May 8, 1956 W. J. KOLSTAD 2,745,076

ELECTRICAL CONNECTOR

Filed Nov. 16, 1954

Fig. 1

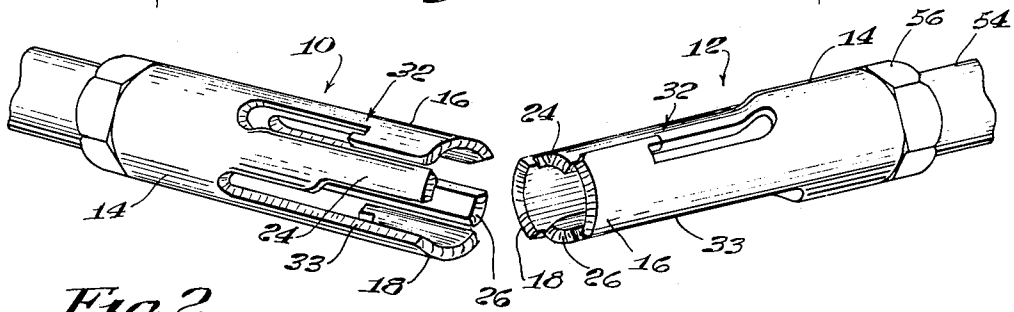


Fig. 2

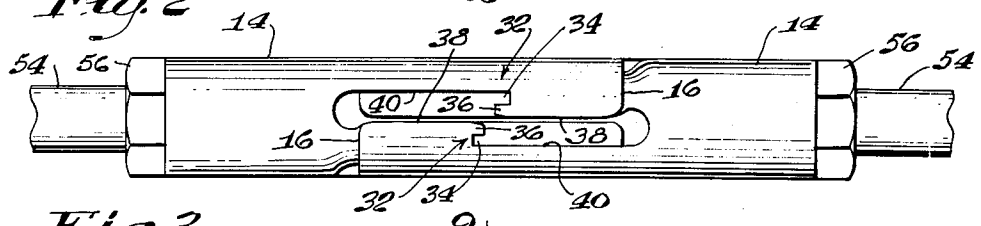


Fig. 3

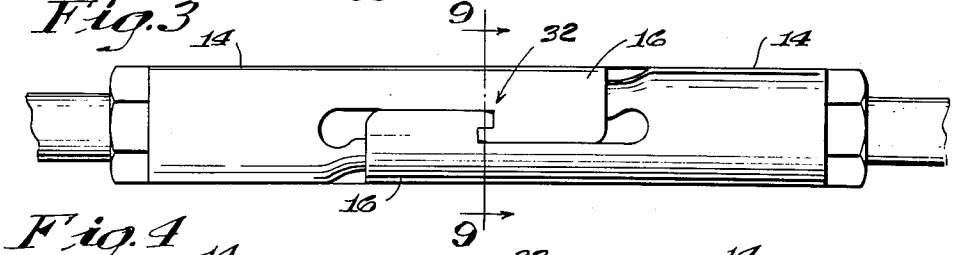


Fig. 4

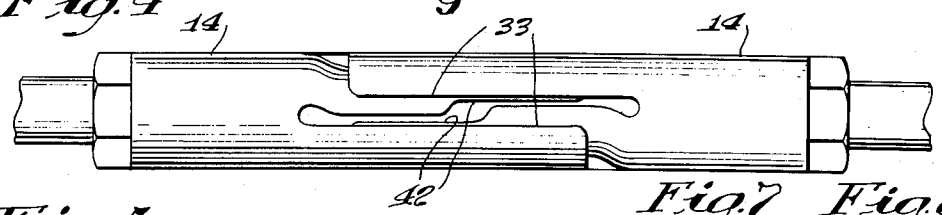


Fig. 5

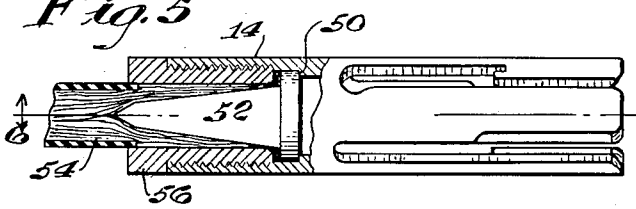


Fig. 6

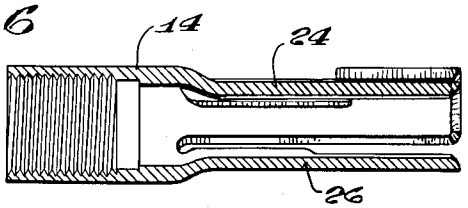


Fig. 7

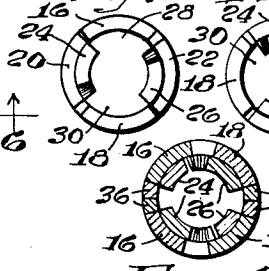


Fig. 8

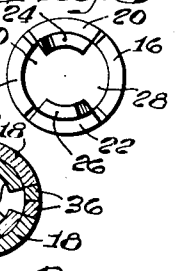


Fig. 9

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ELECTRICAL CONNECTOR

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5 Claims. (Cl. 339—47)

This invention relates to an electrical connector.

The invention has for an object to provide a novel and improved electrical connector and particularly a cable connector which may be used with advantage as a universal connector for cooperation with an identical connector in making an electrical connection.

A more specific object of the invention is to provide a novel construction of electrical connector of the character specified having novel provision for positively locking the connectors in their engaged position and which is capable of being quickly and easily unlocked when it is desired to disengage the connectors.

With these general objects in view and such others as may hereinafter appear, the invention consists in the electrical connector hereinafter described and particularly defined in the claims at the end of this specification.

In the drawings illustrating the preferred embodiment of the invention:

Fig. 1 is a perspective view of two identical connectors embodying the present invention and shown prior to engagement;

Fig. 2 is a side elevation of the two connectors showing the connectors in engagement but prior to being locked together;

Fig. 3 is a side elevation similar to Fig. 2 but showing the connectors in their engaged and locked position;

Fig. 4 is a side elevation of the two connectors as viewed from a different position, substantially at right angles to the position shown in Fig. 3;

Fig. 5 is a side elevation, partly in cross section of a single connector;

Fig. 6 is a cross sectional view as seen from the line 6—6 of Fig. 5;

Figs. 7 and 8 are end views of two identical connectors shown in relative positions to be engaged one with the other; and

Fig. 9 is a cross-sectional view taken on the line 9—9 of Fig. 3.

In general the present invention contemplates a novel and improved electrical connector designed for use as a universal connector in that identical connectors may be coupled together to form an electrical connection. In accordance with the present invention the electrical connector comprises a contact member preferably having provision for connection to a cable, the contact member being provided with spaced fingers arranged for cooperation with an identical connector, and in which the fingers of one contact member fit into the spaces between the fingers of the second contact member when the connection is made. The cooperating fingers serve to frictionally hold the two connectors in engagement. Provision is also made in accordance with the present invention for positively locking the engaged connectors together in a simple and efficient manner whereby to prevent inadvertent separation thereof and in a manner such as to enable them to be quickly and easily unlocked to disengage the connector.

Referring now to the drawings, the invention is herein illustrated as embodied in a universal connector, each connector comprising in general a metallic contact unit **10** adapted for connection with an identical metallic contact unit **12**. Each contact unit comprises a tubular body portion **14**, one end of which may be interiorly threaded to receive a cable connection, the other end of each unit being shaped to form two sets or pairs of opposed elongated contact fingers, one pair of opposed contact fingers **16, 18** forming in effect an outer circle coextensive with the tubular wall of the body portion **14** and having spaces **20, 22** therebetween, and the other pair of opposed contact fingers **24, 26** being offset inwardly from the tubular wall of the body portion and forming in effect an inner circle and having spaces **28, 30** therebetween. The inner fingers **24, 26** may and preferably will be offset from the tubular wall a distance substantially equal to the thickness of the wall so that the inside diameter of the outer circle is substantially coextensive with the outside diameter of the inner circle. The inner fingers **24, 26** may and preferably will be formed by bending the tube walls inwardly, as shown in Fig. 6.

As herein shown, the contact fingers in each circle are arranged to register with and to be in substantially radial alignment with the spaces of its cooperating circle. In other words, each of the illustrated contact units is provided with a pair of substantially diametrically opposed arcuate outer fingers **16, 18** and a pair of diametrically opposed arcuate inner fingers **24, 26**, each pair of fingers lying in different circles so that when facing the connecting end of a contact unit, a diametral line passing through the center of the outer fingers **16, 18** will be substantially at right angles to a diametral line passing through the center of the inner fingers **24, 26**. In practice the widths of the spaces **20, 22** and **28, 30** are preferably greater than the widths of the fingers **16, 18** and **24, 26** respectively to permit relative rotation of the contact units after they are engaged, as will be hereinafter described.

With this construction it will be seen that when two identical contact units are engaged in operative relation the arcuate fingers **16, 18** of each outer circle will fit into corresponding spaces **20, 22** of its opposed circle, and that the arcuate fingers **24, 26** of each inner circle will likewise fit into the corresponding spaces **28, 30** of opposed circles. It will be observed that the elongated contact fingers **16, 18** and **24, 26** are substantially equal in length, and in practice the inner fingers **24, 26** may be sprung outwardly slightly so that when they are subsequently bent inwardly by engagement with the outer fingers **16, 18** of an identical contact unit they will be yieldingly and frictionally engaged therewith to provide a firm contact. As herein shown, the outer end of each finger may be beveled and rounded at the inside edges to facilitate initial engagement of the connectors.

As herein illustrated, the novel provision for positively locking the connectors in their engaged position to prevent inadvertent separation may comprise hooked portions, indicated at **32**, formed in one longitudinal side edge of each finger **16, 18** lying in the outer circle, the hooked portions being disposed substantially intermediate the

ends of the elongated fingers and adapted for cooperation with the corresponding hooked portion of an identical connector. The opposite longitudinal edges 33 of each finger 16, 18 are preferably straight and parallel for sliding engagement when the connectors are initially engaged. Each hooked portion 32 may and preferably will comprise a substantially rectangular and longitudinally slotted or recessed portion 34 and an adjacent substantially rectangular longitudinally extended lug portion 36 extending toward the inner end of the finger. It will be observed that the S-shaped hook portions 32 are provided with square corners for snug fitting engagement with an identically shaped hook portion, and the longitudinally engaging portions of the hooks will be parallel to the longitudinal axis of the contact members so as to positively resist any relative twisting or rotary movement of the contact members when engaged.

In practice the longitudinally extending fingers may be formed by saw cutting the tube longitudinally and offsetting the inner fingers by bending the same inwardly, as shown, and the hooked portions 32 may be formed by cutting away the longitudinal edge 38 from an intermediate point to the inner end of the finger a distance equal to the combined width of the lug portion 36 and the slotted portion 34 forming a reduced width portion of the finger having a longitudinal edge 40. The intermediate portions may then be cut along the transversely extended edge between the longitudinal edges 38, 40 substantially in the form of an S shape with the edge 38 being coextensive with the outer edge of the lug portion 36 and with the edge 40 being coextensive with the inner edge of the slotted portion 34. The inner fingers 24, 26 disposed in the inner circle may and preferably will be cut away along one longitudinal edge, as indicated at 42, from an intermediate point to the outer ends of the fingers to provide clearance for relative rotation of the connectors to permit engagement of the hooked portions.

As thus described, it will be seen that when the connectors are initially engaged by extending the fingers of one connector into the slots of an identical connector with the longitudinal edges 33 of the outer fingers in sliding engagement, the hooked portions 32 will assume an offset position, as shown in Fig. 2, whereupon slight rotary movement of one connector relative to the other will bring the longitudinal edges 38, 40 together to present the hooked portions into longitudinal alignment. Thereafter, the connectors may be pulled outwardly to snugly engage the S-shaped hook portions together, as shown in Fig. 3, to prevent longitudinal separation and to also prevent inadvertent relative rotary movement of the connectors without first pushing the connectors inwardly to disengage the hooked portions. It will be observed that the outer edges of the lug portions 36 may be beveled slightly at the corners to facilitate separation when the connectors are subsequently rotated to the position shown in Fig. 2 and pulled outwardly to effect disengagement of the connectors.

It will be observed that in the illustrated embodiment of the invention the width of each outer finger 16, 18 including the hook portion 32 is such as to substantially fill the spaces therebetween when initially engaged end to end, that is prior to the hooked portions passing each other. For example, in a ⅞ inch diameter tube having a circumference of 2¾ inches, the arcuate width of each finger including its hooked portion and the width of each corresponding space is substantially $1\frac{1}{16}$ inch, each occupying substantially 90° of the circle with sufficient clearance to permit the fingers to be freely engaged. It will be further observed that the cut-away edge of each finger below the hooked portion reduces the width of the finger by an amount equal to the combined width of the lug 36 and the recess 34 which in the present example may be ¼ of an inch, the lug and the recess each being substantially ⅛ of an inch wide. Thus, the reduced width of each finger will be about $\frac{7}{16}$ of an inch, so that the space between the adjacent longitudinal edges of the fingers 16, 18 of one connector will be equal to the width of a corresponding finger including its hook portion and the width of the cut-away portion of the finger of said one connector or a total of about $\frac{15}{16}$ inch, thus permitting a relative rotation of ¼ of an inch to align the hook portion 32. It will also be observed that the hook portions 32 are symmetrically arranged and disposed intermediate the ends of the fingers to permit the ends of the lugs 36 to pass each other to permit rotation of the fingers with longitudinal alignment and engagement of the hook portions by pulling outwardly on each connector. It will be apparent that the illustrated hook portions 32 shown as formed by a cut-away portion from a longitudinal edge of an outer finger forms in effect a laterally projecting hook portion having longitudinally extended lug and slot portions for cooperation with the hook portion of an identical connector.

It will be understood that in practice the present connectors are normally under longitudinal tension in a direction tending to pull the connectors apart and are also subjected to twisting or rotational forces tending to effect relative rotation of the engaged connectors, the present locking means providing a positive means of maintaining the connectors engaged under such longitudinal and rotational stresses.

As herein shown, the cable end of a connector may be bored out longitudinally to provide a shoulder 50 and is also provided with an internally threaded portion. A conical member 52 having a flange at its inner end is arranged to bear against the shoulder 50. The conical member 52 may be inserted into the end of the cable 54, and the end of the cable may then be squeezed into the bored opening by a sleeve nut 56 engageable with the threaded portion of the connector, as illustrated.

While the preferred embodiment of the invention has been herein illustrated and described, it will be understood that the invention may be embodied in other forms within the scope of the following claims.

Having thus described the invention, what is claimed is:

1. A cable connector comprising an elongated metal contact member provided with a pair of spaced elongated outer contact fingers and a pair of spaced elongated inner contact fingers adapted to engage with the spaces of a second and identical connector, at least one of said fingers of each of cooperating connectors having a laterally projecting hook portion adapted for locking engagement with a corresponding hook portion of said second connector upon relative rotation and outward pulling of engaged connectors to engage the hook portions, said hook portions having rectangular engaging surfaces extending parallel to the longitudinal axis of the connectors whereby to positively prevent inadvertent relative rotation and disengagement of the connectors.

2. A cable connector comprising an elongated metal contact member provided with a pair of spaced elongated outer contact fingers and a pair of spaced elongated inner contact fingers adapted to engage with the spaces of a second and identical connector, a hook projecting laterally from one side edge of each outer finger adapted for locking engagement with corresponding hook portions of said second connector upon relative rotation of engaged connectors to align the laterally projecting hook portions longitudinally and upon outward movement of the connectors to cause the hook portions to engage one another, said laterally projecting hooks having rectangular engaging surfaces extending both parallel to and transversely of the longitudinal axis of the connectors, whereby to positively prevent inadvertent relative rotation and longitudinal separation of the engaged connectors.

3. A cable connector as defined in claim 2 wherein the hooks are disposed intermediate the ends of the fingers and wherein each hook comprises a rectangular tongue portion and an adjacent rectangular groove portion adapted to fit into the tongue and groove portions of the second

connector when the tongues are aligned with the grooves and the engaged connectors are pulled outwardly.

4. A cable connector as defined in claim 3 wherein the outer ends of the outer fingers including the hook portions are of a width such as to substantially fill the spaces of the second connector, the inner ends of said outer fingers being reduced in width by an amount substantially equal to the width of the hook portions whereby to permit relative rotation of the engaged connectors to align the hook portions

5. A cable connector as defined in claim 4 wherein the inner contact fingers are reduced in width from an intermediate portion to the outer ends thereof to provide clearance to permit said relative rotation.

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