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CABLE CONNECTOR

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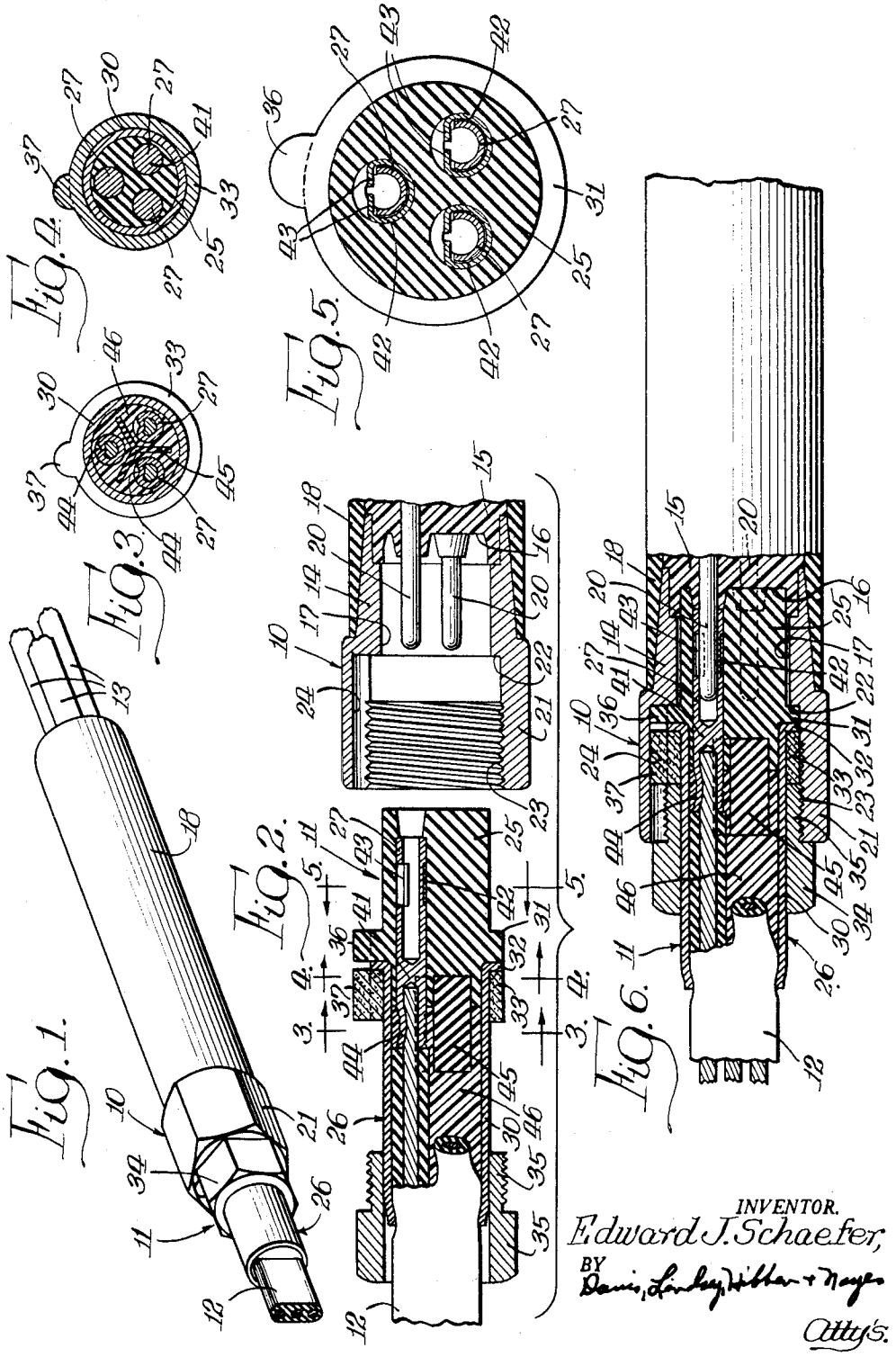

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CABLE CONNECTOR

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The invention relates generally to electrical wiring connections and more particularly to a cable connector.

The general object of the invention is to provide a novel cable connector adapted for use submerged in liquids which would cause short-circuiting if the liquid reached the conductors thereof, and capable of withstanding high pressures in the submerging liquid.

Another object is to provide a novel connector of the foregoing type for a cable comprising a plurality of conductors, the conductor being constructed so that in assembly the proper polarized relation is obtained between the connected conductors.

A further object is to provide a novel cable connector which is relatively small and compact and is therefore particularly useful in locations where space is a minimum.

Still another object is to provide a novel cable connector part which provides an effective seal against moisture that might enter a damaged cable at some point remote from the connector and tend to work into the connector part along the wire strands of the cable.

It is also an object to provide a novel cable connector part of the foregoing character and which is inexpensive to manufacture.

Other objects and advantages will become apparent from the following description taken in connection with the accompanying drawing, in which:

Fig. 1 is a perspective view of a two-part cable connector embodying the features of the invention;

Fig. 2 is an enlarged longitudinal sectional view showing the two parts of the cable connector when separated but in position to be assembled to each other;

Fig. 3 is a transverse sectional view taken on the line 3—3 of Fig. 2;

Fig. 4 is a transverse sectional view taken on the line 4—4 of Fig. 2;

Fig. 5 is an enlarged transverse sectional view taken on the line 5—5 of Fig. 2;

Fig. 6 is a longitudinal sectional view of the conductor with the two parts secured to each other.

A cable connector having a connector part embodying the features of the invention is particularly adapted for use submerged in a liquid which would cause short circuiting if the liquid reached the conductors within the connector. It is also designed for use under these conditions where the liquid pressure may be large. The connector is of a type adapted for use with cable having a plurality of conductors therein, and the two parts of the connector are such that they can be assembled only in a way that provides proper polarized relation between the conductors in the respective cable parts. In motors which are adapted for operation submerged in a well, the restriction of space due to the diameter of the well casing presents problems in designing apparatus sufficiently compact for use in such a location. The present connector is particularly adapted for such conditions since it is of an elongated construction of relatively small cross-sectional size so that it can be readily used in wells or the like where space is a minimum.

The connector is illustrated as being made of two parts adapted to be assembled together so that a connection between cables may be made at some point above the motor within the well. In this instance a length of cable is connected to the motor and to the left-hand member shown in Fig. 2, and the cable to be connected thereto would be provided on its lower end with a terminal structure similar to the right-hand part shown in Fig. 2.

For purposes of illustration, the reference numeral **10** indicates generally the right-hand connector part or socket member while the numeral **11** indicates generally the left-hand connector part or plug member. The type of cable with which the connector is illustrated as being used is herein shown as a three-wire cable with the wires in flat side-by-side relation to each other, each of course being provided with proper insulating and protective covering with the outer layers of such covering holding the wires together as a single cable. While such form of cable is herein shown for purposes of illustration, the covering of course is not limited to this particular type of cable. Thus, in Figs. 1, 2 and 6 I have shown the cable, indicated at **12**, as being of this type and attached to the connector part **11**, while the cable extending from the connector part **10** comprises three individual wires **13** illustrated in Fig. 1.

The connector part **10** or socket member is shown as comprising a metal sleeve **14** and an insulating body **15**. The insulating body **15** extends into the interior of the sleeve **14** and has its end surface, indicated at **16**, spaced from the other end of the sleeve to provide a socket portion **17** therein. The conductors **13** of the cable attached to the right-hand connector part **10** extend into and are embedded in the insulating body **15**, the ends of the respective conductors being turned into a triangular relation with each other at their inner ends. The insulating body **15** and a portion of the sleeve **14** are encased in an insulating sleeve **18**.

Also embedded in the insulating body **15** and particularly that portion extending within the sleeve **14** is a plurality of prongs **20** which also occupy a triangular relationship with each other. The prongs are electrically connected with the respective conductors or wires constituting the cable and project beyond the end surface **16** of the insulating body **15** and into the socket portion **17**. Beyond the socket portion **17**, the sleeve **14** is provided with an enlarged portion **21** providing an inner transverse shoulder **22** at the outer end of the socket portion **17**. The interior of the enlarged portion for a part of its length is threaded as at **23**, and a longitudinally extending groove **24** is provided at one side of the enlarged portion **21** interiorly thereof, with the groove **24** extending from the outer end inwardly to the transverse shoulder **22**.

The connector part **11** embodies the features of the invention and is adapted to be inserted into the socket portion **17** of the connector part **10**. The part **11** comprises an end member **25** made of somewhat yieldable insulating material, such as neoprene, adapted to be inserted into the socket portion **17**, and a body portion, indicated generally at **26**, which is relatively rigid and provides a rigid backing for the end member **25**. A plurality of contact members **27** are provided for engagement with the prongs **20**, the contact members **27** being generally tubular and embedded for a major portion of their length in the end member **25**.

The body portion **26** comprises a metal sleeve member or tube **30**, in this instance brass, telescoped over the inner end of the end member **25**, and a flange **31** is provided on the end member **25** to abut against the end of the sleeve member **30**. The latter is also provided with a flange **32** at its telescoping end and thus has a shouldered engagement with the end member **25**. The body portion **26** also includes a metal ring or ferrule **33** engaging the flange **32** on the sleeve member **30** so as to provide an adequate backing for the end member **25**.

The ring or ferrule 33 is preferably made of sintered bronze. When the connector part 11 is inserted into the part 10, the end member 25 enters the socket portion 17 and the body portion 26 enters the enlarged portion 21 of the sleeve 14. To secure the parts in place, a clamping nut 34, in the form of a sleeve, is rotatably mounted on the sleeve member 30 and is provided with a threaded end portion 35 adapted to engage the threads 23 in the sleeve 14. As the nut is screwed in place, the end of the threaded portion 35 engages the ferrule 33 to force the end member 25 into the socket portion 17 and compress the outer end of the end member 25 against the end surface 16 and the flange 31 against the shoulder 22 in the sleeve 14. When so assembled, the contacts 27 will be forced over the prongs 20.

In order to establish the proper polarized relation between the conductors of the cables 12 and 13, the flange 31 and the ferrule 33 are provided with lugs 36 and 37 which are aligned with each other and are adapted to enter the groove 24 in the sleeve 14 on assembly of the two parts of the connector. Thus, the two parts can be assembled in only one position rotatively relative to each other.

Each contact member 27 is tubular at its respective ends, one end to receive a prong 20 and the other end to receive the bared strands of wire of one of the conductors of the cable 12. Intermediate the ends, the contact member is solid, as illustrated at 41, so as to provide a barrier between the two ends to prevent any moisture that might enter the cable 12 at some remote point from entering the portion engaging the prong 20. On the end receiving the prong 20, means is provided to insure good contact with the prong, which means comprises in the present instance a spring clamping ring 42 having a gap therein and fitting within an annular groove in the contact member and having its ends bent inwardly as at 43 through a notch in the contact member to engage the prong. At its opposite end, each contact member 27 receives and has good electrical contact with the bared strands of wire of one of the conductors of cable 12. While the strands of wire may be soldered in the contact member if desired, the contact member is shown as clinching the strands therein by being indented as at 44.

To insure isolation of each contact member 27 from the other and their associated conductors from each other, a barrier member 45 may be provided. The barrier member is here shown as of Y shape in cross section and is made of an insulating material. The barrier member preferably extends part way into the end member 25 with the remainder of its length projecting beyond the inner end of the end member within the sleeve member 30. The barrier member thus insures separation of the contact members 27 at the point where they connect to the conductors of the cable.

As hereinbefore mentioned, the body portion 26, which includes the sleeve member 30, provides a rigid backing for the end member 25 and the contacts 27. To complete the body member 26 and to cooperate with sleeve member 30 in providing such rigid backing, the space within the sleeve member 30 around the conductors and inner end portions of the contacts 27 is filled with an insulating material 46 which preferably is initially in a liquid form so that, after the parts heretofore described are assembled, it may be poured into the tubular member. The insulating material 46 is also of an adhesive nature and thus firmly and rigidly secures the parts together. It has been found that a catalyzed resin, such as epoxy resin, is highly satisfactory for this purpose since it can be made up in a free-flowing liquid form and thus can be poured into the sleeve member 30 to completely fill the space therein. After being poured, it rapidly hardens or sets to form a rigid part of the body portion 26 and adhesively secures the parts of the connector together. While the solid portions 41 of the contact members 27 prevent any moisture that might enter the cable 12 at some remote point and creep along the wire strands from passing internally through the contact members to the prong-contacting portion thereof, the insulating material 46 prevents such moisture from creeping along the outer surface of the contact members and provides a waterproof seal around the contact members at the point where the conductors are joined thereto.

From the foregoing description, it will be apparent that I have provided a novel cable connector part which provides an effective seal against any moisture that might enter a damaged cable at some point remote from the connector. The connector part is inexpensive to manufacture, is easily assembled and provides a rigid structure readily engageable with the mating connector part.

I claim:

1. A connector part for association with a socket part to form a cable connector, said connector part comprising an end member of yieldable insulating material having one end portion formed to snugly fit into the associated socket part, and having an encircling flange located intermediate said one end portion and the opposite end portion of said end member and adapted to bear against a portion of the socket part, contact members embedded in said end member for engagement with contacts in the associated socket part and having ends protruding from said opposite end portion of said end member, a cable having a conductor connected to each of said protruding ends, a metal sleeve member telescoped over said opposite end portion of said end member and a portion of said cable, said sleeve member terminating at said circumferential flange and abutting thereagainst, and rigid insulating material filling the space in said sleeve member around said protruding ends of said contact members and said conductors and adhering to said members and said conductors thereby sealing the same and providing a rigid backing for said end member, and means for securing said sleeve member to the associated socket part to compress said end member therein, said sleeve member having an encircling flange on its telescoped end in abutment with said encircling flange on said end member, said means abutting the flange on said sleeve member and forcing it against the flange on said end member.

2. A connector part according to claim 1 in which said means includes a metal ferrule encircling said sleeve in abutment with said flange on said sleeve member, said flange on said sleeve member being located between said ferrule and said flange on said end member.

3. A connector part according to claim 2 in which said means further includes a fastener element rotatably mounted on said sleeve member and adapted to be threadedly engaged with the associated socket part, said securing means bearing against said ferrule when so engaged to compress said end member including the flange thereon in said socket.

4. A connector part according to claim 2 in which said flange on said end member and said ferrule are each provided with an outwardly projecting lug, said lugs being in longitudinal alignment and adapted to enter a groove in the associated socket part for holding the connector parts in predetermined rotative relation during assembly thereof.

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