

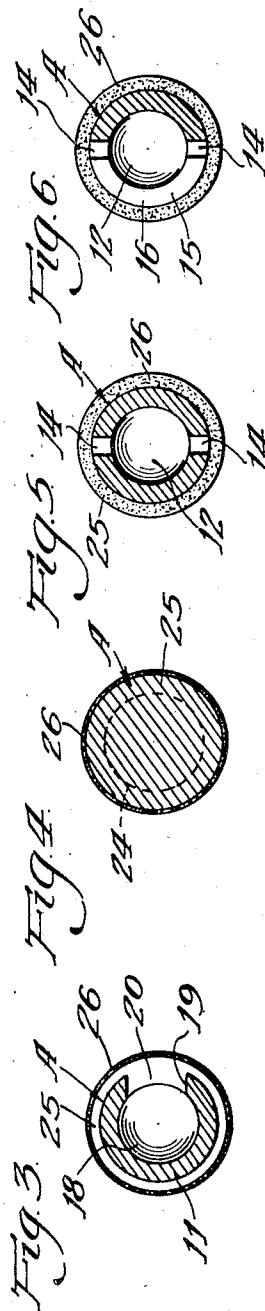
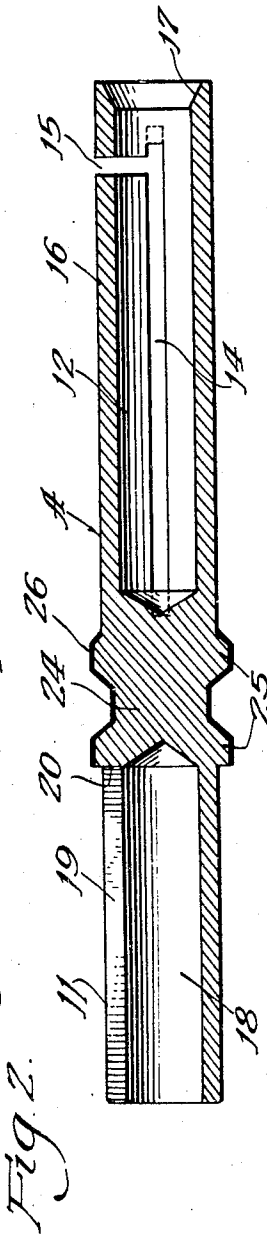
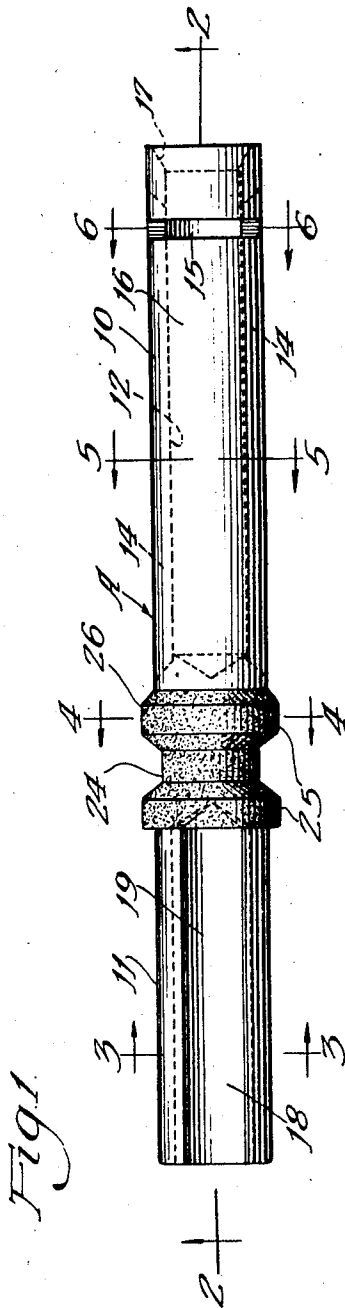
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E. C. QUACKENBUSH
ELECTRICAL CONTACT SOCKET

2,443,513

Filed April 28, 1944

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

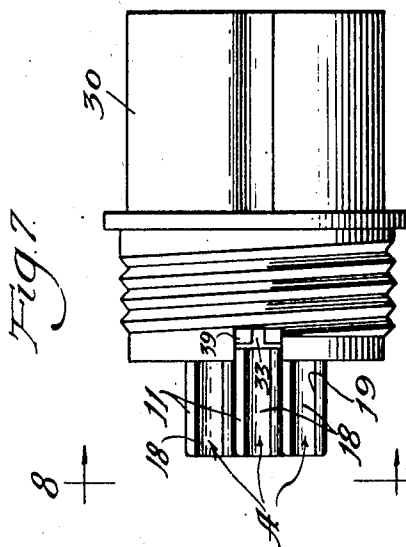
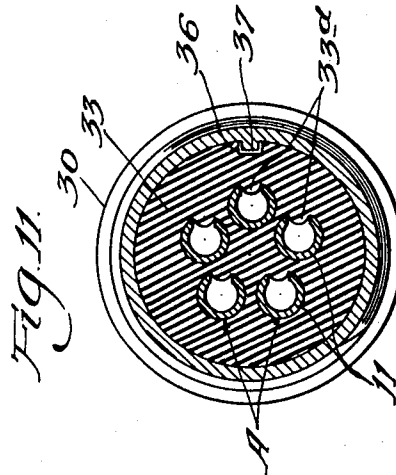
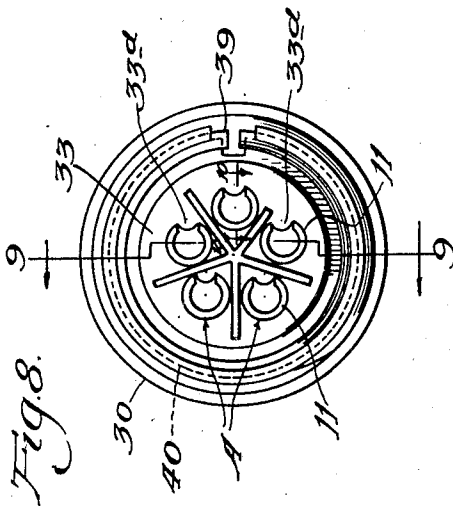
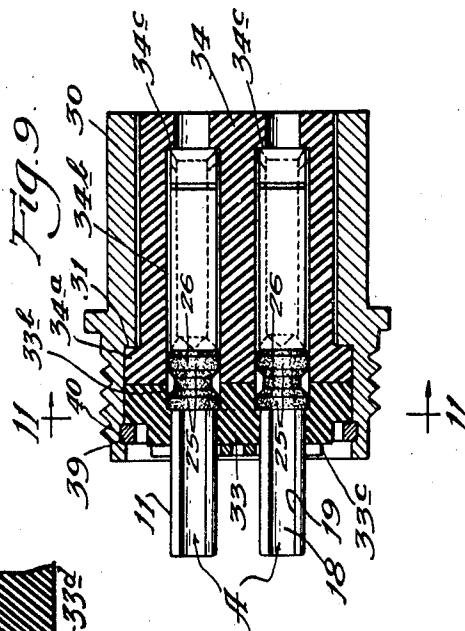
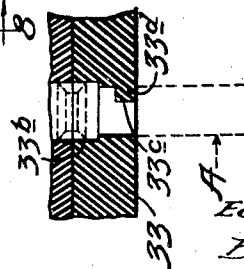


Fig. 10.



Inventor:
Edward Clarke Quackenbush
By: Lee J. Gary
Attorney

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ELECTRICAL CONTACT SOCKET

Edward Clarke Quackenbush, Roselle, Ill.

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3 Claims. (Cl. 173-363)

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This invention relates to electrical connectors of the type including two axially separable assemblies for conveniently connecting and disconnecting cables or conduits containing a plurality of conductor wires constituting portions of electrical circuits, and are adapted to a relatively wide field of use, such as in radio control work, communications, signalling, motion pictures, aircraft control, and in numerous other fields and industrial applications. Connectors of this general type include a male contact assembly and a female or socket contact assembly, together with suitable means for firmly and detachably securing the assemblies together in connected relation.

More particularly, the present invention is directed to improvements in electrical contact sockets or female contacts of the solid bar type. Solid bar contacts have heretofore been extensively used and are especially suitable for heavy duty service, and because of their rugged construction are capable of withstanding substantial abuse without readily becoming damaged or defective. Heretofore such socket contacts having been formed with the contact portion of greater cross sectional dimensions than the terminal portion of the socket contact. This construction has resulted in limiting the amount of dielectric material between the contact portions of sockets in connector assemblies, or has necessitated increasing the general cross sectional dimensions of the assemblies to obtain a desired amount of dielectric between contacts.

One of the objects of this invention is to provide an improved socket contact, of the solid bar type, wherein the terminal portion of the socket contact is of a cross sectional dimension equal to or greater than the cross sectional dimension of the contact portions.

Another object is to provide an improved socket contact, of the solid bar type, characterized by the provision of an increased size soldering pocket in the terminal portion of the contact without increasing the cross sectional dimension of the contact portion of the socket.

A further object is to provide an improved socket contact, of the solid bar type, characterized by the provision of a pair of axially spaced apart annular shoulders for seating respectively in adjacent portions of aligned openings in a pair of cooperating, insulating plug sections, for supporting the contact portion of the socket out of engagement with the wall of the opening.

Other objects and advantages of this invention will be apparent from the following descrip-

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tion taken in connection with the accompanying drawings, in which:

Fig. 1 is an enlarged top elevational view of the socket contact embodying the present invention.

Fig. 2 is an enlarged side elevational view of the socket contact.

Figs. 3, 4, 5 and 6 are transverse sectional views through the socket contact, taken substantially as shown at lines 3-3, 4-4, 5-5 and 6-6 respectively on Fig. 1.

Fig. 7 is an elevational view of a body of a connector element in which there is assembled a plurality of socket contacts embodying the present invention.

Fig. 8 is an end elevational view of the assembly, taken as indicated at line 8-8 on Fig. 7.

Fig. 9 is an axial section through the assembly, taken substantially as indicated at line 9-9 on Fig. 8.

Fig. 10 is a fragmentary sectional view through one of the sections of the insulating plug body, showing the keying relationship of the contact and the plug body, and taken substantially as indicated at line 10-10 on Fig. 8.

Fig. 11 is a transverse sectional view through the assembly, taken substantially as indicated at line 11-11 on Fig. 9.

The socket contact herein disclosed may be made up in a relatively wide range of sizes, and the particular size shown in Figures 1 to 4 of the drawings, is for purposes of clarity shown at a scale several times actual size. The socket contact, which is indicated generally at A, is formed from a solid bar or rod of bronze or brass, or other suitable material of high electrical conductivity. The material used preferably should also possess the desirable characteristics of mechanical strength, ductility and adequate resilience.

The socket contact, as shown in the drawings, is of elongated form and circular cross section, and includes a contact portion 10, and a terminal portion 11. The contact portion comprises approximately one-half the length of the socket and is provided with an internal axial bore 12, opening to the outer end, and adapted to receive a cooperating male contact element. The wall surrounding the bore is provided with a pair of diametrically opposite, longitudinally extending slots 14, terminating adjacent the free end of said contact portion, and intersecting thereat, a transverse slot 15, to provide a resilient, elongated section, indicated at 16. The section 16 is adapted, in the process of manufacture of the

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socket, to be deformed inwardly relatively to the bore so that the inner wall of a portion of said section projects into the bore a slight amount and provides a yielding pressure grip on a male contact element when inserted into the bore, to insure proper electrical contact between the elements. The outer end of the bore 12, is slightly flared, as indicated at 17, to facilitate the entry and accommodation of the male contact element therein.

It is well known that the characteristics of pressure and surface area of contact are main factors in determining the amount of current to be properly handled through a contact without excessive overheating. By virtue of the construction described, the resilient portion 16 may be initially deformed so as to provide the desired amount of pressure when engaged by a cooperating male contact element of a certain diameter.

The terminal portion of the socket contact is provided with an internal axial bore 18 opening to the outer end, and the wall of said portion is formed with a relatively wide, longitudinally extending slot 19 thus forming a substantial size soldering pocket. By virtue of this construction the terminal portion of a conductor wire may be freely inserted through the slot, into the bore and securely anchored therein by the pouring of solder into the trough-like form of the terminal portion of the socket contact. To facilitate the soldering operation, I preferably tin the entire inner surface of the solder trough. The general cross sectional dimension of the terminal portion preferably is equal to or greater than the cross sectional dimension of the contact portion of the socket contact for purposes hereinafter set forth.

The slot 19 in the terminal portion also serves as a keying means for holding the socket contact against rotation in its mounting, as will hereinafter be described. The closed end of the slot, as indicated at 20, serves to limit axial movement of the socket contact, in its mounting, in a direction toward the terminal portions of the contact.

The contact portion 10, and terminal portion 11, of the socket contact are connected by an intermediate portion 24, which includes two longitudinally spaced apart, outwardly projecting annular shoulders 25, one of which terminates flush with closed end 20 of the slot in said terminal portion. Said intermediate portion 24, is surrounded by a band of insulating coating material 26.

In the construction disclosed in Figs. 7 to 11 of the drawings I have shown a multiplicity of socket contacts embodying the present invention assembled in a female element of an electrical connector of the character above indicated. The disclosure in the drawings however is limited to the assembly of the contacts and insulating plugs encased in a body of container and it is to be understood that in connection with the assembly as illustrated herein there is also employed a cooperating male contact section together with a suitable housing for enclosing the terminal portions of the contacts as well as the terminal portions of the conductor wires. There is also usually applied a suitable connector or coupler nut for maintaining the two assemblies containing the respective female socket contacts and male contacts connected together for completing a plurality of portions of electrical circuits.

In the assembly illustrated there is shown a cast metal body 30 of generally tubular cross section which as may be seen in Fig. 9 of the

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drawings includes two portions of different internal diameters to form an annular shoulder 31. Disposed within the body 30 is a plug of insulating material composed of two separate sections as indicated at 33 and 34, the section 33 being dimensioned to fit the larger diameter at the outer end of the body while the section 34 fits into the portion of body of smaller internal diameter and is provided with an enlarged end portion as indicated at 34a for seating in the enlarged diameter of the body and adapted to abut against the annular shoulder 31. To maintain proper registry of the two plug sections 33 and 34 with each other and in a predetermined relation to the body 30, the outer marginal edge of the section 33 and the flange 34a of the section 34 are formed with a longitudinally extending keyway 36 adapted to be registered with an internal key 37 formed in the enlarged diameter portion of the body 30. The two plug sections are held in such assembled relation within the body as seen in Fig. 9 of the drawings by means of a C clamp or spring ring 39 which is initially compressed so as to be inserted into the outer end of the body and then permitted to expand for seating into an annular groove 40 formed in the interior of the large diameter portion of the body 30 in abutting relation to the outer end of the plug section 33 so as to maintain the two plug sections in a fixed assembled relation within the body 30.

The two plug sections 33 and 34 are formed with a multiplicity of circumferentially spaced apart aligned openings or passageways 33b and 34b respectively for accommodating the female socket contacts A. Due to the cross sectional dimensions of the contact portion 10 of the socket contacts, there is provided substantial clearance between the external wall of said portions of the contacts and the wall of the openings 34b of the plug section 34 so as to permit flexibility and yielding of the sections 16 of the walls of the contact portions 10. The socket contacts are supported in the plug sections 33 and 34 by the longitudinally spaced apart annular shoulders 25 which are dimensioned relatively to the ends of the contact and the plug sections so as to be disposed on opposite sides of the plane of abutment of the cooperating and engaging ends of the two plug sections as clearly seen in Fig. 9 of the drawings which serves to insure supporting the contact portions 10 of the socket contacts out of engagement with the walls of the openings 34b in the plug section 34. The outer ends of the contact portions of the contacts A abut against shoulders 34c formed in the respective openings 34b of the plug section 34 adjacent the outer end thereof and thus serves to preclude forward movement of the contact; in other words, to the right in the plug section 34 as seen in the assembly in Fig. 9 of the drawings.

The openings 33b of plug section 33 terminate at their outer ends in reduced openings 33c of a cross sectional dimension to provide a snug fit about the terminal portion 11 of the socket contact. If the socket contacts when mounted in the insulating plug sections were permitted to turn or rotate, there is substantial possibility of twisting or breaking of the conductor wires or the soldered connection between the conductor wires and the terminal portions of the socket contacts. To overcome this objectionable condition the outer ends of the openings 33b in the plug section 33 are formed with internally projecting lugs or keys 33d adapted to register and seat in the

slots 19 of the terminal portions 11 of the socket contacts. This construction serves the dual purpose of preventing rotation of the contacts in the plug assembly and precludes rearward axial movement of the socket contacts in the plug assembly in the direction of said terminal portions by the abutment of the shoulders 20 at the ends of the slots in the terminal portions of the socket contacts with the keys 33d of the plug section 33.

It is highly desired in connector assemblies of the character above indicated to utilize socket contacts having terminal portions provided with soldering pockets of maximum dimensions to facilitate the soldering operation and to insure making of an adequate soldered joint with the conductor wires. Where the size or cross sectional dimensions of the connectors is considerable, it can be appreciated that there is a possibility that the contact portions of the socket contacts may be so closely spaced as not to provide an adequate amount of dielectric material between adjacent contact portions of the socket contacts. To insure the provision of adequate dielectric material between the contact portions of adjacent socket contacts, my improved socket contact is constructed so that the general cross sectional dimensions of the contact portion thereof is no greater than the general cross sectional dimensions of the terminal portion thereof.

Heretofore in socket contacts of the solid bar or rod type it has been the usual practice to always form the contact portion of cross sectional dimensions substantially in excess of the cross sectional dimensions of the terminal portion of such socket contacts. Hence difficulty has been experienced with such prior constructions because of the limited amount of dielectric material between the contact portions of adjacent socket contacts.

When the contacts A are assembled in the two plug sections 33 and 34 the intermediate or connecting portion 24 of the contacts is disposed in alignment with the plane of abutment of the two plug sections. The enamel insulating band 26 of the contacts is disposed in registry with the plane of abutment of the two plug sections as clearly seen in Fig. 9 of the drawings. The purpose of the insulating band surrounding each of the contacts is to raise the permissible voltage between contacts and to reduce surface leakage of current from contact to contact. As may be seen in Fig. 9 of the drawings, any leakage from one contact to another must by necessity travel a relatively long circuitous path and hence it is possible to obtain the advantages of greater permissible voltage between contacts while also retaining a reduction in surface leakage of current between contacts.

Although I have herein shown and described a certain preferred embodiment of my invention manifestly it is capable of modification and rearrangement of construction features without departing from the spirit and scope thereof. I do not therefore wish to be understood as limiting this invention to the precise embodiment herein disclosed except as I may be so limited by the appended claims.

I claim as my invention:

1. A female electrical connector comprising a pair of abutting dielectric bodies having coaxial bores extending therethrough at substantially

right angles to the plane of abutment of said two bodies, the bores in both of said bodies being restricted adjacent opposite ends thereof to form a pair of shoulders, a female contact member

positioned in the core of one of said dielectric bodies and having an integral terminal portion positioned in the bore of the adjacent body, a pair of annular abutments upon said contact member spaced from each other by an annular groove provided in said contact member, said groove being in alignment with the plane of abutment of said dielectric bodies, the peripheries of each of said annular abutments being in contact respectively with each of said dielectric bodies, the surfaces of said annular abutments and the surface of said contact member defining said groove carrying a dielectric material, the end of said contact member abutting against one of said shoulders and one of said annular abutments being in contact with the other shoulder to confine said contact member in said bores.

2. A female electrical connector comprising two solid dielectric bodies disposed in abutting relationship to each other, a female contact member positioned in one of said bodies, said female contact member having an integral terminal portion positioned in said adjacent dielectric body, a pair of peripheral abutments upon said contact member spaced from each other by a peripheral groove, said groove being in alignment with the plane of abutment of said dielectric bodies, and the surfaces of said peripheral abutments being coated with a dielectric material and being in contact with the respective dielectric bodies.

3. A female electrical connector comprising two solid dielectric bodies disposed in abutting relationship to each other, a female contact member positioned in one of said bodies, said female contact member having an integral terminal portion positioned in said adjacent dielectric body, a pair of spaced annular abutments upon said contact member, separated by an annular groove provided in said contact member, the plane of abutment of said dielectric bodies being in alignment with said groove, the periphery of each of said annular abutments being in contact respectively with each of said dielectric bodies, the surface of said annular abutments and the surface of said contact member defining said groove carrying a dielectric material.

EDWARD CLARKE QUACKENBUSH.

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