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R. S. THACKER

2,497,568

ELECTRICAL CONTACT DEVICE

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Fig. 1.

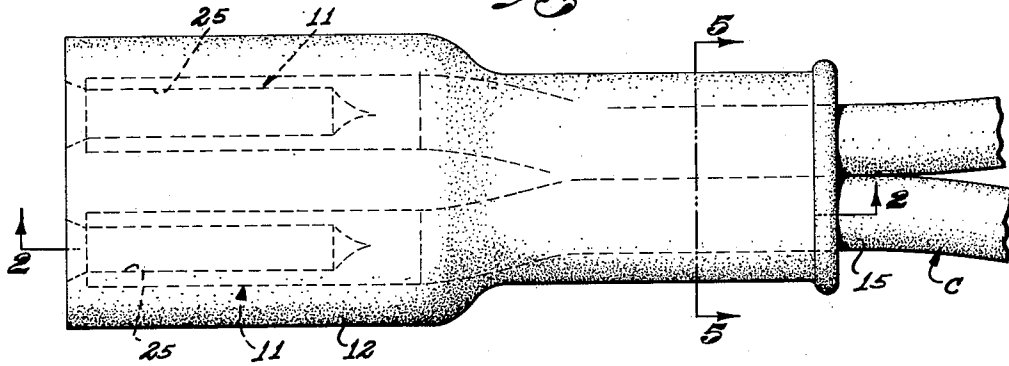


Fig. 2.

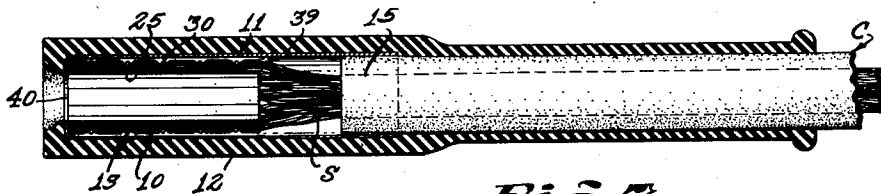


Fig. 3.

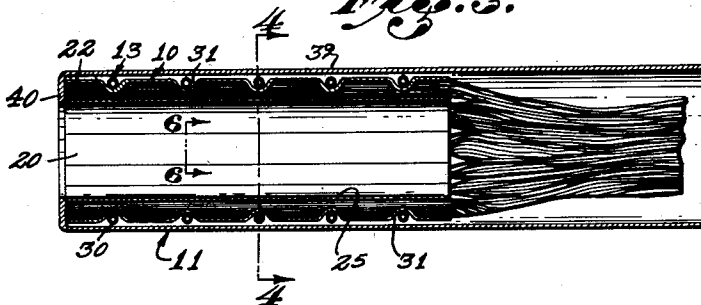


Fig. 4.

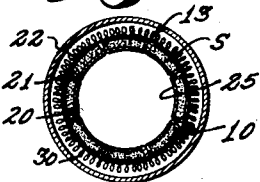


Fig. 5.



Fig. 6.



INVENTOR,

RALPH S. THACKER

BY

ATTORNEY

UNITED STATES PATENT OFFICE

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ELECTRICAL CONTACT DEVICE

Ralph S. Thacker, Windsor Hills, Calif.

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8 Claims. (Cl. 173-332)

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This invention has to do with an electrical contact device and has particular reference to a socket for a pin type contact device. A general object of the invention is to provide an inexpensive, simple and highly efficient contact device particularly useful on stranded cable.

Electrical contact devices in the nature of sockets have been made in various manners. However, the usual socket for receiving a pin member involves a longitudinally split contact sleeve, one end of which is open to receive the pin while the other end is joined to the lead line or wire. Such split sleeve type sockets establish limited contact with the pin and, in practice, there is a substantial voltage drop or electrical loss across such connection.

It is a general object of this invention to provide a socket type connector involving, generally, a plurality of free or floating contact segments for engaging the pin, each of which is free to establish a separate and most effective contact with the pin.

Another general object of the invention is to provide an assembly of the engaging segments such as I have hereinabove referred to with means whereby the segments are yieldingly urged into effective engagement with a pin arranged in the device. In accordance with my invention the several segments are elongate members connected directly with the ends of the strands of a cable. Springs surround the assembly of segments bearing on each one to urge it inwardly into bearing engagement with the pin.

Another object of my invention is to provide a socket contact device of the general character hereinabove referred to in which the segments are carried in a simple sleeve which serves to receive the end portion of the insulation on a cable or line connected to the device forming with the cable a complete operative structure which may be used without amplification or around which insulating material can be readily formed or molded to form a carrier or body.

Another object of the present invention is to provide a contact device of the general character referred to in which the individual contact members which enter into the tubular assembly for receiving the pin are simple tubes applied over the strands of the cable to which the device is connected, which tubes are intimately bonded to the material of the strands by being formed around the strands through the application of external pressure.

The various objects and features of my invention will be fully understood from the following

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detailed description of a typical preferred form and application of the invention throughout which description reference is made to the accompanying drawings, in which:

Fig. 1 is a top or plan view of an electrical contact device or plug embodying the present invention and showing it assembled on or in contact with a pair of electrical cables. Fig. 2 is a longitudinal detailed sectional view of the structure of the present invention, being a view taken as indicated by line 2-2 on Fig. 1. Fig. 3 is an enlarged view of a part of the structure being a longitudinal sectional view of the contact parts shown applied over the ends of the strands of a cable and showing the retaining sleeve around the contact parts. Fig. 4 is a transverse sectional view taken as indicated by line 4-4 on Fig. 3. Fig. 5 is a transverse sectional view taken as indicated by line 5-5 on Fig. 1, and Fig. 6 is an enlarged detailed sectional view of one of the segments taken substantially as indicated by line 6-6 on Fig. 3, showing it apart from the other elements of the construction.

The structure provided by my present invention is applicable, generally, to sockets for receiving electrical connectors of the pin type. For example, it may be used to advantage in a construction suitable for receiving an electrical connector of the general type or form which is set forth in my companion application, entitled "Electrical connector," filed on even date herewith, Serial No. 558,944. In the present disclosure I set forth a simple embodiment of the invention wherein there are two units of the invention incorporated in a single structure to handle a pair of pin contacts. In practice a device may involve but one unit of the invention or it may involve many units and these may be alike or they may be of different sizes or shapes. The construction that I have provided may be used in each of the units of the construction and, therefore, it is to be understood that the following description of one of the units may apply equally well to the other.

The structure that I have provided can be used most advantageously in connection with an electrical conductor or cable C involving a plurality of strands S wound or wrapped together in the manner common to stranded cables. The construction that I have provided involves, generally, a contact part or segment 10 on or in connection with each strand of the cable, which contact parts are such as to form a tubular assembly for the reception of a pin type electrical contact, means 13 yieldingly urging the contact parts in-

wardly, a retaining sleeve 11 which surrounds the assembly of contact parts and which also receives the end portion of the cable C, and if desired a body 12 of insulating material, preferably a rubber or rubber-like composition, cast or otherwise formed around the assembly of contact parts and sleeve and, in the preferred form of the invention, around the end portion of the cable C as well.

When a standard cable C, which as I have shown in the drawings, is used, I remove the insulation 15 of the cable from the end portion of the cable so that suitable lengths of the strands S of the cable are exposed. The several strands which are substantially round in cross section, being an assembly of fine wires, are separated and the contact parts that I have provided are applied thereto.

Each contact part or segment 10 is in the form of a straight tube. In practice I prefer to use simple round tubing of a size that will slidably receive a strand S of the cable C and I prefer to form the tubes of a good electrical conducting material such as copper. In accordance with my invention I apply external pressure to the tube while it is on the end of the strand S so that the tube is compressed onto the strand and is formed so that it is segmental in cross sectional configuration, as shown in Fig. 6. The desired pressure may be applied by means of a die or forming device which gives the tube the desired shape.

In the preferred form of the invention I apply pressure to the tube so that the several wires of the strand S within the tube are pressed into intimate contact with each other and with the interior of the tube and the tube is formed to have a concave inner wall 20, substantially flat radial side walls 21, and a convex outer wall 22. In practice I may apply sufficient pressure so that the wires of the strand in contact with the interior of the tube are flattened against the tube and the several wires are brought into contact with one another so that they are substantially polygonal or hexagonal in cross sectional configuration.

I form the inner wall 21 of the contact to have a radius that will conform to that of the pin to be used with the device, and I form the outer wall 22 so it is substantially concentric with the inner wall. The circumferential extent of each contact part is governed by the number of strands and corresponding contact parts employed in the construction. For instance, where I have employed a cable with eight strands, as illustrated in Fig. 4, each contact device extends around through an angle of about 45 degrees. In practice I proportion the several contact devices so that they assemble into an annular body such as is shown in Fig. 4 which body forms a pin receiving opening 25 somewhat smaller than the pin to be inserted in the device when the adjacent contact parts are in contact with each other. In practice I prefer to suitably dress the forward inner cover of each contact part to facilitate insertion of a pin into the assembly.

The means 13 provided for yieldingly urging the contact parts 10 inwardly involves a plurality of annular spring elements 30 surrounding the assembly of contact parts. Each contact part is provided in its outer wall at suitable points along its length with indentations or notches 31, and the notches of the several contact parts register forming annular channels or grooves around the assembly of contact parts to receive or to accommodate the spring members 30. In

the preferred form each spring member 30 is a helical spring arranged in a loop with its ends joined together forming what is commonly termed a garter spring. In the preferred construction the springs 30 and the notches 31 are proportioned so that the spring seat in the notches and do not project radially outward beyond the outer walls 22 of the contact parts. In some cases the springs may be merely applied around the assembly without being received into the contact parts.

The application of force or pressure to the exterior or outer part of each contact part to form the notches 31 therein creates very high pressure or compressive force at the points where the notches occur and, in effect, establishes a crimped condition in the strands or between the strands and the contact tubes positively preventing displacement of the contact tubes from the strands.

The retaining sleeve 11 is preferably a simple, tubular part which carries the assembly of contact parts so that there is a suitable clearance between the exterior of the annular assembly of contact parts and the inner wall of the sleeve. The clearance thus provided is such as to allow for some spreading or outward radial movement of the contact parts under the influence of a contact plug inserted into the assembly.

The sleeve 11 is somewhat longer than the contact parts and the parts are arranged so that the assembly of contact parts is located in the forward end portion of the sleeve. An inwardly projecting radial flange 40 is provided at the forward end of the sleeve to form a stop or limiting shoulder for the forward end of the assembly of contact parts. The rear end portion of the sleeve projects inward beyond the assembly of contact parts and beyond the point from which the strands have been bared by removal of insulation 15 so that the end portion of the body of insulation 15 on the cable C is carried within the sleeve. This relationship of parts is clearly illustrated in Fig. 2 of the drawings. The structure formed by the assembly of contact parts and the sleeve 11 may be used without any additional parts.

The body 12 when used is preferably a molded or cast body of insulating material which encases the sleeve and the end portion of the cable C. In the particular case illustrated there are two cables and the sleeves with their assemblies of contact parts are molded or cast in side by side relation in the body 12. It will be apparent that by having provided a sleeve around the assembly of contact parts, which sleeve has the inwardly turned flange 40 at its forward end and has engagement over the forward end portion of the insulation 15 on the cable C, it is a very simple operation to mold a body of insulating material, such as rubber or the like, around the sleeve and cable without in any way affecting or complicating the other parts of the structure. It will be noted from an examination of Fig. 2 of the drawings that there is a short length of exposed strands S between the end of the insulation 15 and the assembly of contact parts giving slight longitudinal play or yieldability to the contact parts.

From the foregoing description it will be apparent that I have, by my present invention, provided a construction in which each individual strand of the cable C has an individual contact part directly and intimately joined therewith, which contact part is to a limited extent loose or

free floating to have individual engagement or

contact with a pin inserted in the assembly of contact parts. The springs surrounding the assembly of contact parts act on each and every one of the contact parts normally urging it inwardly and since there is no mechanical tie between the contact parts except through the springs and the cable strands, each contact part is free to center and seat itself on the exterior of the pin or plug to establish a highly efficient seating engagement or electrical contact.

Having described only a typical preferred form and application of my invention, I do not wish to be limited or restricted to the specific details herein set forth, but wish to reserve to myself any variations or modifications that may appear to those skilled in the art and fall within the scope of the following claims:

Having described my invention, I claim:

1. An electrical socket including a plurality of individual contact parts forming a tubular assembly to receive a pin and each having an opening to receive an electrical conductor, a yieldable element surrounding the assembly of contact parts to yieldably urge each one inwardly, a sleeve surrounding the assembly and said elements, and a body of insulating material surrounding the sleeve.

2. An electrical socket including a plurality of individual contact parts forming a tubular assembly to receive a pin and each being a tube adapted to be connected with an electrical conductor, a yieldable element surrounding the assembly of contact parts to yieldably urge each one inwardly, and a member surrounding and housing the assembly of contact parts.

3. In combination a stranded cable, a tubular contact on each strand of the cable, the contacts being arranged to form an annular socket, means normally yieldably urging the contacts inwardly, a sleeve around the contacts, and a body around the sleeve, the body being formed of insulating material.

4. In combination a stranded cable, a tubular contact on each strand of the cable, the contacts being arranged to form an annular socket, means normally yieldably urging the contacts inwardly, and an insulating member around the contacts, each contact being shaped around the strand contained therein to have a concave inner face.

5. In combination a stranded cable, a tubular contact on each strand of the cable, the contacts being arranged to form an annular socket, means

normally yieldably urging the contacts inwardly, a sleeve around the contacts, and a body of insulation around the sleeve, each contact being tight on the strand contained therein and having a concave inner face and substantially flat radial sides and a convex outer face concentric with the inner face, there being notches in the outer faces of the contacts, said means including an annular helical spring carried in the notches.

6. In combination a stranded cable, a tubular contact on each strand of the cable, the contacts being arranged to form an annular socket, means normally yieldably urging the contacts inwardly, a sleeve around the contacts, and a body of insulation around the sleeve, the sleeve having an inwardly extending flange at the forward end of the receptacle formed by the contacts and having an inner end portion projecting beyond the said receptacle and over the cable.

7. In combination a stranded cable including conducting strands and insulation over the strands except at their end portions, a tubular contact on the end portion of each strand of the cable, the contacts being arranged to form an annular socket, means normally yieldably urging the contacts inwardly, and an insulating member surrounding the socket formed by the contacts.

8. An electrical socket for use on a stranded cable including a plurality of individual tubular contacts each having a strand of the cable extending into it and all assembled to form a socket, each contact having an inwardly indented portion to grip the strand within it, and a yieldable member surrounding the assembly of contacts and held by the notch portions of the contacts.

RALPH S. THACKER.

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