

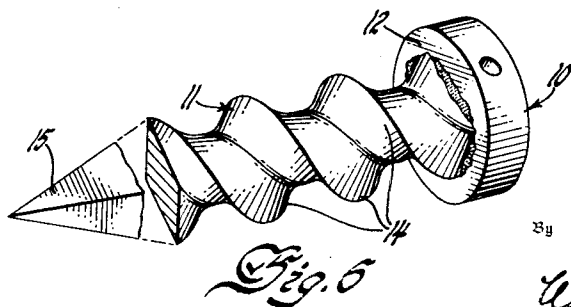
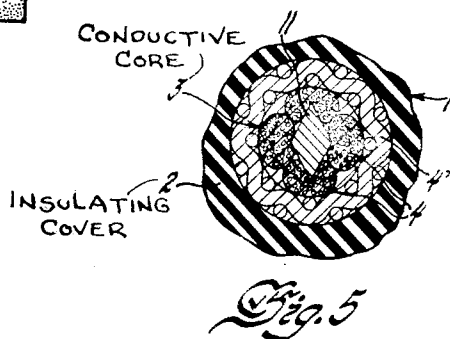
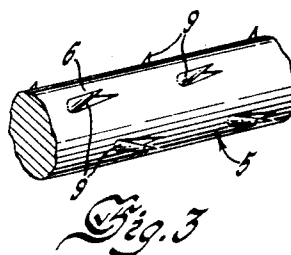
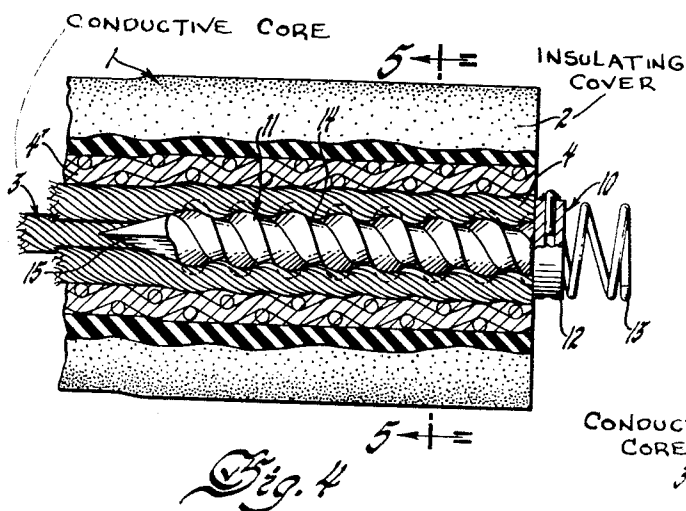
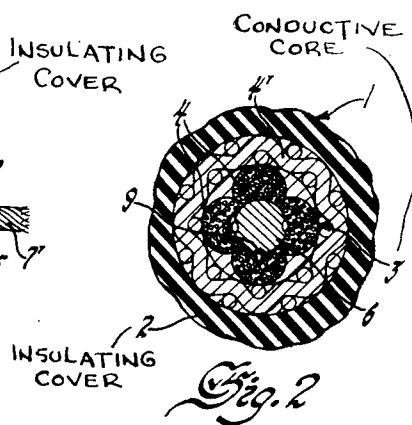
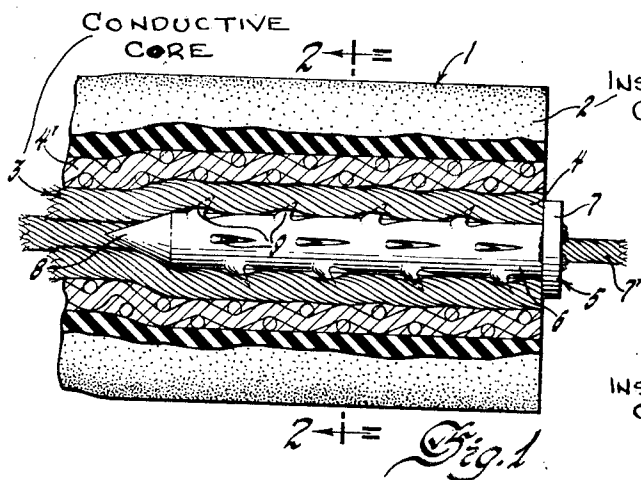
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CONNECTOR FOR USE ON HIGH TENSION RESISTANCE CABLE

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CONNECTOR FOR USE ON HIGH TENSION RESISTANCE CABLE

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This invention relates to electrical connectors and more particularly to terminal connectors especially adapted to connect fibrous cored electrical conductors in electrical systems.

Fibrous cored electrical conductors, particularly conductors having cores of organic fibers coated to provide high electrical resistance characteristics, are currently being used to a considerable extent to suppress resonant electrical conditions in automotive vehicle ignition systems which interfere with audio and video reception.

Heretofore, considerable difficulty has been experienced in providing suitable electrical connections for conductors of this type in electrical systems. In effecting electrical connections with this type of conductor, the conventional methods of soldering have been found to be unsatisfactory, as the heat associated with this form of operation has a destructive effect on the organic core material. Moreover, as the high resistance coatings on the fibers of such conductors are generally of a carbonaceous material, such as graphite, it has been found difficult to effect a suitable electrical or mechanical bond between the graphite and the metallic connector by the conventional methods of soldering.

Accordingly, it is a principal object of the present invention to provide a simple and highly improved terminal connector which is so constructed and arranged as to effect a mechanical bond of suitable electrical characteristics with fibrous cored conductors.

Another object is to provide a connector adapted to be forcibly inserted into a fibrous conductor and retained therein by the mechanical co-action between a gripping means on the connector and the fibers of the conductor.

A more specific object is to provide a connector having an elongated shank with a point at one end for facilitating the insertion thereof into a fibrous conductor and projecting means on said shank for locking the said connector in assembled position by the gripping action of said projections with the fibers of said conductor.

A further object is to provide a terminal connector having a shank adapted to be inserted into the core of a cable and gripping means on the shank adapted to engage and hold the shank securely in the cable thereby providing a rigid mechanical connection with desirable electrical characteristics between the conductor and the connector.

Other and further objects will become apparent as the description of the invention progresses.

For a better understanding of our invention reference may be had to the drawing in which, Fig. 1 is a view partly in cross-section and partly broken away of a conductor illustrating one form of a connector embodying the present invention; Fig. 2 is a view taken on the line 2—2 of Fig. 1; Fig. 3 is an enlarged perspective view, partly broken away, of the connector illustrated in Figs. 1 and 2; Fig. 4 is a view similar to

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Fig. 1 illustrating another form of connector embodying the present invention; Fig. 5 is a sectional view taken on the line 5—5 of Fig. 4, and Fig. 6 is a perspective view of the connector illustrated in Figs. 4 and 5.

Referring now to the drawing and more particularly to Figs. 1 to 3 thereof the numeral 1 indicates generally a conductor consisting of an outer protective coating of insulating material 2, such as rubber, surrounding a conductive core of organic fibers 3 coated with an electrically conductive carbonaceous material such as graphite. The core 3 includes a central region of braided strands of coated fibers 4 surrounded by a concentric sleeve 4' also consisting of woven strands of electrically conductively coated fibers. Conductors of this general type are shown and described in the co-pending applications of R. W. Buchanan, R. W. Smith and T. G. McDougal Serial No. 99,756, filed June 17, 1949, now abandoned and Serial No. 208,930, filed February 1, 1951, Patent No. 2,703,356 and to which reference may be had for a more complete description thereof. The electrical connector associated with conductor 1 is designated generally as 5, and comprises an elongated shank 6 of metallic material having suitable electrical conductive characteristics. A cap or head member 7, constructed of a suitable electrically conductive material may be attached to one end of shank 6 in order to provide a means for attaching lead wire 7'. However, if it is found desirable the lead wire may be secured directly onto the shank 6. In such cases the cap or head member 7 may be dispensed with since the lead wires are adapted to be connected directly to the shank 6. The lead wires 7' of an electrical system are attached to head 7 by any suitable means, such as soldering. The other end of the shank 6 is tapered to a point as shown at 8, to facilitate insertion of the connector 5 into the core of the conductor. In order to secure the connector 5 in position within the conductor 1 the shank 6 of the former is formed with a plurality of circumferentially and axially spaced barbs 9. These barbs are integral with the shank 6 and may be formed with a suitable cutting tool which after the forming operation bends them outwardly of said shank as shown in Figs. 1 to 3. Connectors constructed in this fashion, it is seen, may be easily inserted in position within the conductor and when so assembled are effectively locked in position. Any movement tending to dislodge the connectors causes the barbs 9 to grip the fibers of the conductor and penetrate into the twisted and braided structure of the core sleeve, thus effectively preventing separation of the parts. It is also seen that as the connector 5 is inserted into the core structure, the shank 6 thereof forces the surrounding core against the yielding pressure of the rubber sleeve 2 thus forming a tight mechanical connection between the said connector and core structure. A good mechanical bond which assures efficient electrical conduction between the connector and core is thus provided.

In Figs. 4, 5 and 6 there is illustrated another form of connector embodying our invention which is generally designated as 10. Connector 10 is assembled with a conductor 1, similar to the conductor 1 shown in Figs. 1 and 2, and comprises a cylindrical shank 11. This shank may be equipped with a cap or head member 12, one end thereof having a transverse or annular aperture adapted to receive one end of a helical spring 13 for coupling the connector onto an electrical terminal (not shown). However, if it is found more convenient, the shank 11 may be fastened directly to the terminal. The head 12, in such cases is unnecessary and may be dispensed with. The shank 11 of connector 10 is formed with relatively deep helical threads 14 which terminate in a pyramidal end portion 15. The threads 14 are

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formed on the shank 11 by twisting a rod which has a polygonal cross section about its axis until the threads acquire the desired pitch. The drawing discloses the use of a rod having a diamond cross section, but it should be understood that other cross sectional shapes may be used. By a proper choice of a cross sectional shape the threads can be given the depth required for optimum gripping. In assembling the parts, as shown in Fig. 4, the pyramidal end 15 of connector 10 is first inserted into the core structure of conductor 1 and the shank 11 is then screwed into the core until the cap or head member 12 abuts the end of said conductor. As with the connector 5, the insertion of connector 10 into the conductive region of the conductor 1, causes expansion of the core structure against the yielding pressure of the rubber covering 2. By this action, the threads 15 intimately engage the braided and twisted strands of the conductor, thus firmly securing the parts in assembled position. It therefore will be observed that a mechanical bond is provided between the core and connector having highly efficient electrical conductive characteristics. The cap or head member 12, like cap member 5, may be secured to the shank 11 by soldering or by any other suitable means. The helical spring 13 especially adapts the connector 10 for varied uses, such for example, as in connecting conductors to shielded spark plugs (not shown). In such cases the conductor 1 is inserted into a recess in the spark plug and the spring 13 resiliently engages the central electrode thereof.

The connectors have been shown and described herein as being associated with conductors having central strands coated with electrically conductive material surrounded by a sleeve also of electrically conductive material which in turn is surrounded by a sleeve of insulating material. It is apparent, however, that the conductors shown herein may be associated with other types of conductors without departing from the invention, as for example, conductors comprising a single electrical conductive member or strand with or without an outer coating or sleeve of insulating material.

From the foregoing description it is seen that simplified and highly improved connectors have been provided which insure proper control with fibrous cored conductors under all conditions. By this construction resonant electrical conditions in automotive vehicle systems can be effectively suppressed, especially those which in any manner interfere with audio and video reception.

While the embodiments herein disclosed constitute preferred forms of our invention, it will be apparent to those skilled in the art that the invention may be embodied in other forms. It therefore is to be understood that it is not intended to limit the invention to said embodiments but only by the scope of the claims which follow.

What we claim as new and desire to secure by Letters Patent of the United States is:

1. A connector adapted to be inserted longitudinally through the end of an electrical conductor having an electrically non-conductive outer layer of elastic material into the electrically conductive core of fibers of a non-metallic material which is disposed inside of said outer layer and compressed radially inwardly thereby, said connector comprising an elongated cylindrical shank of electrically conductive material, a tapered point on one end of said shank, said point being adapted to be forced into said conductive central fibers of said conductor so as to spread said fibers for the entrance of said shank, an enlarged head secured to the opposite end of said shank to limit the extent of movement of

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said shank into said conductor, said head being adapted to be connected to electrically conductive means, and gripper means on said shank comprising a plurality of barbs, said barbs projecting radially outwardly from said shank and being axially inclined toward said head to thereby position said barbs for spreading said conductive fibers apart when said shank is inserted into said conductor and to embed themselves in said fibers and prevent the withdrawal of said shank from said conductor; said barbs being axially and circumferentially staggered around the outer surface of said shank to embed at least a portion of said barbs in circumferentially different portions of said fibers.

2. The combination of an electrically conductive cable having a central non-metallic fibrous core coated with an electrically conductive carbonaceous material encompassed by an electrically insulating outer cover of radially inwardly contracting elastic material for compressing said fibers radially together, a connector having a shank extending axially inwardly from one end of said cable and being disposed in said central fibrous core in intimate contact with said electrically conductive coating, the inner end of said shank being tapered to spread said fibers to facilitate inserting said connector axially into said cable, the opposite end of said shank having an enlarged head for abutting said end of said cable and being adapted to receive electrically conductive means, said shank including a plurality of gripping means, said gripping means being disposed axially along said shank and projecting radially from said shank into said fibers, said elastic cover compressing said fibers radially inwardly against said grippers for causing said grippers to be embedded in said fibers.

3. The combination of an electrically conductive cable having a central non-metallic fibrous core coated with an electrically conductive carbonaceous material encompassed by an electrically insulating outer cover of radially inwardly contracting elastic material for compressing said fibers together, a connector having a shank extending axially inwardly from one end of said cable and being disposed in said central fibrous core in intimate contact with said electrically conductive coating, the inner end of said shank being tapered for spreading said fibers to facilitate inserting said connector axially into said cable and the other end of said shank having an enlarged head for abutting said end of said cable and being adapted to receive electrically conductive means, said shank including a plurality of barbs projecting radially outwardly from said shank into said fibers, said barbs being circumferentially and axially staggered on said shank and axially inclined towards said head for spreading said fibers apart when said shank is inserted axially into said conductor, said outer cover compressing said fibers radially inwardly for embedding said barbs therein.

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