

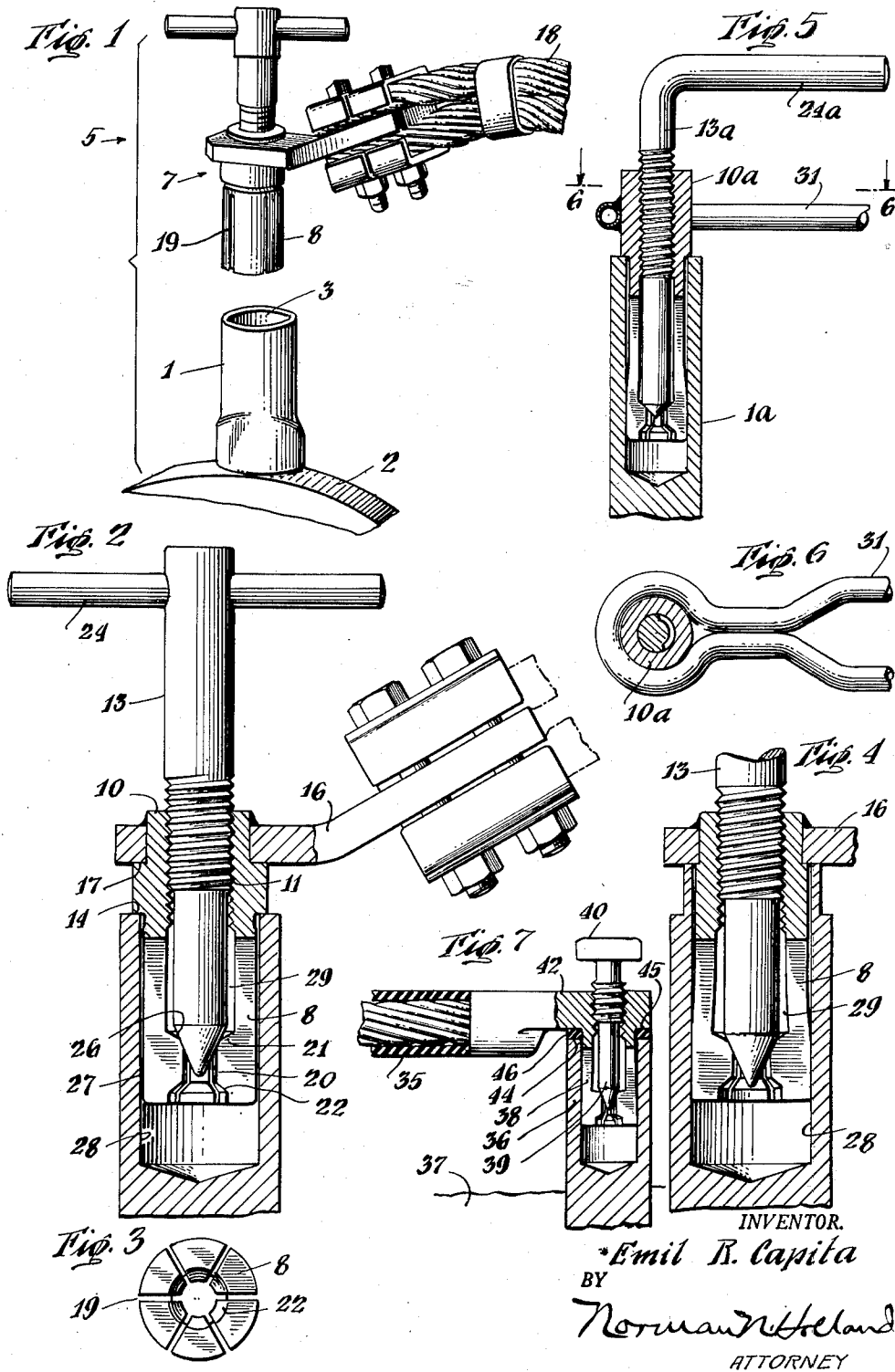
April 22, 1952

E. R. CAPITA

2,593,981

ELECTRICAL CONNECTOR

Filed July 22, 1949



# UNITED STATES PATENT OFFICE

2,593,981

## ELECTRICAL CONNECTOR

Emil R. Capita, North Bergen, N. J.

Application July 22, 1949, Serial No. 106,229

4 Claims. (Cl. 173-269)

1

The present invention relates to electrical connecting devices and more particularly to an improved electrical connector embodying parts which are readily engageable or disengageable without requiring any tools.

In the electrical industry it is frequently desired to join together or to disconnect conducting cables, conduits or the like without utilizing permanently soldered joints, yet the connection or joint should have all the desirable attributes of such a permanently soldered joint without its disadvantages of time, expense and trouble in order to make the joint and subsequently "break" it. For example, it may be desired to connect or disconnect conductors with transformers or parts of electro-plating baths in order to substitute different transformers or while doing work on the plating bath vats. Various couplings or unions have been devised in attempts to solve the problem but they have generally been objectionable due to their complicated or expensive nature or due to requiring various accessory tools in order to make and break the connection; where the work is done over an electro-plating bath the need of accessory wrenches, nuts, screwdrivers and the like is highly objectionable since they frequently accidentally drop into the vat.

The present invention aims to overcome the above and other difficulties or disadvantages by providing a new and improved electrical connecting device of relatively simple and inexpensive construction which may be readily operated to join together or to disconnect cables or conduits. The invention further contemplates the provision of such an improved device which does not require any accessory tools such as wrenches, screw drivers, nuts, bolts or the like in order to make and break the connection.

An object of the present invention is to provide a new and improved electrical connecting device.

Another object of the invention is to provide an improved connecting device which is relatively simple in construction and operation.

Another object of the invention is to provide an improved connecting device which may be inexpensively manufactured and sold.

Still another object of the invention is to provide an improved electrical connecting device which does not require accessory tools to join together or to disconnect its parts.

A still further object of the invention is to provide a new and improved electrical connecting device which may be used to connect a battery cable terminal with a battery post.

Other and further objects of the invention will

2

be obvious upon an understanding of the illustrative embodiment about to be described, or will be indicated in the appended claims, and various advantages not referred to herein will occur to one skilled in the art upon employment of the invention in practice.

A preferred embodiment of the invention has been chosen for purposes of illustration and description and is shown in the accompanying drawings, forming a part of the specification, wherein:

Fig. 1 is a perspective view illustrating one form of the present invention;

Fig. 2 is a longitudinal sectional view through a connecting device such as shown in Fig. 1;

Fig. 3 is a bottom view of the spreadable fingers and expander member shown in Fig. 2;

Fig. 4 is a fragmentary sectional view of the device shown in Fig. 2, with the fingers or prongs in a spread apart relationship;

Fig. 5 is a view partly in section showing a slightly different form of the present invention;

Fig. 6 is a cross sectional view taken along the line 6-6 of Fig. 5; and

Fig. 7 is a longitudinal sectional view showing a battery-connecting form of the invention.

Referring more particularly to Figs. 1-4 there is shown one form of the present electrical connecting device which includes a lower portion 1 secured in any suitable manner at one lower end to a transformer, conducting bar, or other device represented generally by the reference character 2. This member 1 has a recess or socket 3 adapted to receive the upper portion 5, to which is joined the conducting cable 18. The upper part of the device is shown comprising a tube-like hollow member 7 provided with a plurality of spreadable fingers or prong-like portions 8 and an annular upper portion or collar 10 having an internal screw thread 11 adapted to cooperate with a corresponding screw thread on an internal expander rod or member 13; the expander member 13 co-operates with the fingers 8 to move them in and out of engagement with walls of the lower socket portion 1, as will be hereinafter described in greater detail.

The downwardly extending finger or prong-like portions 8 may be provided by forming cuts or slits 19 in the lower portion of the hollow member 7 and each of these so formed fingers is shown with an inwardly extending projection 20 adjacent to but spaced from its lowermost end; preferably the upper and lower surfaces of these projections 20 are respectively downwardly inclined as at 21 and upwardly inclined as at 22.

The upper annular portion or collar 10 has a

3

lower shoulder 14 which is adapted to rest against the upper end of the socket member 1 to limit the extent of insertion of the member 7 into the socket 3. In addition, the collar portion preferably has an upper shoulder 17 which serves as a mounting or base for a cable-connecting plate 16, permanently attached to the collar by soldering, brazing, welding or otherwise.

The expander rod or member 13, which is threadedly engaged with the screw thread 11 of the prong member 7, has an end portion which projects upwardly beyond it at all times and also a lateral extension 24 for facilitating rotation of the expander and movement of it in and out of the hollow member 7.

As the expander member is rotated into the hollow member 7, a tapered lowermost end 26 thereon comes into contact with the downwardly inclined upper surface 21 of the inwardly extending finger projections 20 and serves to spread them outwardly so that outermost surfaces 27 move into contact and firm engagement with inner surfaces 28 of the socket member 1. The co-operating inclined surfaces 21 and 26 on the fingers and expander member, respectively, facilitate gradual expansion of the fingers into contact with the socket walls and gradual increasing resistance to rotation of the expander member 13. The expander may be screwed inwardly far enough and firmly enough to give a very firm or tight engagement between the finger outer walls and the inner socket walls.

It will be noted that the engaging walls are each shown uninterrupted along their lengths; there are no shoulders or "breaks" which would interfere with insertion or removal of these two members with respect to each other. These smooth and longitudinally uninterrupted wall portions have been found to give excellent results in actual practice without requiring any interlocking shoulders or recesses.

When it is desired to separate the upper portion of the connector from the lower socket member 1, the expander member 13 may be rotated to move its lower end away from the inward projections 20 of the fingers; this releases the expanding pressure and allows the fingers to yield inwardly so that the upper portion 5 of the device may be readily separated from the socket member 1, thereby disconnecting the cable or conductor 18 from the transformer or conductor 2 to which the socket member 1 is secured.

The respective outer and inner diameters of the finger portions 7 and socket member 1 are preferably such as to permit free or easy insertion of the former into the latter when the fingers 8 are in fully collapsed or unspread relationship; a slight amount of play or looseness between these mating diameters is not objectionable.

It will be noted that the portion of the expander rod 13 below the threads thereof is of reduced diameter, so that it is in effect provided with a recessed portion that extends from the lower end of the thread to its free end. There is thus provided a clearance between the outermost unthreaded portion of the expander rod 13 and the inner surface of the finger portions 8 which extends from the inward projections 20 to the thread 11 at the upper part thereof. This provides free movement of the expander rod at the interior of the fingers 8 until the lowermost end thereon comes into contact with the in-

4

clined upper surfaces 21 of the projections 20. The finger portions 8 commence to spread apart only upon such contact, the lowermost outer portions of the fingers first coming into engagement with inwardly facing surfaces of the socket walls and thereafter adjacent portions move progressively into contact therewith as the expander member is turned further into the finger member.

In addition to providing a desirable initial easy rotation and movement of the expander member the construction provides a highly desirable firm engagement of the fingers from their bottommost portions and extending upwardly therealong, so that the greatest engaging pressure occurs at the deepest part of the socket and hence serves to hold the parts firmly together even though they might be subjected in unusual cases to forces which tend to pull them apart from each other. Even though the finger members should be pulled partially out of the socket 3, a maximum holding pressure is still exerted by the lower portions of the fingers which continue to engage with another higher up portion of the socket wall.

Instead of providing the lower end of the expander member 13 with the cut away or recessed lower portion 29, the inwardly disposed walls of the finger members 7 may be cut away or recessed to thereby provide a similar clearance or space between the fingers and the expander member 13. While any suitable dimensions may be utilized, depending upon the size of the device, in one instance a clearance at each side of the expander member 12 of about  $\frac{1}{32}$ " to  $\frac{3}{64}$ " gives good results.

In some instances, particularly with high frequency currents, it is desirable to prevent excessive heating of the connecting device and in Figs. 5 and 6 there is shown one means for cooling such a device. As there shown a length of copper tubing is connected and extends around the collar portion 16a, fitting closely against the exterior surface of the collar. A shoulder such as the shoulder 17 in Fig. 2 may be provided if desired. The length of tubing may be brazed, soldered or otherwise fixed to the collar. Any type of connections may be made with the hollow tubing 31 so that water or other cooling fluid may circulate through the tubing to remove heat transmitted to the tubing from the device. The tubing 31 may comprise a portion or extension of a high frequency heating coil.

With the exception of the incorporation of the length of cooling tubing 31 in lieu of the connecting plate 16 of Figs. 1-4, and the provision of a spreader rod or member 13a having only a single laterally projecting arm 24a, the connecting device of Fig. 5 is similar in construction and operation to that hereinabove described in connection with Figs. 1-4.

Fig. 7 illustrates a form of the invention which may be utilized to connect a cable 35 with a post 36 of a battery 37. The battery post 36 itself serves as a socket member and has an opening therein to receive the hollow finger or prong member 38 and the interior expander member 39. Inward movement of the expander member 39 into the finger member 38 serves to expand the fingers into engagement with the socket walls as previously described and outward movement of the expander member allows the prongs or fingers to move toward each other in connection with separation of the parts. The expander member 39 may have lateral projections like

those indicated by the reference numerals 24 and 24a of Figs. 2 and 5 or they may be in the form of "wings" 43; the projection may be an enlargement with knurling or flat sides for facilitating holding and turning of the expander member.

Adjacent shoulders 44 and 45 of the socket member or battery post 35 and of the connecting plate or extension 42, respectively, preferably seat against an intermediate gasket 46 of rubber or other suitable material. This gasket seals off the area of contact between the prongs and the interior walls of the socket member and thereby prevents acid fumes from the development of corrosion at the areas of contact. There is thus provided a connection which remains highly efficient over long periods of time.

As shown in Fig. 7, the connecting plate or member 42 is integral with the prong member 38 and has a recess into which is fitted the end or cable 35. The cable may be retained therein by solder or otherwise.

The socket member, hollow finger or prong member and expander member of the present device may be made from any suitable material, for example, copper or brass. Likewise, the connecting plate or length of cooling tubing may be of copper or brass. It is not necessary that any special spring materials be utilized for the expander member; the smooth engaging walls of the present device co-operate to give an excellent gripping engagement and yet one which permits ready separation of the parts when "unlocked" by the expander member.

It will be seen that the present invention provides a new and improved electrical connecting device which may be readily assembled or disassembled to connect or disconnect cables or conduits joined with the respective separable parts of the device. The finger member fits easily and smoothly into the socket member without requiring any interlocking or interengaging shoulders or grooves and the spreader member moves easily in and out of the finger member to effect engagement or disengagement of it with walls of the socket member. The inwardly extending projections adjacent the lower ends of the finger members co-operate with the expander member to lock the parts together firmly at the bottom or lower portions of the socket member and the co-operating inclined surfaces of the expander and finger members provide application of gradual increasing pressure to engage the parts together. There are no loose parts such as nuts, washers or bolts which may loosen and drop into a vat or adjacent machinery; no tools or accessories such as wrenches, screw drivers or the like are required to engage or disengage the parts from each other. A cable or other conduits may be readily clamped and bolted together with a laterally extending arm or flange carried by the finger member and this may be done at a location removed from any vat or machinery.

When utilized for connecting a cable with a battery or the like, the rubber sealing gasket between the adjacent seating surfaces of a prong member and a socket member effectively seals off the area of contact between these two members and thus maintains them clean and free from acid fumes at all times.

As various changes may be made in the form, construction and arrangement of the parts herein without departing from the spirit and scope of the invention and without sacrificing any of its advantages, it is to be understood that all

matter herein is to be interpreted as illustrative and not in a limiting sense.

Having thus described my invention, I claim:

1. An electrical connecting device of the class described for connection with a socketed member comprising, a generally tubular member insertable into said socket having an interiorly threaded upper portion and depending prongs, each prong having an inwardly extending spreader projection, and an elongate expander rod extending into said tubular member having an inwardly sloping lower end for forcing said spreader projections and prongs radially outwardly and having an exteriorly threaded portion in engagement with the threaded upper portion of said tubular member, said rod having a length greater than the distance from said spreader projections to the upper end of the tubular member so that an upper portion of the rod projects above the tubular member at all times, and means secured to and projecting laterally from said expander rod above said tubular member for rotating the rod and adjusting its lower sloping end toward and away from said spreader projections.

2. An electrical connecting device of the class described for connection with a socketed member comprising, a generally tubular member insertable into said socket having an interiorly threaded upper portion and depending prongs with curved exterior surfaces together forming a generally cylindrical exterior, each prong having an inwardly extending spreader projection, electric conducting means projecting laterally from said upper portion of the tubular member, and an elongate expander rod extending into said tubular member having an inwardly sloping lower end for forcing said spreader projections and prongs radially outwardly and having an exteriorly threaded portion spaced above said sloping lower end and in engagement with the threaded upper portion of said tubular member, said rod having a length greater than the distance from said spreader projections to the upper end of the tubular member so that an upper portion of the rod projects above the tubular member and above said electric conducting means at all times, and means secured to and projecting laterally from said expander rod above said tubular member and above said electric conducting means for rotating the rod and adjusting its lower sloping end toward and away from said spreader projections.

3. A device as claimed in claim 1, in which a connecting plate is secured to said upper portion of said tubular member and projects laterally therefrom.

4. A device as claimed in claim 1, in which a cooling conduit is secured to said upper portion of the tubular member and extends along a portion thereof.

EMIL R. CAPITA.

#### REFERENCES CITED

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

#### UNITED STATES PATENTS

Number	Name	Date
1,284,424	Morrison	Nov. 12, 1918
1,605,904	Van Brunt	Nov. 2, 1926
1,788,089	Farrell, Jr.	Jan. 6, 1931
1,894,984	Ericksen et al.	Jan. 24, 1933
1,908,007	Bende	May 9, 1933