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(54) Connector

(57) The invention relates to a connector for the mechanical and electrical connection of the ends of electrical conductors. The connector comprises at least two components, said components having complimentary engagement means to allow the components to be brought and held together to form the connector. The engagement means limit axial movement along the connector and retaining means are provided to lock the engagement means in position and prevent relative movement of the components perpendicularly to the longitudinal axis of the connector.

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Description

[0001] This invention relates to a connector for use in the connection of electrical conductors, and particularly although not necessarily exclusively for the connection of the ends of two electrical cables with any insulation surrounding the conducting cores removed at the respective ends to allow the ends to be inserted into and secured in the connector parts.

[0002] Use of mechanical connectors to join electrical conductors and allow the transfer of electricity between said conductors via the connector body is well known. One such conventional connector comprises two parts, each part having a port at one end for the location of an electrical conductor end therein and an engagement portion at the other end. The parts are joined together by overlapping the engagement portions of the respective parts so as to provide a horizontal interface between the parts and clamping them together using a bolt which passes through corresponding apertures in said overlapping engagement portions.

[0003] A problem associated with this type of connector is that there is nothing to mechanically hold the two parts of the connector together before the bolt is located therewith. As such, a user is required to use both hands to fit the connector together; a first hand to grip the two parts of the connector together in overlapping arrangement and a second hand to locate the bolt in the aperture and tighten the same. As this type of connector is typically used for connection of electrical conductors underground, there is normally limited space and/or access in which the connectors can be fitted and thus the user often has difficulties in manoeuvring themselves to be able to fit the connector. In practice, the user often has difficulties in aligning the parts using one hand whilst locating the bolt in the aperture using the other hand. Thus conventional connectors tend to be fiddly and time consuming to assemble.

[0004] A further problem associated with such connectors is that in order to manoeuvre the mating connector parts into an overlapping position, an extended portion of each of the conducting cable ends located with the parts of the connector need to be able to flex to allow relative movement of the conductor ends and connector parts and allow connection. This is not always easily possible and this adds to the difficulties associated with assembly of the connector.

[0005] It is therefore an aim of the present invention to provide a connector which overcomes the abovementioned problems and is quick and easy to assemble.

[0006] According to a first aspect of the present invention there is provided a connector for use in connecting together at least first and second electrical conductors, said connector including first and second components and at least one component having at least one port therein for the location therein of one of said first and second electrical conductors and characterised in that said components are provided with complimentary engagement means to allow engagement of said components together to form the connector and limit relative movement along the longitudinal axis of the connector and retaining means are provided to retain the components in the engaged position and limit movement of said components perpendicularly of the longitudinal axis of the connector.

[0007] Preferably said retaining means includes a locking member which locates in a port in the connector to clamp the components together.

[0008] Preferably one end of the locking member has smaller cross sectional dimensions than the other end of the member.

[0009] In one embodiment at least a portion of the locking member is tapered along its length.

[0010] Preferably a greater portion of the port for the location of the locking member is formed on one component than on the other component. In one embodiment only the wider part and tapered section of the locking member contacts with one of the components.

[0011] Preferably at least a portion of the locking member is threaded and engages with a complementary threaded portion of the port.

[0012] When the components are engaged together by said complementary engagement means, the locking member is inserted into said port and the threaded portion engages with the threaded bore. The portion of the locking member with increased cross sectional dimension contacts both components and forces the two components apart to a limited extent, thereby increasing the clamping effect of the complementary engagement means.

[0013] Preferably the complimentary engagement means are in the form of, on one of said components, a flange portion or portions which slidably engage(s) with a complementary groove or grooves on the other of said components, thereby forming said engagement means.

[0014] In one embodiment the groove(s) has an open end for sliding the flange portions therein and a blind end against which ends of the flange portions engage.

[0015] The advantages of the present invention are that the connector allows self alignment and electrical connection of the conductors. As the components are engaged by the complimentary engagement means, they do not need to be held together by the user to the same extent as the conventional connectors when clamping the components together, thereby allowing the user to use only one hand to secure the locking member in position and hence form the connector. This is advantageous when there is only limited space available for assembling the connector. The user can use two hands to locate the locking member in the offset port if required, which is not typically possible with prior art connectors. Once the components are engaged together, the user need only be concerned with separation of the components in a single direction whilst securing the locking member, compared to conventional connectors which can separate in any number of directions. Thus the

present invention increases the ease with which the connector can be assembled.

[0016] A further advantage of the present invention is that the engagement portions of the components are relatively short as they do not require the length to be provided for the mating parts as required in conventional connectors. As such, a reduced length of conducting cable is required to be flexed in the present invention to allow fitment and assembly of the connector components, compared to conventional connectors.

[0017] An embodiment of the present invention will now be described with reference to the accompanying figures wherein:

Figure 1 is an exploded view of the connector components in one embodiment of the present invention;

Figure 2a is an elevation of the locking member with one of the connector components in cross section;

Figure 2b is a side view of the other of the connector components to that shown in Figure 2a;

Figure 2c is a plan view of the connector component of Figure 2b; and

Figure 3 illustrates the connector once formed, in plan.

[0018] Referring to Figure 1, there is illustrated the components of a connector 2 for connecting at least ends of first and second electrical cables together.

[0019] The connector 2 comprises a first component 4, a second component 6 and a locking member in the form of a locking shear screw 8. The first and second components 4, 6 have ports 5, 7 respectively for the location of first and second electrical conductor cables respectively. The ports are sized according to the size of the cable core, with insulating removed, to be located therein and securing means such as clamping screws are provided to locate in threaded apertures, shown in Figure 3, in the components to exert a clamping force on the conductors and retain the same in the components.

[0020] The components are provided with first and second complimentary engagement means, 10, 14.

[0021] The component 4 is provided with a flanged portion 10 at end 12. The component 6 is provided with a complimentary grooved portion 14 at end 16. In use, the flanged portion 10 is slidably located in the grooved portion 14, as shown by arrow 17, thereby holding the two components together to prevent movement axially along the longitudinal axis of the connector as shown by arrow 18.

[0022] As illustrated in Figures 2a-c the grooved portion 14 is shaped so that there is a first open end 20 through which end 22 of the flanged portion 10 is inserted, and a blind end 24 against which end 22 engages when in a fully connected position. Therefore, the component 4 is slidably engaged with the component 6 in direction 17. The two components can be separated by moving the components in the reverse direction to 17. The grooved and flanged portions, when engaged, also limit movement of the components transversally to one possible direction, as well as preventing movement axially. Thus, in assembly of the connector, the user need only be concerned with separation of the components in a single direction, compared to conventional connectors which can separate in any number of directions unless the parts are securely gripped in a user's hand.

[0023] Once the components 4,6 are engaged, a threaded end 26 of locking member 8 is inserted in port 27 formed by both the components, to clamp the components together by rotation according to arrow 31. Port 27 is provided in and formed by component 6 and, to a lesser extent, by component 4 and has a threaded portion 29 to engage with threaded end 26 of the locking member. The port 27 includes the threaded portion 29 and a wider diameter part 28. The majority of the port 27 is formed on one component, 6, and indeed, as shown in Figures 2b and c, only a portion of the wider diameter part 28 of the port 27 is formed in component 4. Location of locking member 8 in the port 27 forces the first and second components 4, 6 apart due to the tapered increasing diameter of section 30 of the locking member being in line with and in contact with stepped portion 32 of the port 27 in components 4 and 6. This movement apart is limited by and acts to further engage the flanged portion 10 of component 4 with the grooved portion 14 of component 6 as well as ensuring close contact between the components and hence assured electrical connection between the components and hence conductors.

[0024] The threaded portion can be provided along a greater or smaller portion of locking member 8 as required.

[0025] The connector is typically made from a conducting material, such as a metallic material. The outer surface of the connector is provided with smooth contours so as to reduce electrical discharge as required in the conventional manner.

[0026] Figure 3 illustrates an assembled connector 2 formed from components 4, 6. The engagement means 10, 14 are shown engaged and the locking member 8 is shown with the head 40 of the same removed as the same is designed to shear off via weakened line 42, shown in Figure 1, when a predetermined turning torque is reached.

[0027] It is also shown how conductors 44, 46 are respectively located with respective ends 48, 50 located in ports 7, 5 respectively and held in position by shear bolts 52 with their heads sheared off as with locking member 8 with the shear bolts located in apertures in the connector components and contacting the conductors to exert a clamping force on the same and secure

them in the connector to allow the electrical connection through the connector and between the conductors. As many shear bolts 52 as required can be provided as required.

[0028] Thus the present invention provides a connector which can be easily assembled in limited space.

Claims

1. A connector (2) for use in connecting together at least first and second electrical conductors, said connector including first and second components, (4; 6), at least one component having at least one port (5; 7) therein for location of one of said first and second electrical conductors; **characterised in that** said components are provided with complimentary engagement means (10, 14) to allow engagement of said components together to form the connector and limit relative movement along the longitudinal axis (18) of the connector and retaining means (8) are provided to retain the components (4, 6) in the engaged position and limit movement of said components perpendicularly of the longitudinal axis (18) of the connector (2).

2. A connector according to claim 1 **characterised in that** said retaining means includes a locking member which locates in a port (27) formed by the connector components to clamp the components together.

3. A connector according to claim 2 **characterised in that** one end (26) of the locking member (6) has a smaller cross sectional area than the other end.

4. A connector according to claim 2, **characterised in that** a portion (30) of the locking member is tapered along its length.

5. A connector according to claim 2 **characterised in that** a greater portion of the port (27) is formed in one component (6) than in the other component (4).

6. A connector according to claim 2 **characterised in that** a portion (26) of the locking member (8) is threaded to engage with a complimentary threaded portion (29) of the port.

7. A connector according to claim 1 **characterised in that** when the components (4, 6) are engaged together by said complimentary engagement means (10, 14), a locking member (8) is inserted into a port (27) defined by said components and a threaded portion (26) of the locking member engages with a threaded portion (29) of the port.

8. A connector according to claim 7 **characterised in that** the locking member contacts both components (4, 6)and forces the two components apart to a limited extent thereby increasing the engagement of the complimentary engagement means (10, 14).

9. A connector according to any of the preceding claims **characterised in that** one of the components (4) is provided with a flange portion (10) which slidably engages with a complimentary channel (14) on the other of said components (6) to form the complimentary engagement means.

10. A connector according to claim 9 **characterised in that** the channel (14) has an open end (20) for the introduction of the flange portion end (22) and a blind end (24) against which the end (22) of the flange portion (10) engages.

11. A connector according to any of the preceding claims **characterised in that** each component has a port (5, 7) each port receiving an end of a conductor therein.

12. A connector according to claim 1 **characterised in that** the conductor end is located in each port with at least one clamping screw passing through an aperture in the connector component and on to the conductor.

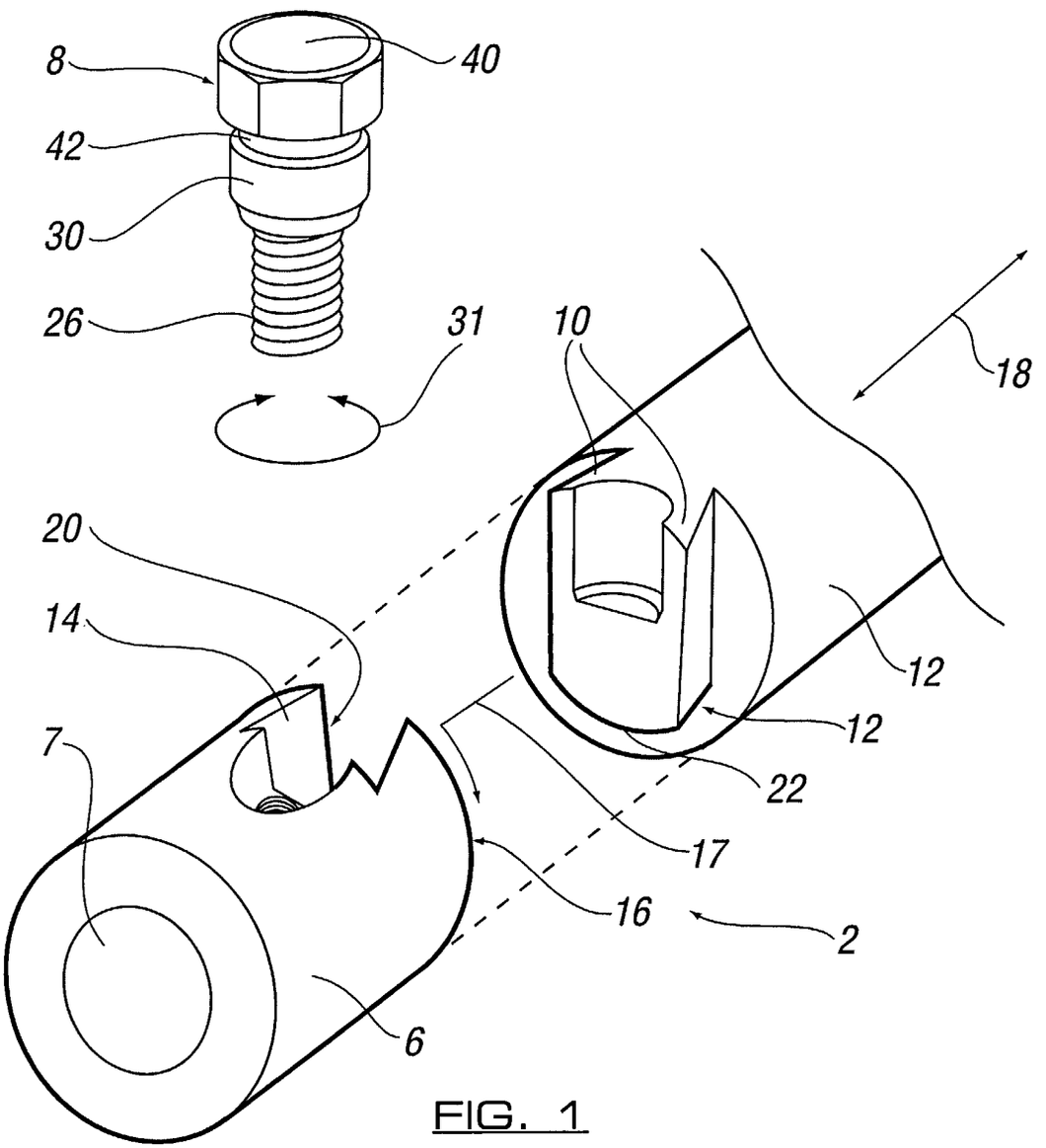

FIG. 1

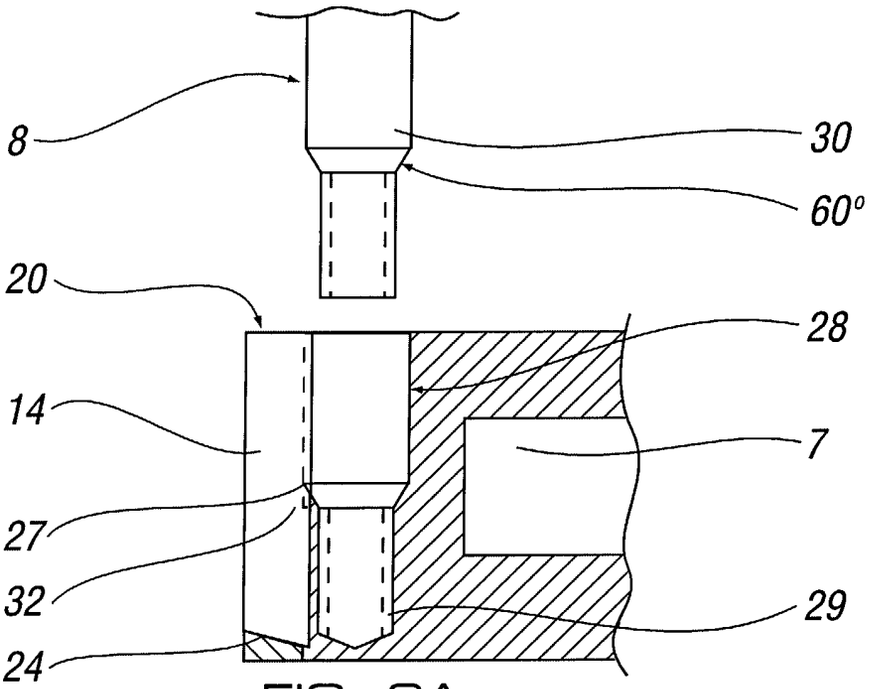

FIG. 2A

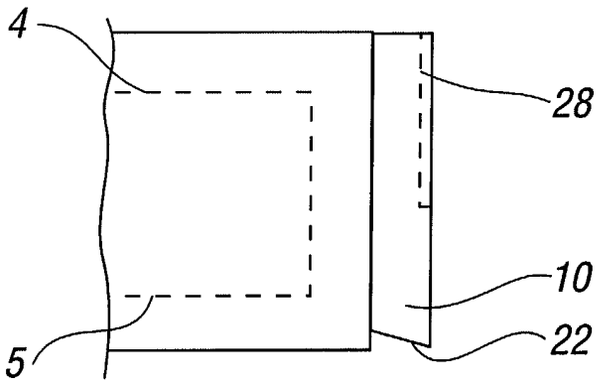

FIG. 2B

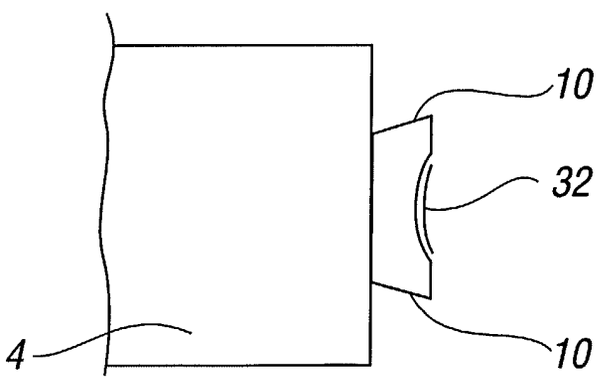

FIG. 2C

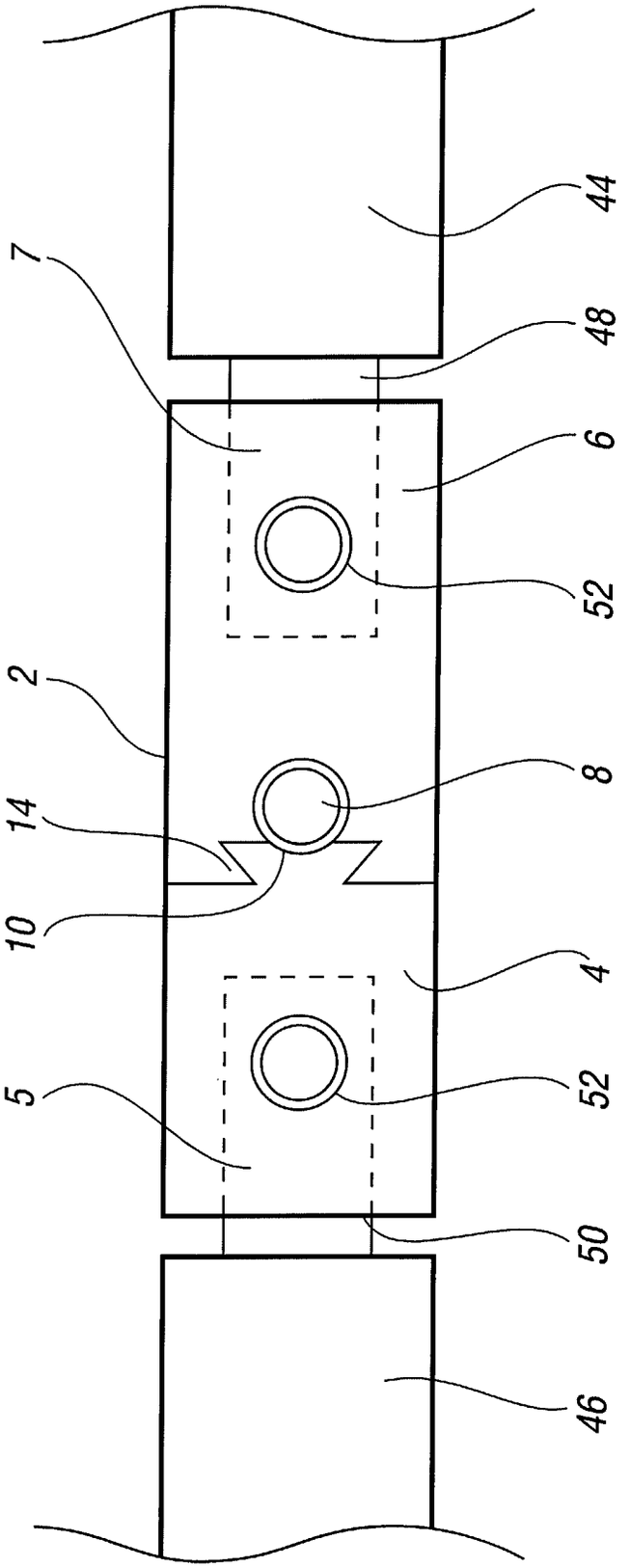

FIG. 3