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SOCKET CONTACT FOR ELECTRICAL CONNECTOR

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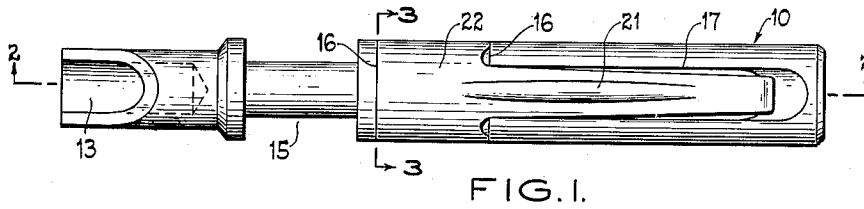


FIG. 1.

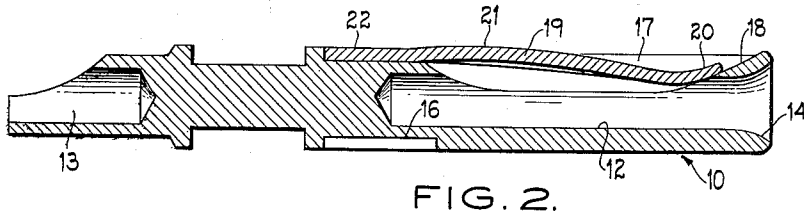


FIG. 2.

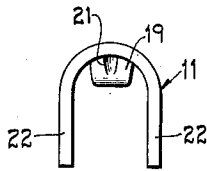


FIG. 4.

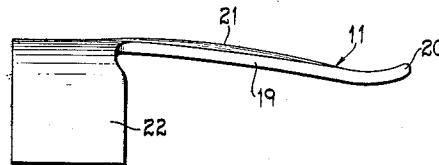


FIG. 5.



FIG. 7.

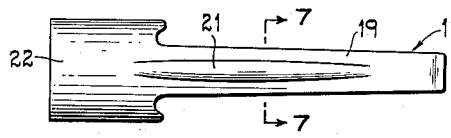


FIG. 6.

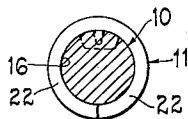


FIG. 3.

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## SOCKET CONTACT FOR ELECTRICAL CONNECTOR

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5 Claims. (Cl. 339—262)

This invention relates to electrical apparatus and more particularly to electrical connectors of the type wherein electrical connections are made by interfitting plug and socket contacts.

The advantages of the socket contact assemblies of the type comprehended by the present invention have long been recognized and many attempts have been made to provide sockets of this general type without attaining the degree of success and results attained by the present novel construction. Others have been unable to provide a structure comprising a minimum number of parts which could be readily and inexpensively fabricated and at the same time be capable of attaining the desired functional advantages throughout long periods of usage under severe operating conditions.

One of the objects of the present invention is to provide a novelly constructed socket contact for use in readily separable electrical connectors of the pin and socket type.

Another object of the invention is to provide a novel socket contact or contact assembly which is so constructed as to substantially eliminate the likelihood of damage by the insertion of an over-sized pin contact or probe or by improper manipulation of the pin contact with respect to the socket.

A further object is to provide a substantially rigid socket contact having pin retaining and contact making spring means associated therewith and secured thereto in a novel manner.

A still further object is to provide a novel socket contact assembly which is fabricated from a minimum number of parts that are novelly assembled in such manner as to facilitate assembly and insure a long and effective operating life.

The above and further objects and novel features of the invention will more fully appear from the following detailed description when the same is read in connection with the accompanying drawings. It is to be expressly understood, however, that the drawings are for the purpose of illustration only and are not intended as a definition of the limits of the invention.

In the drawings, wherein like reference characters refer to like parts throughout the several views,

Fig. 1 is a top plan view of one form of socket contact embodying the present invention;

Fig. 2 is a sectional view taken substantially on line 2—2 of Fig. 1;

Fig. 3 is a transverse section taken substantially on line 3—3 of Fig. 1;

Figs. 4, 5 and 6 are detail end, side and plan views, respectively, of the contact spring just prior to assembly with the socket body; and,

Fig. 7 is a sectional view taken substantially on line 7—7 of Fig. 6.

In the form illustrated in the accompanying drawings, by way of example, the novel electrical socket contact comprehended by this invention comprises only two parts—a body or socket member 10 and a contact spring

11. As shown, said body or socket member is a rigid metallic bar suitably drilled, machined and slotted in a novel manner to be next described. The spring 11 is fabricated from sheet metal and applied to member 10 in a permanent manner and under initial tension without the aid of supplementary fastening means of any kind.

Socket or body member 10 is preferably made from copper alloy bar stock which has been cold drawn after heat treatment. In one successful embodiment, the copper alloy consists of about 60% copper, .5 to 1% tin, .4 to 1% lead, .1% or less iron, and the remainder zinc. In another suitable embodiment the copper alloy consists of a minimum of 96.5% copper, .85 to 1.35% nickel, .15 to .35% phosphorus, .35 to .65% tellurium, a maximum of .2% iron, a maximum of .1% lead, and a maximum of 1% zinc.

One end of body member 10 is drilled to provide a bore 12 for slidably receiving a pin or plug contact (not shown), the mouth of said bore being contoured or bell-shaped, as at 14, to facilitate entry of the pin which has a diameter only slightly less, about .002—.005 inch, than the diameter of bore 12. The other end of member 10 is likewise drilled and partially cut away at one side to provide a suitable recess 13 in which the end of an electrical conductor may be secured by soldering or other suitable means. Intermediate its ends, member 10 is machined to form two annular grooves 15 and 16, the first of which is utilized in mounting the contact in a resilient support or insert, such as in the manner disclosed in Uline et al. U. S. Patent No. 2,563,762.

Groove 16 is utilized in a manner to hereinafter appear for mounting spring 11. To further accommodate said spring, the member 10 is provided with an elongated slot 17 extending radially through the wall of said member around bore 12. Said slot may be cut by means of a rotary cutter or other suitable means to terminate with the bevelled surface 18 just short of the mouth end of bore 12. The mouth of said bore is thus closed, i. e., it is constituted as a solid ring having a fixed, as distinguished from an expansible diameter. The other or inner end of slot 17 extends into groove 16, as is best seen in Fig. 2.

Spring 11 is preferably formed from a blank cut in the form of a T from fully heat treated copper alloy sheet stock, such as "Berylco #10" containing about 2.4 to 2.7% cobalt, .38 to .50% beryllium and the remainder copper. Another excellent non-magnetic metal from which spring 11 may be made is known commercially as "Inconel." This is a high nickel alloy which need not be plated and which is less abrasive on the pin contact. Spring steel may also be used. The leg 19 of the T-shaped blank constitutes a leaf spring or finger which is preferably tapered in width toward its free end and adapted to fit and flex freely in slot 17. The end portion 20 of the spring finger is curved outwardly from the center of bore 12 to engage tapered surface 18 as a stop while permitting a part of the curved portion thereof to dip into bore 12 and hence, into the path of a contact pin to be inserted in the bore for making an electrical connection in a manner well understood in the art. In order to insure adequate strength in spring finger 19 and hence the required pressure on the pin contact, a rib 21 is formed on the finger in a forming die by reciprocally deforming the opposed surfaces thereof in the manner best seen in Figs. 2 and 7.

The collar portion 22 of spring 11 is integral with finger 19 and is tightly wrapped around body 10 within groove 16. The depth of said grooves is preferably approximately equal to the thickness of collar 22 and the width of the collar is such as to closely fit between the ends of the groove. Thus, no part of spring 11 projects radially beyond the surface of the adjacent portions of body member 10. The contact assembly 10, 11 may accordingly be removably mounted within a supporting in-

sert in a desirable manner without creating interference with the free action of the spring finger. Additionally, when the spring is thus novelly constructed and mounted on the body member, it is protected from either accidental or deliberate over-stressing and is held against undesirable movement relative to body 10. The construction is preferably such that the free end of finger 19 does not project beyond the circumference of body 10 when a contact pin is in bore 12.

Prior to assembly with body 10, the collar 22 of spring 11 is bent to U shape, as seen in Fig. 4, and leg or finger 19 is shaped as above described and bent at a suitable angle to the collar for attaining the desired initial tension in the finger when the assembly is complete with the curved end of the finger resting on bevelled surface 18. The spring is then held in position on the body member with a contact pin inserted in bore 12 while two oppositely directed crimping tools having convex end surfaces cold press the sides of the U-shaped collar snugly against the bottom of groove 16. A third and similar crimping tool is then moved in at right angles to the first two for cold pressing the ends of the collar firmly against the body member. Both the body member and spring are preferably silver-plated to a thickness of from .0002 inch to .0004 inch. If desired, the ends of the wings of collar 22 may be suitably secured together or said wings may be soldered, spot-welded or similarly secured to body 10.

It will now be seen that when a contact pin or plug having a diameter comparable to the diameter of bore 12 is inserted in the latter, the curved end portion of spring finger 19 will be engaged by the pin and the spring flexed outwardly, placing it under additional tension. The spring thus yieldably presses the pin firmly against the opposite wall of bore 12 to provide good electrical conduction. The pressure exerted on the contact pin by the spring is so predetermined that it will neither be too easy nor too difficult to engage and disengage the pin and socket contacts. The present construction is such that the force required to engage a pin with the socket or disengage it therefrom will remain reasonably constant during long periods of use and excellent control of these forces is possible.

There is thus provided an electrical socket contact assembly which is highly efficient in effecting a good electrical connection and exceptionally durable in use under most severe adverse conditions. Additionally, the novel construction of said assembly obviates damage of the type which ordinarily results from carelessness or inadvertence of personnel in the use of electrical apparatus. Said assembly is also advantageously constituted by only two parts of simple construction which may in turn be readily and inexpensively made and assembled in a manner which will insure the desired engaging and disengaging force.

Although only a single embodiment of the invention has been illustrated in the drawings by way of example, it is to be expressly understood that various changes, such as in the relative dimensions of the parts, the materials used and the like, may be made therein without departing from the spirit and scope of the invention as will now be apparent to those skilled in the art. For a definition of the limits of the invention, reference is had primarily to the appended claims.

What is claimed is:

1. An electrical socket contact comprising an elongated cylindrical metallic body having an axial cylindrical bore in one end and terminating short of the other end, an annular external groove adjacent the closed end of said bore and an elongated axially extending slot in the wall thereof around said bore, said slot terminating at one end

in said groove and at its other end adjacent the open end of said bore, the wall of said slot at said other end being bevelled externally of the bore, and a contact retainer comprising a cylindrical collar received in said groove and tightly wrapped around and in intimate contact throughout its extent with the bottom surface of the groove, the outer surface of the collar having a diameter not greater than the outer diameter of said body, said retainer further comprising a resilient finger extending from said collar in said slot, said finger having a curved intermediate portion which extends into said bore when the free end portion thereof engages said bevelled surface and being normally under tension urging said free end portion into engagement with said bevelled surface, and said finger also having a longitudinally extending rib in that portion thereof between said curved intermediate portion and said collar.

2. An electrical socket contact comprising an elongated body having an axial recess for receiving a contact pin of a diameter only slightly less than the diameter of the recess and an axially extending slot in one wall thereof, both ends of said slot terminating intermediate the ends of said body, and a spring contact clip comprising a collar received in an external annular groove in said body and tightly cold pressed around and into intimate contact throughout its extent with the bottom surface of the groove, the outer surface of the collar having a diameter not substantially greater than the outer diameter of said body, said clip further comprising a resilient finger in and extending the full length of said slot, said finger being biased toward said recess and having a curved portion near the free end thereof extending through said slot into said recess for engagement with said pin, the movement of said finger into said recess being limited by the engagement of the free end portion of the finger with the end wall of said slot remote from said collar when no pin is in said recess.

3. An electrical socket contact as defined in claim 2 wherein said body is cylindrical and said clip is mounted thereon so that no part of the clip extends outside of the circumference of the body.

4. An electrical socket contact consisting of a socket member having a recess for slidably receiving a pin contact, and a resilient clip mounted on the socket member for yieldably engaging said pin contact to resist engagement and separation of the pin and socket, said clip comprising a collar portion received in an external groove in said socket member and tightly wrapped around and in intimate contact throughout its extent with the bottom surface of the groove, the outer surface of the collar having a diameter not substantially greater than the outer diameter of said socket member, said clip further comprising a resilient finger having a free fit in a closed-end slot in the wall of said socket and inherently biased toward said recess, said finger having a curved portion adapted to project through said slot into said recess to engage the pin contact.

5. An electrical socket contact as defined in claim 4 wherein the wall of said slot at the end thereof remote from said collar is bevelled and an end portion of said finger is biased toward said recess against said bevelled wall which serves as a stop for said finger when no pin contact is in place in the recess.

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