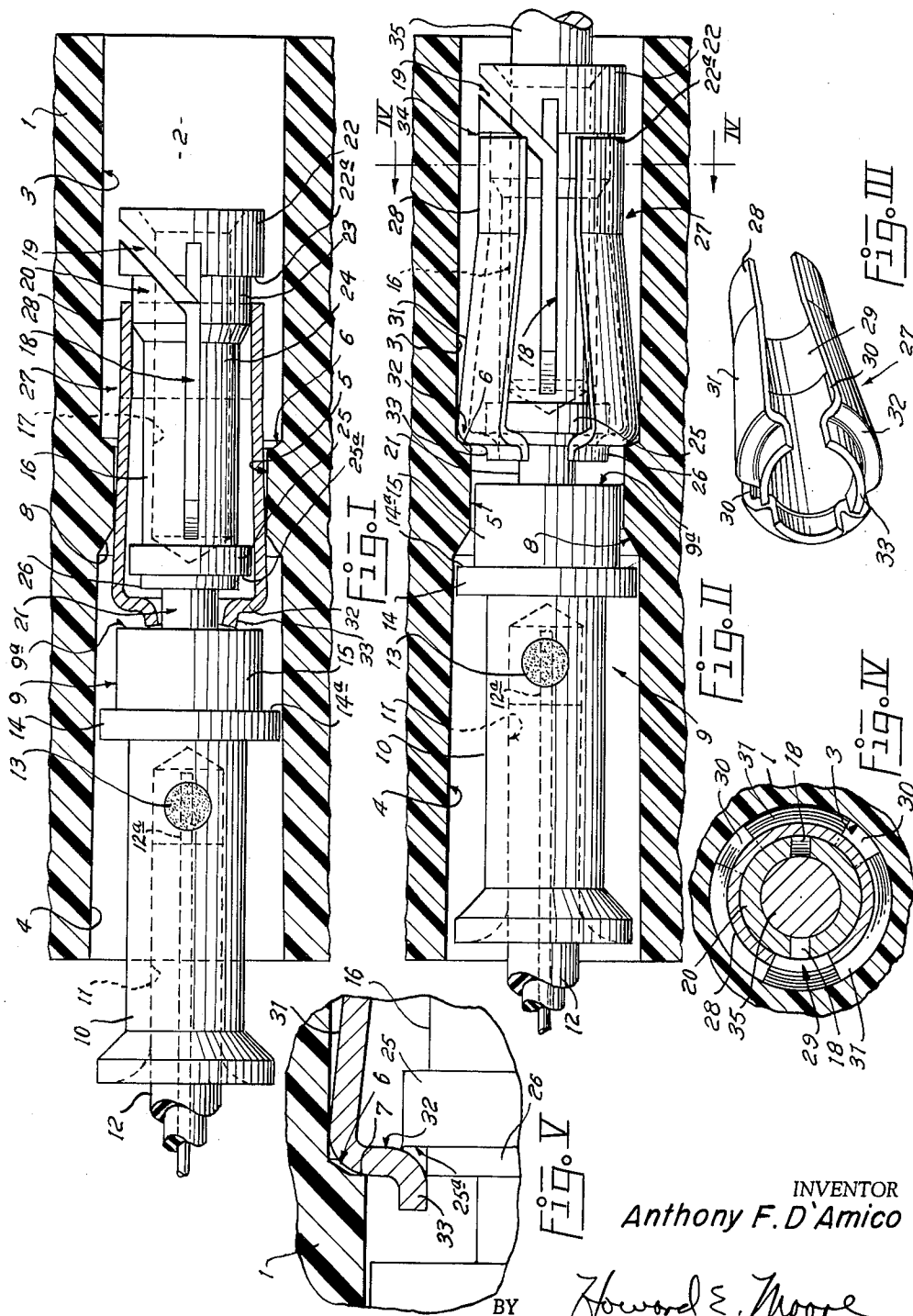
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REPLACEABLE CONTACT FOR MULTIPLE CONNECTOR

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REPLACEABLE CONTACT FOR MULTIPLE CONNECTOR

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This invention has to do with a removable contact for multiple contact connectors, and is particularly concerned with an improvement in a snap-in type of contact for multiple outlet connectors employing a collet type spring retainer member for removably mounting the contact in the bore of the body of a connector plug so as to firmly but removably mount the contact in the bore in position so that it cannot be removed therefrom without the employment of an insertion tool to retract the retainer member.

This improved contact mounting means makes it possible to reduce the diameter of the bore and the length of the bore in which the contact is mounted, thus making it possible to reduce the overall size of the body in which the multiple connectors are mounted.

This invention is concerned with an improvement in the type of contact and retainer means therefor disclosed in my Patent No. 3,075,169, issued January 22, 1963, entitled "Snap-In Contact for Multiple Connectors."

The connector and retainer assembly shown in said patent require that the retainer member be disposed about a reduced mid-section of the contact member requiring excessive length of contact member to accommodate the retainer member; the spring prongs on the retainer member were turned outwardly and had a shoulder thereon engageable with a shoulder in the counterbore in the connector body which increased the overall diameter of the retainer member, and since sufficient annular space had to be provided between the outside diameter of the outwardly turned prongs to accommodate an insertion tool to retract same, the overall diameter to the bore in which the contact member and retainer member were inserted was required to be unduly large for many applications.

Miniaturization of circuits and circuit components has become increasingly important in computer technology and electronics components employed in guidance and control equipment for rockets, so that it is an impelling requirement that circuit components, and the like, and particularly contact members mounted in contact blocks containing many circuit connections, be reduced in size to a minimum.

It is equally important that the contacts be mounted in such a way that they can be quickly replaced or interchanged without damage to the contact or the retainer member therefor, and that when mounted in the bore therefor the contacts are securely held in place therein against pulling forces of excessive magnitude to assure that vital circuits will not be interrupted to cause failure of critical electronics and electrical components in computers and guidance elements used in rockets, missiles, and other equipment.

The present invention is primarily intended to provide a connector and retainer combination to meet the foregoing requirements.

It is, therefore, a primary object of the invention to provide a removable connector member for multiple connectors which occupies a minimum amount of space in the bore therefor, reducing the overall length and diameter of the bore, thereby reducing the overall size of the block or body in which the connectors are mounted.

Still another object of the invention is to provide an improved spring retainer member for a multiple connector which securely mounts the connector in the bore

therefor, yet is easy and simple to mount therein and to demount therefrom.

Still another object of the invention is to provide an improved combination of connector and retainer members wherein the outer ends of the prongs on the retainer member are turned inwardly and are abutted against shoulders on the connector and in the bore in such position that the inwardly turned portions of the prongs are firmly gripped between the shoulders and held against lateral or longitudinal movement when axial force is exerted against the connector.

Other and further objects of the invention will become apparent upon reading the detailed specification hereinafter following, and by referring to the drawing annexed hereto.

A suitable embodiment of the invention is shown in the attached drawing, wherein:

FIGURE I is a cross-sectional, elevational view of a bore through a contact block, showing a contact and retainer assembly made in accordance with the improvement comprehended by this invention, as it would appear while being inserted into the bore from the terminal end thereof;

FIGURE II is a view similar to FIGURE I wherein the contact has been inserted into the bore and the prongs on the retainer member have sprung out into engagement with the shoulder in the bore, to disengageably mount the contact in the bore;

FIGURE III is a perspective view of the retainer member employed to disengageably secure the contact within the bore;

FIGURE IV is a transverse, cross-sectional view taken along the line IV-IV of FIGURE II; and

FIGURE V is an enlarged fragmentary cross-sectional, elevational view of the bore and retainer member, showing the relationship of the ends of the prongs of the retainer member with reference to the locking shoulders on the contact member and in the bore.

Numeral references are employed to indicate the various parts shown in the drawings, and like numerals indicate like parts throughout the various figures of the drawings.

The numeral 1 indicates a contact block plug or body made of insulating material, having a bore 2 therethrough. It will be understood that the contact block body 1 customarily has a great number of such bores 2 therethrough in each of which may be mounted a contact and retainer combination, as will be hereinafter described.

The bore 2 includes a reduced diameter portion 5, with counterbores 3 and 4 at each end thereof.

The counterbore 3 provides a shoulder 6 which has an area at the outer side thereof which is disposed diagonally with reference to the axis of the bore, and an area 7 on the inner side thereof, which is disposed in right angular relationship to the axis of the bore.

The counterbore 4 provides a tapered shoulder 8 for the purpose which will be hereinafter mentioned.

The contact member, which is generally indicated at 9, is made of electrical conductive material, and includes a hollow conductor engaging end 10 having a bore 11 therein to receive the end of a conductor 12. The conductor 12 may be secured in the bore 11 by application of solder through the hole 13, or it could be crimped therein, or otherwise securely mounted within the bore 11.

The insulation is removed from the outer end of the conductor 12, as indicated at 12a, so that solder applied through hole 13 will provide an electrical connection between the conductor and contact 9.

The terminal end 10 includes an annular area 14 of greater diameter than the conductor engaging portion 10, which provides a shoulder 14a arranged to come into en-

gagement with shoulder 8, to limit the inward movement of the contact within the bore 2 for the purpose which will be hereinafter described.

Adjacent the shoulder portion 14 is another cylindrical portion 15 which is lesser in diameter than the cylindrical portion 14, and is of such outside diameter as to pass through the reduced diameter bore 5, and provides a shoulder 9a for the purpose hereinafter mentioned.

The contact member 9 also includes a receptacle end 16 which is made integral with the terminal end 10 and is joined thereto by a reduced diameter portion 21.

A bore 17 is provided in the receptacle end 16, which is arranged to receive a prod conductor 35. The prod conductor 35 would be secured to an electrical conductor or would be one of a plurality of such prods extending outwardly from a conductor block which would provide a connection between the contacts in the block 1 and electrical conductors secured to such prods.

The receptacle 16 includes a spring segment 20 which is deflected inwardly in order to grippingly engage the male prod 35 when inserted therein, the said spring segment 20 being formed by aligned longitudinal slits 18 and diagonally disposed slits 19 cut through the wall of the receptacle 16.

An enlarged diameter area 22 is provided on the outer end of the receptacle portion 16 of the contact 9, which provides a shoulder 22a for the purpose hereinafter mentioned.

Adjacent the enlarged diameter portion 22 is a reduced diameter portion 23 about which may be disposed the retainer member 27 hereinafter described. An additional reduced diameter portion 24 is provided between the diameter portion 23 and 25.

The diameter portion 25 provides a shoulder 25a, and disposed below the shoulder 25a is a reduced diameter portion 26 which functions in the manner hereinafter described.

The retainer member 27 is made of spring-like metallic material, is hollow, and has the generally cylindrical reduced diameter end 28 from which extends outwardly tapered prongs 31. The prongs 31 are formed by slits 30 extending from the cylindrical portion 28 to the outer ends thereof. The prongs 31 are terminated at their outer ends by inwardly extending generally right angular portions 32 and longitudinally formed terminal portions 33, which are generally parallel to the longitudinal axis of the retainer member.

A relatively wide longitudinal slit 29 is provided to extend the full length of the retainer 27.

When the contact and retainer assembly is positioned in the bore, as shown in FIGURE II, a stand-off space 34 is provided between the end of the cylindrical portion 28 of the retainer 27 and the shoulder 22a for the purpose hereinafter mentioned.

The operation and function of the device hereinbefore described is as follows:

The contact 9 is secured to the conductor 12 in the manner hereinbefore described.

The retainer 27 is placed about the contact 9 by placing the slit 29 thereagainst and forcing it thereover by springing the sides thereof outwardly and allowing it to contract thereabout.

In such position, the outer ends of the prongs 31 will abut against the shoulder 9a and the reduced cylindrical portion 28 thereof will be disposed about the cylindrical area 23. The contact is then inserted into the counterbore 4 and the outer surfaces of the prongs 31 slide along the inner surface of the bore 4 until they reach the shoulder 8, at which time said prongs are contracted by being forced against the shoulder 8 and are retracted for passage through the reduced diameter bore 5.

Upon the inwardly turned portions 32 of the prongs 31 reaching the enlarged bore 3, the prongs 31 relax and spring outwardly so that the inwardly turned shoulder portions 32 engage the shoulder 6 and the right angular

portion 7 thereof. At such time the inner surfaces of the longitudinally turned ends 33 of the prongs will engage the outer surface of the cylindrical area 26 and the shoulder 25a will engage the upper surface of the inwardly turned portion 32, when longitudinally directed force is applied outwardly against the terminal end 10.

Since the inwardly directed portions 32 of prongs 31 are seated against right angular shoulders 7, any force exerted in such direction is a longitudinally directed force parallel to the axis of the bore, so that there is no tendency for such force to expand the bore, crack the body, or shear the shoulder 7. Moreover, the inwardly directed ends of the prongs are clamped and fixedly secured between the diameter portion 26 and the inner wall of the bore, so that the prongs cannot move inwardly or be deformed or distorted to such an extent as to allow the contact 9 to pass therethrough.

Sufficient stand-off space 34 is provided between the end of the retaining member 27 and the shoulder 22a so that force is applied through the shoulder 25a and shoulder 7 to the inwardly turned ends 22 of the prongs to firmly clamp same in place instead of allowing the force to be absorbed between the upper end of the retaining member and shoulder 22a, thereby assuring that the inwardly turned ends of the prongs are firmly clamped between said shoulders and against lateral movement.

By virtue of the fact that the retainer member is disposed about the female contact end of the contact 9 when latched in place in the bore, and does not require a reduced diametrical portion of the contact in which to latch, and by further virtue of the fact that the locking ends of the prongs of the retainer member are turned inwardly and are not required to be turned outwardly to lock the contact in place, the overall dimension of the block 1 may be made considerably smaller in that the bores 2 may be made shorter and of less diameter.

Furthermore, the contacts 9 can be made of smaller diameter, thus greatly conserving space and allowing a greater number of circuit components and contacts to be accommodated within a given area.

When it is desired to remove the contact 9 from the bore 2, a removal tool (not shown) may be inserted through the bore 3. Said removal tool comprises a tubular member which passes over the female receptacle 16 and when forced downwardly over the outwardly tapered prongs 31, retract same inwardly sufficiently that the prongs will enter the reduced diameter portion 5 to thereby allow the contact to be withdrawn through the bore 4.

It will be understood that other and further embodiments of the invention may be made without departing from the spirit and scope of the appended claims.

Having described my invention, I claim:

1. In a device of the class described,

a connector plug body having a bore therethrough including

a main bore with a counterbore at each end, said counterbores providing annular outwardly facing shoulders at each end of the main bore;

an electrical contact insertable in said bore, having conductor connection ends thereon arranged to receive electrical conductors, and a reduced midportion;

first shoulder means on the outer end of one of the conductor connection ends;

second shoulder means on the contact adjacent the reduced midportion facing the first shoulder means;

third shoulder means on the contact spaced from, and facing, the second shoulder means;

a retainer member constituting a split sleeve extending about the contact between the first shoulder means and the second shoulder means and about the third shoulder means;

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a plurality of longitudinal slits in said sleeve providing outwardly tapered spring prongs thereon;

inwardly extending flanges on the outer ends of the prongs,

each flange including a portion extending substantially right angularly with reference to the axis of the bore,

the said flanges being arranged to contact one of the shoulders in the bore,

with the inner surfaces thereof engaged by the third shoulder means on the contact.

2. The combination called for in claim 1 wherein the one shoulder in the bore which contacts the flanges has a surface lying in a plane normal to the axis of the bore

arranged to receive the right angular portions on the ends of the prongs.

3. The combination called for in claim 1 with the addition of

a diameter portion on the contact adjacent the third shoulder

which is less in diameter than the third shoulder and greater in diameter than the reduced mid-portion;

the inner ends of the flanges on the prongs being arranged

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to contact said diameter portion to limit the inward movement of the prongs.

4. The combination called for in claim 3 wherein the ends of the flanges are terminated by portions turned parallel to the axis of the bore.

5. The combination called for in claim 1 wherein the spacing between the first and third shoulders on the contact and the said one shoulder in the bore with relation to the length of the retainer is such that when the right angular portions of the flanges on the prongs are engaged by said one shoulder and said third shoulder,

a space is provided between the outer end of the retainer and the first shoulder on the contact.

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