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CONTACT SOCKET

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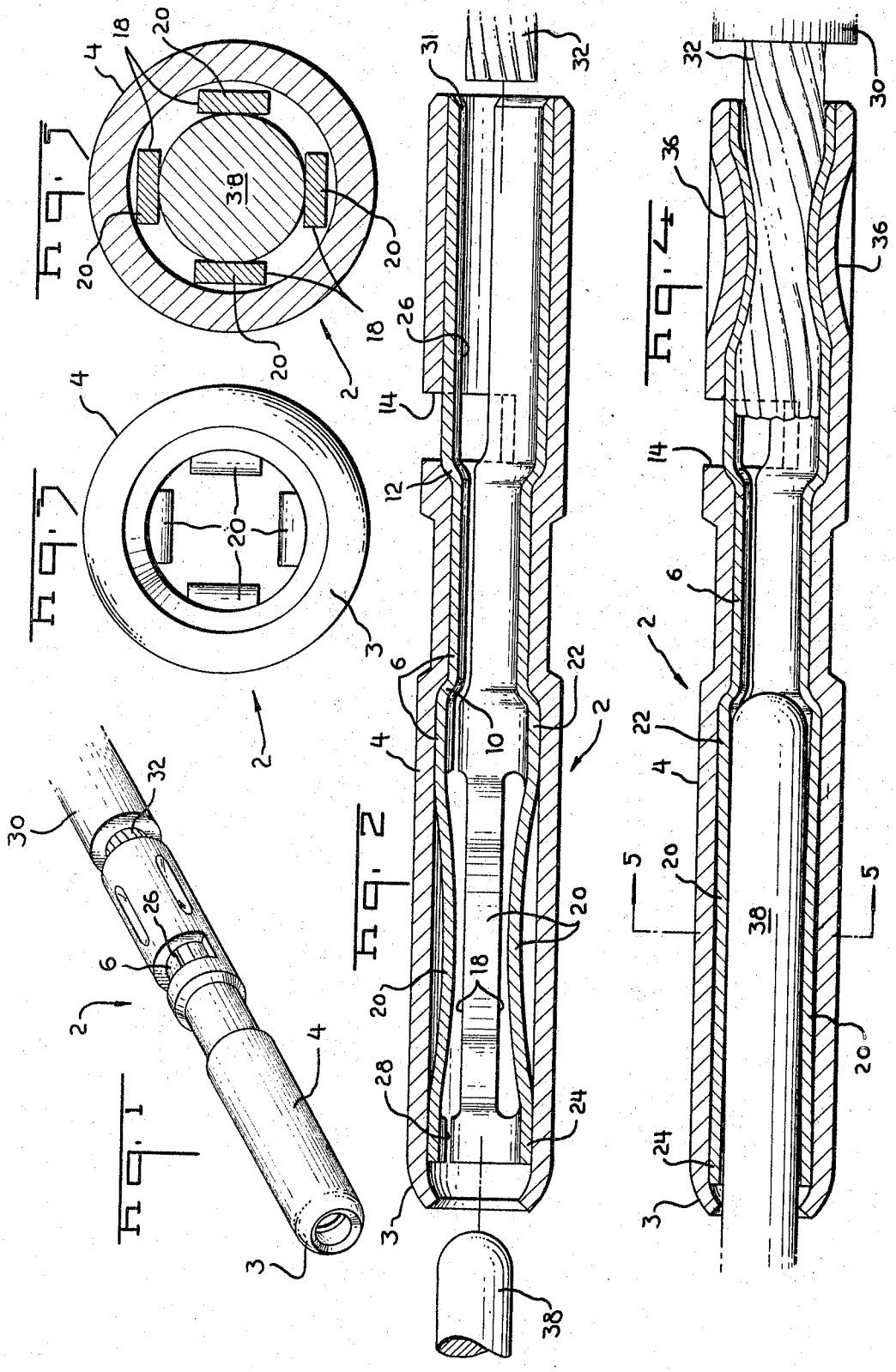

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This invention relates to contact sockets of the type adapted to receive a complementary contact pin to form a disengageable electrical connection.

An object of the invention is to provide an improved contact socket. A further object is to provide a contact socket incorporating a contact spring means which functions as the primary current-carrying element of the socket. A further object is to provide a contact socket which can be made, at a reasonable cost, in a size adapted for usage with relatively fine wires. A still further object is to provide a contact socket having a contact spring therein which is totally protected against damage as a result of abusive handling. A still further object is to provide a contact socket incorporating a contact spring of a metal having optimum spring characteristics.

These and other objects of the invention are achieved in a preferred embodiment thereof comprising a cylindrical sleeve in which there is contained a thin-walled contact member extending substantially the full length thereof. The contact member is provided with axially extending slots at the pin-receiving end of the socket to form a plurality of axially extending elements which are bowed inwardly relative to the socket axis whereby they function as semi-elliptic springs which exert a contact force on the inserted pin. The tubular sleeve and the contact member are crimped onto the end of a wire at the rearward end of the socket so that the contact member is in direct electrical contact with the wire. The contact member thus functions as the primary current-carrying element of the socket with the tubular sleeve functioning primarily to support and protect the contact member and to hold the crimped portion of the contact member against the wire end.

In the drawing:

FIGURE 1 is a perspective view of a contact socket in accordance with the invention;

FIGURE 2 is a sectional side view of the socket of FIGURE 1;

FIGURE 3 is an end view of the socket of FIGURE 1;

FIGURE 4 is a view similar to FIGURE 2 but showing a contact pin in position in the socket; and

FIGURE 5 is a view taken along the lines 5—5 of FIGURE 4.

A preferred form of socket 2, in accordance with the invention, comprises an outer tubular sleeve 4 and cylindrical contact member 6 contained in the sleeve and extending for the full length thereof. Sleeve 4 advantageously has a wall which is relatively thick, in comparison to the wall thickness of the contact member 6, and may be of machined stock, draw tubing, or stamped and formed sheet metal construction. As will be explained below, this outer sleeve does not function primarily as a current-carrying member so that it can be of a metal having an optimum balance of strength and crimping characteristics. Thus the sleeve 4 may be of bronze or of a relatively soft brass and in any event should be relatively malleable so that it will respond readily to the crimping operation.

The inner contact member 6 is advantageously manufactured by stamping and forming of a relatively thin sheet metal having good electrical properties and good spring properties, for example, beryllium copper. Contact member 6 will thus have an open seam as shown in 26, 28. Both the sleeve 4 and the contact member 6 have a reduced diameter constricted portion intermediate

their ends which form abutting conical surfaces as shown at 10 and 12. This constriction cooperates with a suitable constriction in the cavity in the connector block to retain the cavity in the block. The pin-receiving end of the sleeve 4 is advantageously formed inwardly of the socket axis as shown at 3 to retain the contact member within the sleeve. Advantageously, the diameter of the opening of the end 3 of the socket is slightly less than the inside diameter of the cylindrical portion 24 of the contact member in order to prevent damage to the contact member by insertion of an oversized test probe or contact pin.

A plurality of axially extending slots 18 are provided in the contact member 6 at the pin-receiving end of the socket to define a plurality of axial elements 20. These elements are formed inwardly with respect to the socket axis and function as semi-elliptic contact springs for engagement with the pin contact.

The socket 2 is secured to the end of the wire 30 by merely inserting the stripped end 32 into the end 31 of the socket until the end of the wire is visible through the inspection slot 14. The end 31 of the socket is then crimped onto the wire with a suitable crimping tool, the disclosed embodiment of the invention being crimped to the wire by means of four circumferentially spaced indentations 36. The crimping of the end 31 of the sleeve 4 has the effect of pressing the end portion of the contact member 6 against the surface of the wire thereby to form the electrical connection between the wire and the socket.

A salient advantage of the invention is that the sleeve member 4 functions only as a casing for the contact member 6 and as a crimping barrel for holding the contact member against the wire. Thus, since this sleeve 4 is not called upon to perform any spring function or any current-carrying function, it can be of a metal having optimum physical properties for its intended use. From the standpoint of crimping, it is desirable that the sleeve should be of a relatively soft and malleable material such as a relatively soft brass or a bronze as previously noted. Materials such as these can be crimped with ease and without any danger of cracking as is likely to happen with a relatively hard and brittle material. The contact member 6 on the other hand, can be made of a metal having an optimum balance of spring characteristics and electrical conducting ability and need not be a material which would ordinarily be regarded as having good crimping characteristics. In other words, the indentations in the sleeve 4 firmly press the internal surface of the contact member 6 against the wire and establish a high interfacial contact pressure in the crimp even though the contact member itself is of a material which is inherently resistant to the crimping operation and would, by itself, be incapable of forming a high-quality crimped connection.

The inwardly formed elements 20 of the contact member constitute semi-elliptic springs, each spring being integral at one end with the cylindrical portion 22 of the contact member and being integral at its forward end with the cylindrical portion 24. Upon insertion of the contact pin 38 onto the socket, these springs are partially flattened and the cylindrical section 24 of the contact member is moved a very short distance leftwardly towards the mouth of the socket. This movement of the cylindrical section 24 is very slight and is hardly perceptible where the contact is made in a relatively small size, however, it is essential to the proper functioning of the semi-elliptic springs 20 and this movement must be permitted to take place when the contact pin is inserted. It follows that the end of the cylindrical section 24 should not be disposed against a shoulder or other obstruction in the bore of the sleeve member 4. As is apparent from the

drawing, a slight amount of movement can take place in the disclosed embodiment since the inwardly formed end 3 of the sleeve member is located beyond the end of the contact member. This feature of permitting the semi-elliptic springs 20 to be flattened (rather than being buckled or compressed) upon insertion of the pin results in a socket contact having an easily controlled insertion force for the contact pins. It is recognized that high-quality pin and socket contacts should have a consistent insertion force and a closely controlled contact force. It is further recognized that in a given group of pin and socket contacts, the insertion and contact forces of all the contacts should lie within a relatively narrow range so that the performance of the group will be predictable and consistent.

Another advantage of the disclosed embodiment of the invention is that the relatively gentle slope of the springs 20 provides a relatively long guiding surface for the pin member 38 while it is being inserted. As a result, the insertion force required builds up slowly during insertion. It is also advantageous that the wear on the spring member is evenly distributed among the four spring members when a pin is inserted.

The provision of the contact member extending to the full length of the sleeve 4 results in a device in which the contact member-wire interface is the only electrical interface between the wire itself and the pin-receiving sections 20 of the terminal. Furthermore, the contact member 6 can be economically provided with an electro-deposited plating of gold or other suitable metal over its entire internal surface prior to its being assembled to the sleeve to further enhance the electrical stability and conductivity of a crimped connection and socket contact portion in accordance with the invention. There is, of course, no necessity for providing gold plating on the sleeve member since it does not function as a current-carrying element of the socket.

We claim:

1. An electrical contact socket comprising a relatively thick-walled tubular metal sleeve member and a relatively thin-walled cylindrical metal contact member within said sleeve member, said contact socket being adapted to receive a contact pin at one end thereof and to be crimped onto a wire at the opposite end, said contact member being substantially coextensive with said sleeve member but terminating short of said one end of said sleeve member, said contact member having a plurality of axially extending slots proximate to said one end and said contact member being inwardly bowed between said slots thereby to form a plurality of axially extending semi-elliptic contact springs, said springs being integral at their forward ends with a cylindrical wall section of said contact member bearing against the internal surface of said sleeve whereby, upon insertion of a contact pin, said springs are flattened and said cylindrical wall section is moved relatively towards said one end, said other end of said socket is crimped onto an inserted wire with said sleeve member

pressing said contact member against said wire, the shape of said contact member is similar to the shape of said sleeve member at said crimped end of said socket whereby said contact member is held against said wire to establish an electrical connection therewith, said contact member providing a continuous electrical path between said wire and said pin and being protected by said sleeve member.

2. An electrical contact socket comprising a relatively thick-walled tubular sleeve member and a relatively thin-walled cylindrical contact member within said sleeve member, said contact socket being adapted to receive a contact pin at one end thereof and to be crimped onto a wire of the opposite end, said sleeve member being radially inwardly formed at said one end to define an opening for said pin, said opening having a diameter less than the diameter of said contact member, said contact member being substantially coextensive with said sleeve member but terminating short of said one end of said sleeve member, said contact member having a plurality of axially extending slots proximate to said one end and said contact member being inwardly bowed between said slots thereby to form a plurality of axially extending semi-elliptic contact springs, said springs being integral at their forward ends with a cylindrical wall section of said contact member bearing against the internal surface of said sleeve whereby, upon insertion of a contact pin, said springs are flattened and said cylindrical wall section is moved relatively towards said one end, said other end of said socket is crimped onto an inserted wire with said sleeve member pressing said contact member against said wire, the shape of said contact member is similar to the shape of said sleeve member at said crimped end of said socket whereby said contact member is held against said wire to establish an electrical connection therewith, said sleeve being of a relatively soft and malleable metal having optimum crimping characteristics, and said contact member being of a relatively hard conductive metal having a relatively high yield point and a relatively high elastic modulus.

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