

Nov. 30, 1948.

K. NEIJSTROM
ELECTRICAL CONNECTOR
Filed Jan. 7, 1944

2,454,829

Fig. 1.

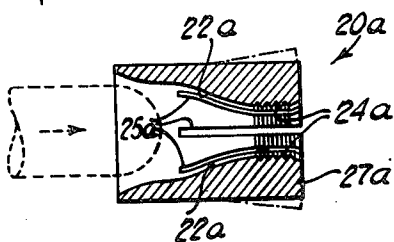


Fig. 2.

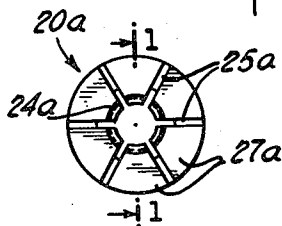


Fig. 3.

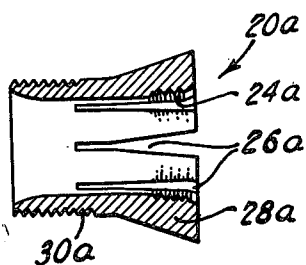


Fig. 4.

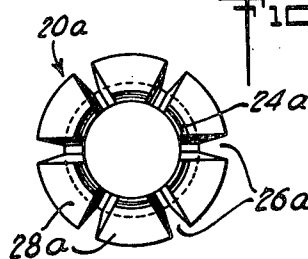


Fig. 5.

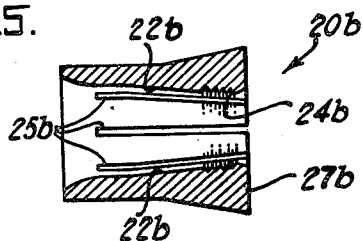


Fig. 6.

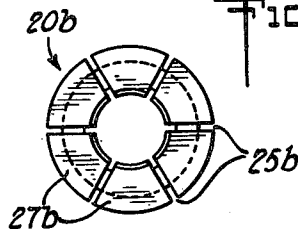


Fig. 7.

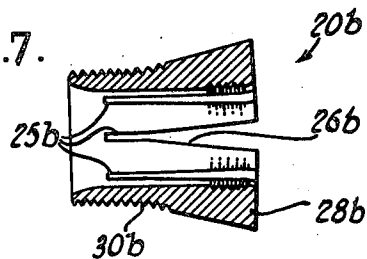


Fig. 8.

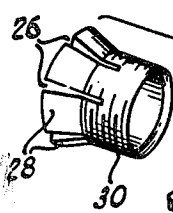
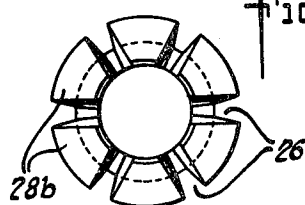


Fig. 9.

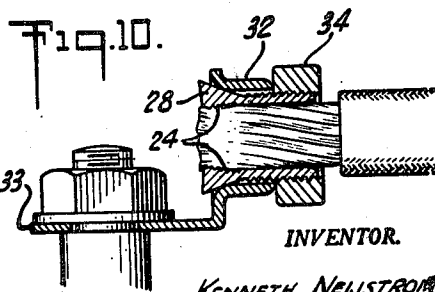
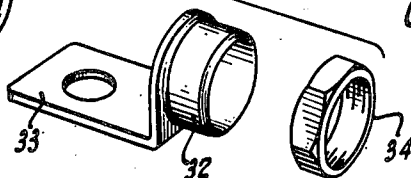


Fig. 10.

INVENTOR.

BY *Kenneth Neijstrom*
Allen Curtis & Hayward
ATTORNEYS.

UNITED STATES PATENT OFFICE

2,454,829

ELECTRICAL CONNECTOR

Kenneth Neljstrom, Harrisburg, Pa., assignor to
Aircraft-Marine Products, Inc., Elizabeth, N. J.,
a corporation of New Jersey

Application January 7, 1944, Serial No. 517,313

1 Claim. (Cl. 287—75)

1

2

This invention relates to electrical connectors and, more specifically, to a method of manufacturing electrical connectors of the collet type whereby a cable lug, for example, may readily be fastened to a conductor by a wedging action and without resort to soldering or crimping. The present method provides a rapid and practical way of fashioning such connectors.

Heretofore, a large variety of solderless electrical connectors have come into use. The copending applications of Stephen N. Buchanan, Serial No. 501,909, filed September 11, 1943, now Patent No. 2,406,346, and James O. Johnson, Serial No. 484,167, filed April 23, 1943, now abandoned, give satisfactory examples of connectors which may readily be attached to conductors by means of ordinary wrenches, and may also be disconnected. Such connectors comprise each a ferrule-like sleeve and a collet shaped to fit within the ferrule-like sleeve and to cooperate therewith in a wedging action upon the end of an electrical conductor telescoped therewithin so as to attach the ferrule-like sleeve to the conductor. The ferrule-like sleeve includes an integral tongue, or contact portion, whereby the connector may be clamped to a binding post. The present invention includes methods of manufacturing collets of the general type illustrated in these applications of Buchanan and Johnson above mentioned.

It is an object of the present invention to provide a practical method of manufacturing collets of the type above-mentioned with economy of both labor and material. A further object is the provision of novel methods and operations which may be carried out by conventional machine tools and equipment whereby a collet of the general type disclosed in the Buchanan application above-mentioned may be more readily manufactured from stock materials. Other objects will be in part pointed out as the description proceeds and will in part become apparent therefrom.

In this specification and the accompanying drawings, 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 drawings, in which exemplary embodiments and operations for achieving the above objectives are set forth and in which similar reference characters designate corresponding parts:

Figure 1 is a sectional elevation through a collet showing an early stage in a method embodying the present invention;

Figure 2 is an end elevation of the collet shown in Figure 1;

Figure 3 is a view similar to that of Figure 1 but showing the collet after a punching and spreading operation has been performed upon it;

Figure 4 is an end elevation of the collet shown in Figure 3;

Figure 5 is a sectional elevation through a collet showing how the early stages of the invention may vary from that shown in Figures 1 and 2;

Figure 6 is an end elevation of the collet shown in Figure 5;

Figure 7 is a view similar to that of Figure 5 but showing the collet after a punching and spreading operation has been performed upon it;

Figure 8 is an end elevation of the collet shown in Figure 7;

Figure 9 is an expanded perspective view showing a collet made in accordance with the invention and in association with a ferrule-like sleeve and collet nut preparatory to assembly; and

Figure 10 is an elevational view, partly in section, showing the assembled connector in use fastening the end of an electrical conductor to a terminal binding post.

With reference to Figure 1, a blank for a collet is generally indicated at 20a. The blank advantageously is fabricated from copper bar stock (rod and wire being considered herein as "bar stock") and may be used for appropriate sizes of collets; and this blank includes a bore therethrough configured with a tapering portion 22a and provided with internal threads 24a in the region where the diameter of the bore is a minimum. The blank is deeply slotted as at 25a back from the end where the bore is of smaller diameter. In Figure 2 the slotted end of blank 20a appears showing how slots 25a radiate from the center of the blank to give prongs 27a. These prongs 27a extend from the left-hand, unslotted portion (see Figure 1) of the blank and each is rendered somewhat wedge-shaped by virtue of taper 22a. Insofar as the present invention is concerned, collet blank 20a may be formed in any usual manner. Thus, for example, it may

3

be turned out as a screw machine product; it may be fashioned in a header; or it may be drilled or reamed from bar stock or otherwise prepared.

Figure 3 illustrates the collet formed from the collet blank shown in Figures 1 and 2. The blank is spread by a punch entering the bore as from the position shown in dotted lines in Figure 1, the collet being supported by a suitable holder. The diameter of the punch illustrated is substantially equal to the inside diameter of the finished collet of Figure 3, the size and shape of the punch being varied in accordance with the interior dimensions and form of the finished collet desired.

In spreading blank 20a, the taper of portion 22a is transferred from the bore to the outer surface of the collet. At the same time slots 25a, which may be made as a kerf by a conventional saw or cutter, are spread apart to form the expanding slots 26a shown in Figures 3 and 4. The interior of the bore-carrying thread 24a has been flared somewhat and the substantially cylindrically shaped outer surface of the collet on the left, as viewed in Figure 3, has been threaded, for a reason to be described hereinafter.

Except for the thread 30a the exterior of the collet has not been machined and therefore retains characteristics developed by mechanical working in the production of the bar stock from which it is made. It is therefore much more resistant to stresses resulting from bending of the prongs 28a. The retention of the longitudinally rolled or otherwise worked surfaces of the bar stock also gives a better surface for sliding over the ferrule 32 to close the prongs 28a, whereas a screw machine operation produces transverse tool marks which increase the friction when the collet is drawn into the ferrule.

In the embodiment shown in Figure 5, blank 20b has its portions on the right formed with an expanding external diameter, whereas the taper within the bore is somewhat more gradual than that disclosed in the example of Figures 1 through 4 and extends substantially throughout the bore. The external taper may be formed by a preliminary "leader" or forging operation on bar stock, or by a screw machine operation or otherwise. As in the first example, the interior surface may be formed by a screw machine operation or otherwise. Figures 7 and 8 show collet 20b after it has been spread upon a punch. It will be noted that the thread 30b may, in this form, be cut upon the blank before the punching and spreading or it may be cut afterwards. If formed on the blank, the threaded portion will be somewhat conical in the finished collet, but that is not objectionable as the prongs 28 are driven back toward the center when the nut is drawn up on these threads. The collet, after forming, should be annealed to facilitate bending back onto the wire without mechanical weakening.

4

Figure 9 shows a collet as made according to the invention in association with a ferrule-like sleeve 32 having an integral contact portion 33, and a collet nut 34. In Figure 10 the bared end of an electrical conductor has been shown inserted within the bore of the collet and the collet has been drawn into ferrule-like sleeve 32 by means of collet nut 34. Wedge-shaped prongs 28 have been forced hard against the wire and threads 24 have bitten into the wire to aid in maintaining a tight engagement and good electric contact, all as described in greater detail in said Buchanan application above-mentioned.

From the foregoing description it will be seen that a practical mode of operation has been disclosed whereby collets of the general type referred to may be fabricated, and the method of the invention does not depend upon specialized tools or unusual stock materials. 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 drawings is to be interpreted as illustrative and not in a limiting sense.

I claim:

An electrical connector collet including an integrally formed annulus and exteriorly flared end portion: said end portion being divided into prongs by longitudinally extending slots which flare in a direction away from said annulus, each arm being integrally carried by said annulus, the radial thickness of each arm being progressively less as measured inwardly from its free end, there being a substantially cylindrical bore extending axially longitudinally straight through said annulus and end portion, the grain of the metal in said prongs running longitudinally of said end portion and following the outward flare of said prongs, and the exterior surfaces of said end portion being of the compacted metal which is found on the surface of cold rolled stock, bar stock, and the like.

KENNETH NELJSTROM.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,716,331	Stowell	June 4, 1929
1,966,053	Squires	July 10, 1934
2,105,618	Silva	Jan. 18, 1938
2,214,241	Baxendale	Sept. 10, 1940
2,219,008	Drissner	Oct. 22, 1940
2,160,694	Buchanan	May 30, 1939
2,193,917	Bone et al.	Mar. 19, 1940

FOREIGN PATENTS

Number	Country	Date
510,038	France	1920