A device for making an electrical connection between the ends of electrical conductors by means of contact elements which can be embedded in at least one insulating member; one contact element consists of a preferably longitudinally slotted sleeve whereas the second contact element, into which the sleeve-like first contact element is adapted to snap in perpendicularly to its longitudinal direction, consists of an expanding spring which is shaped in the manner of a lyre and which in its turn is snapped into the insulating member in a barb-like manner.
DEVICE FOR ELECTRICALLY CONNECTING THE ENDS OF ELECTRICAL CONDUCTORS

The present invention relates to a device for establishing an electrical connection between the ends of electrical conductors by means of contact pieces which can be embedded in at least one insulating part.

Numerous types of contacts or connector devices are known in the prior art. The turned or machined parts, which are used on the one hand, are excessively expensive; on the other hand, contact elements made from sheet metal could be brought heretofore into establishing the electrical contact only by their displacement in the longitudinal direction of the conductor ends.

The aim of the present invention is to provide a universally applicable contact or connector device which is favorable as regards cost, can be readily manufactured and can be brought into making the electrical contact by a movement of the contact elements perpendicularly to the longitudinal axis of the conductor ends.

The underlying problems are solved according to the present invention in that one contact element consists of a sleeve, preferably of a longitudinally slotted sleeve, whereas the other contact element, into which the sleeve is adapted to snap in perpendicularly to its longitudinal direction, consists of an expanding or spreading spring shaped in the form of a lyre which in its turn is snapped into the insulating part in a barb-like manner, whereby the contact elements are stamped out of sheet metal and are rolled into appropriate shape.

Expanding springs adapted to snap-in in a barb-like manner have been utilized heretofore only for the fastening of nameplates or tags for line-up terminals (German Pat. No. 565,623).

According to a further feature of the present invention, the sleeve-shaped contact element may be connected with a second insulating member which is constructed cover-like fitting the first insulating member and can be installed or mounted on the first insulating member by snap-action. Furthermore, according to the present invention, two conductor ends arranged coaxially to one another and having lyre-like contact elements can be connected with each other by means of a sleeve-shaped contact element. Especially, when only small openings or passages are available for extending therethrough a cable, for example, in the body of a motor vehicle, a further development of the present invention can be utilized advantageously, according to which a preferably circular insulating member with several lyre-shaped contact elements mutually offset in the longitudinal direction and in the peripheral direction is provided, into which the sleeve-shaped contact elements are adapted to engage according to the existing arrangement.

Accordingly, it is an object of the present invention to provide a device for establishing an electrical connection between the ends of electrical conductors which avoids by simple means the aforementioned drawbacks and shortcomings encountered in the prior art.

Another object of the present invention resides in a device for making an electrical contact between the ends of electrical conductors which is relatively low in cost, inexpensive in manufacture and easy to install.

A further object of the present invention resides in a device for electrically connecting the ends of electrical conductors which permits easy assembly in a direction perpendicular to the longitudinal axis of the conductor ends and which may also be used in areas where the space is limited.

These and other objects, features and advantages of the present invention will become more apparent from the following description when taken in connection with the accompanying drawing which shows, for purposes of illustration only, several embodiments in accordance with the present invention, and wherein

FIG. 1 is a partial, cross-sectional view through a contact device according to the present invention, taken at right angle to the axial direction of the conductors,

FIG. 2 is a partial, cross-sectional view taken along line II—II of FIG. 1,

FIG. 3 is a cross-sectional view through a contact element constructed according to the present invention as spreading or expanding spring and shaped in the manner of a lyre,

FIG. 4 is a cross-sectional view through a sleeve-shaped contact element according to the present invention,

FIG. 5 is a cross-sectional view through a modified embodiment of a device in accordance with the present invention for connecting the ends of three-wire cables which includes contact elements having insulating parts matched to one another in a lid-like manner,

FIG. 6 is an end elevational view of the contact device of FIG. 5,

FIG. 7 is an exploded, partially cross-sectional view illustrating the connection of two conductor ends having two lyre-like contact elements by means of a sleeve-shaped contact element in accordance with the present invention, and

FIG. 8 is a perspective view of a preferably circular insulating element with openings therein for the insertion of lyre-shaped contact elements according to the present invention.

Referring now to the drawing wherein like reference numerals are used throughout the various views to designate like parts, and more particularly to FIGS. 1 and 2, in the illustrated embodiment shown in these two figures reference numeral 1 designates an insulating member made, for example, of any suitable known synthetic plastic material such as synthetic resinous material. A contact element 2 is snapped into the insulating member 1 in a barblike manner by springing engaging with its free ends 2' against undercut shoulders 1'. The contact element 2 consists of an expanding or spreading spring shaped lyre-like and stamped out of sheet metal preferably of such material as has appropriate spring action. The cross-section through this contact element 2 by itself is illustrated in FIG. 3. Sheet metal tongue portions 3 are punched out of the bottom of the lyre-shaped spreading spring 2 and are bent off, which have the purpose to surround the end 4 of the electric conductor whose insulation has been removed or stripped off. The conductor end 4, as shown in FIGS. 1 and 2, can be clamped fast and pressed against the contact element 2 by the sheet metal tongue portions 3 and additionally may be soldered to the contact element 2.

A second contact element is constituted by a preferably slotted sleeve 5 which is also stamped or punched out of sheet metal and rolled. Tongue portions 6 are punched out again in a similar manner out of the sleeve.
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formation the second contact element. The tongue portions 6 are electrically connected with the conductor end 7 by bending over the tongue portions 6 as shown in FIG. 1 and by soldering the conductor end 7 to the sleeve 5. The sleeve 5 is connected by conventional means with the cover 8 also consisting of suitable insulating material. In FIGS. 1 and 2 the electrically conductive connection is illustrated which is established by pressing together the two contact elements 2 and 5 in a radial direction, i.e., perpendicular to the longitudinal direction of the conductor ends 4 and 7.

FIGS. 5 and 6 illustrate a further application of the present invention. In this embodiment three-conductor cables 9 and 10 are connected with each other by a connector device in accordance with the present invention. The individual contact elements 11 are thereby mutually offset in the longitudinal direction within a box-shaped insulating member 12. The insulating member 12 is closed and secured by a cover 13 adapted to be clamping mounted on the box-shaped insulating member 12 by snap-action as shown in FIG. 6. An elastically yielding cord 14 is inserted into a corresponding groove for providing a seal between the insulating members 12 and 13. This self-locking snap-on connection can be assembled in the following manner:

The three conductors or wires of the cable are cut off in three different lengths already prior to the assembly, the insulation thereof is then stripped off and the thus bared wire ends are each soldered into a respective contact sleeve. The cable-tree resulting therefrom is not yet larger in diameter than the insulation forming the original sheathing. Such a cable-tree can be slipped easily also through narrow bores or openings. On the other side of such a bore or opening, the cables are inserted into the cable connector, as illustrated in FIG. 5, and are secured therein by clamping action with the respective contact springs, to which the other cable ends are fastened. The cover 13 clamping held by snap-action on the insulating member 12 seals the cable connector. It is thereby of advantage that the cable connector of this embodiment cannot be closed if the connection is not made correctly. Such an advantage does not exist in a threaded connection.

FIG. 7 illustrates how two coaxially arranged conductors 15 and 16 which are provided in accordance with the present invention with lyre-shaped contact elements 17 and 18, can be connected with each other by a sleeve-shaped contact element 19. The lyre-like contact elements 17 and 18 are thereby connected with the corresponding insulating members 21 and 22 in the manner according to the present invention by inserting the same into corresponding openings or recesses provided in the insulating members 21 and 22 and then permitting the same to expand in these corresponding openings. For the assembly, it is thereby only necessary to slightly compress the open ends of the lyre-shaped, spring-like contact elements 17 and 18 made of suitable material, insert the same into the corresponding openings or recesses and permit the same to expand by their own spring-action. The sleeve-shaped element 19 is mounted on a further insulating member 23 with which it is suitably connected in any known conventional manner. The contact elements 17, 18 and 19 are provided with slots 24 and 25 to improve the electrical contact-making.

FIG. 8 illustrates a further application of the present invention. Peripherally mutually offset longitudinal grooves 27 are provided in a roller member 26 consisting of any suitable known insulating material. Apertures or recesses 28 are provided in the grooves 27 which are mutually offset with respect to each other in the longitudinal direction and which are constructed correspondingly so that the lyre-like expanding springs such as springs 2 of FIGS. 1 and 3, can be inserted therein. Also in this embodiment the cable ends can be clamping installed by snap-action in a manner similar to the embodiment of FIGS. 5 and 6. A hose is then pulled appropriately over the entire assembly and the hose ends are secured by means of hose clamps. This type of connection entails a high relief of tangential stresses of the places producing the electrical connection, properly speaking. The connection is very flexible except for a short section and is absolutely water-tight. Additionally, the contact elements can pass through relatively narrow places which are not larger than the cable cover itself so that an easy assembly is possible.

As to the rest, the following further advantages can be achieved with the device according to the present invention in that the contact elements can be stamped or punched out from sheet metal material and can be rolled. They are therefore more favorable as regards price than the customarily utilized turned or machined parts. Furthermore, only slight space requirements are necessary for the storage of the raw stock. With the use of box-like cable connectors according to the present invention, a self-locking action results during the contact-making in a groove so that upon opening of the cover the connecting elements cannot fall out. The contact making takes place in a radial direction and produces a contact safety as a result of the existing slots.

In the construction according to the present invention, soldering and squeezing of the cable ends is selectively possible with the same type of construction. In case soldering is used, a breaking off at the soldering place is not possible due to the insertion into the groove and the guidance of the cable in the cable groove produced thereby. Finally, defective cables can be readily interchanged.

While I have shown and described only one embodiment in accordance with the present invention, it is understood that the same is not limited thereto but is susceptible of numerous changes and modifications as known to those skilled in the art and I, therefore, do not wish to be limited to the details shown and described herein but intend to cover all such changes and modifications as are encompassed by the scope of the appended claims.

What I claim is:

1. A device for establishing a connection between ends of electrical conductors comprising at least one first contact means including lyre-like spring portions and having tongue portions for clamping to an end of a first electrical conductor, and second contact means including slotted sleeve portions and having tongue portions for clamping to an end of a second electrical conductor, said sleeve portions of said second contact means adapted to be clamped by the lyre-like spring portions of said first contact means, and said lyre-like spring portions having babble-like ends, said lyre-like spring portions being housed in an aperture in a first insulating member, said first insulating member having protruding shoulders said first contact means being em-
beddedly held in said first insulating member by engagement of said barb like ends with said shoulders.

2. A device according to claim 1, characterized in that said slotted sleeve portion is longitudinally slotted.

3. A device according to claim 1, characterized in that said first and second contact means consist of punched out sheet metal members rolled into appropriate shape.

4. A device according to claim 1, characterized in that said sleeve-shaped second contact means is connected with a second insulating member constructed cover-like to fit the first insulating member and adapted to be mounted thereon by snap-action.

5. A device for establishing a connection between ends of electrical conductors comprising at least one first contact means including lyre-like spring portions and having tongue portions for clamping to an end of a first electrical conductor, and second contact means including slotted sleeve portions and having tongue portions for clamping to an end of a second electrical conductor, said sleeve portions of said second contact means adapted to be clamped by the lyre-like spring portions of said first contact means, and said lyre-like spring portions having barb-like ends adapted to engage a first insulating member such that said first contact means are beddedly held in an aperture of said first insulating member, characterized in that said insulating member is provided with a plurality of said lyre-like first contact means arranged in a plurality of apertures of said insulating member, said aperture means being mutually offset from one another in the longitudinal and peripheral directions, and in that said sleeve-shaped second contact means engage in each of said lyre-shaped first contact means.

6. A device according to claim 6, characterized in that said insulating member is substantially circular in cross section.

7. A device according to claim 6, characterized in that said slotted sleeve-like second contact means is longitudinally slotted.

8. A device according to claim 7, characterized in that said first and second contact means consist of punched out sheet metal members rolled into appropriate shape.

9. A device according to claim 8, characterized in that said first and second contact means consisting of punched out sheet metal members rolled into appropriate shape.

10. A device for establishing a connection between ends of electrical conductors comprising at least one first contact means including lyre-like spring portions and having tongue portions for clamping to an end of a first electrical conductor, and second contact means including slotted sleeve portions and having tongue portions for clamping to an end of a second electrical conductor, said sleeve portions of said second contact means being clamped by the lyre-like spring portions of said first contact means, and said lyre-like spring portions having barb-like ends engaging a first insulating member such that said first contact means are beddedly held in said first insulating member, characterized in that two substantially mutually coaxial conductor ends are each connected to separate ones of said lyre-like first contact means, and separate ones of said first contact means being connected with each other by said sleeve-like second contact means.

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