

Aug. 27, 1946.

S. N. BUCHANAN
ELECTRICAL CONNECTOR

2,406,346

Filed Sept. 11, 1943

Fig. 1.

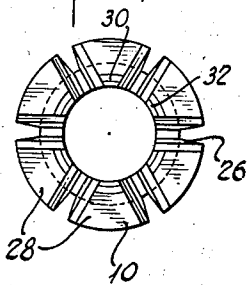


Fig. 2.

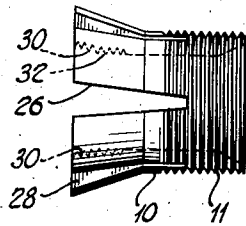


Fig. 3.

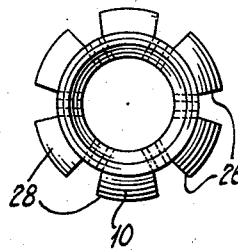


Fig. 4.

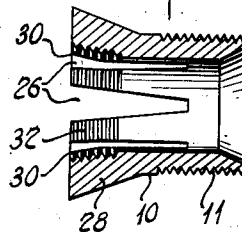


Fig. 5.

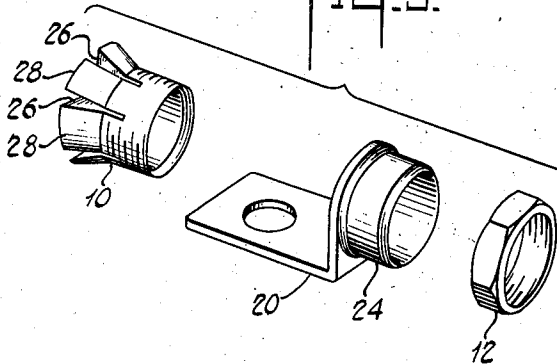


Fig. 6.

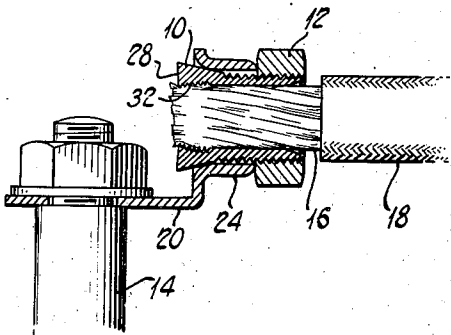
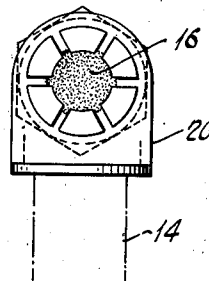


Fig. 7.



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2,406,346

ELECTRICAL CONNECTOR

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Application September 11, 1943, Serial No. 501,909

1 Claim. (Cl. 173-269)

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This invention relates to cable connectors and more specifically to a connector which may be attached to an electrical conductor to effect a strong, low-resistance connection or may at will be detached therefrom without the use of special tools.

The present invention is particularly well suited to use with stranded electrical conductors or cables, but obviously its application is not limited to conductors of the stranded type. Heretofore electrical connectors for binding conductors of this type to binding posts, terminal contacts, and the like, either have required permanent attachment to the electrical conductors, as by brazing or by soldering, or else they have involved a mechanical locking or clamping action calling for the use of special tools and fixtures in order to make a sufficiently tight bond. The electrical connectors which were permanently attached to the electrical conductors could, for many purposes, be made sufficiently strong and to give an electrical bond of low conductivity, but they suffered the disadvantage that once they were attached, they permitted of no subsequent rearrangement; that is, they could not readily be disconnected from the conductor and used elsewhere on another conductor nor could the length of the electrical conductor later be changed by cutting off the end of the conductor and reattaching the electrical connector. The majority of the electrical connectors heretofore known which have depended upon some mechanical clamping action either did not give a sufficiently tight electrical bond or else they were too complicated or cumbersome to be of great practical value.

It is an object of the present invention to provide an electrical connector whereby an electrical conductor may be connected to an electric terminal in a practical manner and wherein the electrical connector may be disconnected from the electrical conductor easily and without the use of special tools. Another object is the provision of a collet, as will be described, for use in establishing and maintaining an easily broken and rearranged electrical connection. Other objects will be in part pointed out as the description proceeds and will in part become apparent therefrom.

The present invention results from the discovery that a collet, as will be described, may be positioned within a ferrule-like sleeve and that if one end of the collet projects through the sleeve and is threaded so as to receive a collet nut, and if the other end of the collet is properly slotted

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and configured with an expanding thickness, the collet may be drawn into the sleeve by means of the collet nut with a wedging action resulting from the expanding thickness at the opposite end of the collet. If the collet itself is first telescoped over the bare end of a wire cable or any electrical conductor before the collet nut is tightened, the wedging action may be used to effect an excellent mechanical engagement and electrical contact between the collet and the electrical conductor and to form as tight a bond as may be desired between the electrical conductor and a binding post to which the electrical connector may be clamped. Moreover, any subsequent pull on the cable, etc., will tend, by wedging the collet more tightly into the sleeve, to tighten its grip on the cable, etc.

In this specification and the accompanying drawing, I have shown and described a preferred embodiment of my invention and various modifications thereof; but it is to be understood that these are not intended to be exhaustive nor limiting of the invention, but on the contrary are given for purposes of illustration in order that others skilled in the art may fully understand the invention and the principles thereof and the manner of applying it in practical use so that they may modify and adapt it in various forms; each as may be best suited to the conditions of a particular use.

In the accompanying drawing, in which a satisfactory form of the invention for achieving the above objectives is set forth:

Figure 1 is an end elevation of a collet embodying the invention;

Figure 2 is a side elevation of the collet shown in Figure 1;

Figure 3 is an elevation of the collet shown in Figure 1 but taken from the opposite end;

Figure 4 is a sectional elevation of the collet shown in Figure 2;

Figure 5 is an expanded perspective view of the collet shown in Figures 1 through 4 in association with a ferrule-like sleeve and collet nut and in accordance with the invention;

Figure 6 is a sectional elevation of the parts shown in Figure 5 in assembled relationship and clamped upon the end of an electrical conductor; and

Figure 7 is an end elevation of the parts shown in Figure 6.

With reference to Figures 1 through 4, a collet 10 is shown having an externally threaded portion 11 toward its right-hand end (see Figures 2 and 4) and being provided with a gradually in-

creasing diameter toward its left-hand end. The end of increased diameter is slotted, as at 26, and these slots taper somewhat toward the longitudinal center of the collet so that they are narrower toward their innermost points. The interior of the collet is serrated, as at 32, within its slotted, enlarged portion and each end of the cylindrically shaped passage through the collet is interiorly enlarged somewhat so as to afford a slightly flared or funnel-shaped end. The left-hand funnel-like inner enlargement of the collet (see Figures 2 and 4) is indicated at 30 and affords a clearance for a purpose to be described. The combination of slots 26 with the increasing diameter and thickness of the ferrule provides wedge-shaped segments 28 toward the left-hand end of the collet as viewed in Figures 2 and 4.

Figure 5 shows collet 10 in association with a terminal connector 20 provided with a ferrule 24 and a collet nut 12. The threaded portion of collet 10 is inserted through ferrule 24 so that collet nut 12 may be screwed onto the threads of the collet thus drawing collet 10 into ferrule 24. Connector 20 is of the type illustrated and claimed in the copending application of James O. Johnson, Serial No. 484,167, filed April 23, 1943. As pointed out in said Johnson application, this connector advantageously is made from dead soft, malleable sheet copper.

Figures 6 and 7 illustrate the manner in which the bared end 16 of a conductor 18 may be telescoped within collet 10 in association with connector 20 and collet nut 12, as indicated in Figure 6, by tightening nut 12 upon the threaded portion of the collet. The wedge-shaped segments 28 are forced inwardly into intimate contact with the wire of the conductor by means of the wedging action effected by relative movement of the collet with respect to ferrule 24. Tapered slots 26 permit the portions of greater thickness to be compressed radially. Clearance 30 gives some relief at the thicker portions of the segments, but the dimensions of the collet are such that it is impossible to draw the collet completely within ferrule 24. In one satisfactory form of the invention the cross-sectional area of the central opening in the larger end of the collet, when compressed as much as possible, is less than the cross-sectional area of the central opening in the smaller end of the collet by about 15 to 20 per cent. The over-all area at the larger end may likewise be about 15 to 20 per cent greater than that of the smallest part of the hole in the ferrule.

The sharp edges formed by slots 26 are advantageous, in that they cut into the side walls of ferrule 24, and through any oxide film thereupon,

to give a bright, low-resistance electrical contact.

During the process of drawing the collet into the ferrule some of the strands of the conductor may be caught within slots 26. These strands are flattened and extruded by the tightening of the collet and aid in sealing any interstices which might otherwise remain within the slotted collet.

Hence it is evident that an electrical connector made in accordance with the instant invention and as above described is admirably suited for easy connection upon or disconnection from an electrical conductor and that when connected a mechanical engagement of high strength can be effected.

As various embodiments may be made of the above invention and as changes might be made in the embodiment above set forth, it is to be understood that all matter hereinbefore set forth or shown in the accompanying drawing is to be interpreted as illustrative and not in a limiting sense.

I claim:

A connector for wire and the like which comprises: a dihedral member of dead soft, malleable sheet copper or the like having parallel sides normal to the dihedral angle adapted to receive a hand wrench, and having a female opening through one of the angularly related portions thereof adapted to receive a collet; a collet having an opening therethrough adapted to fit over the wire or like member to which it is to be connected and having a smaller externally threaded end portion of substantially uniform external diameter fitted into and extending through said female opening in a direction away from the other angularly related portion, the opposite end of said collet tapering to an external diameter substantially larger than said female opening and to substantially increased wall thickness, the walls of said tapering end being slotted to permit its compression to smaller diameter but the width of the slots being limited to less than would permit said tapering end to be drawn completely into the female opening, the interior surface of the tapering end being serrated for secure engagement with the wire, and the interior surface at the smaller end being smooth and smoothly rounded at its edge; and a nut threaded onto said smaller end of the collet and bearing against said female member whereby to draw said tapering end partially into the female opening and thereby to reduce its internal diameter by closing its slots.

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