

[54] **INSULATIVE TORQUE COUPLING
ASSEMBLY FOR ELECTRICAL DEVICE
TERMINALS**

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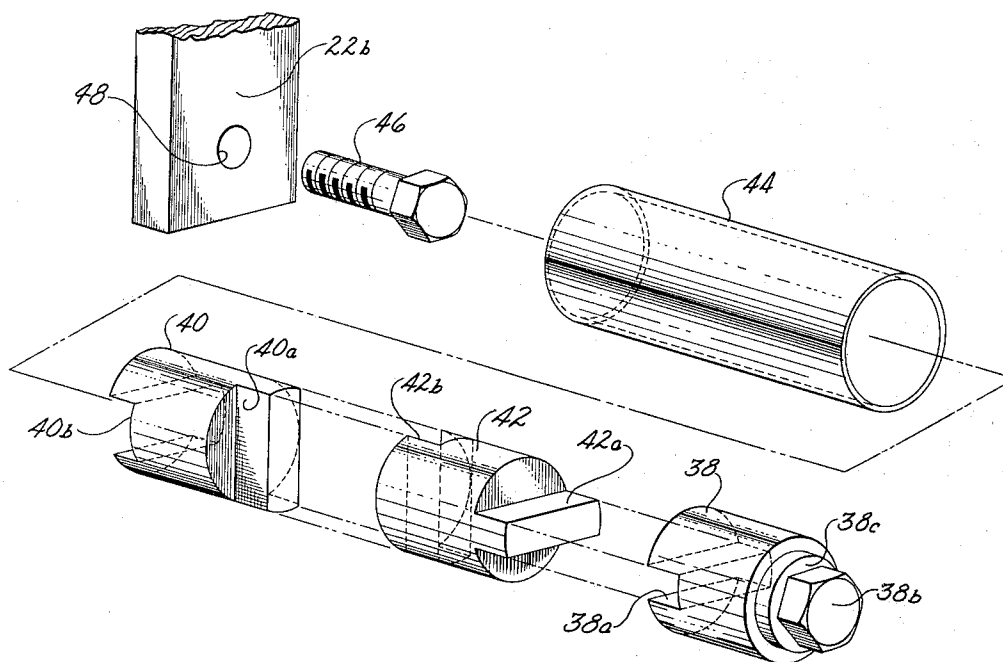
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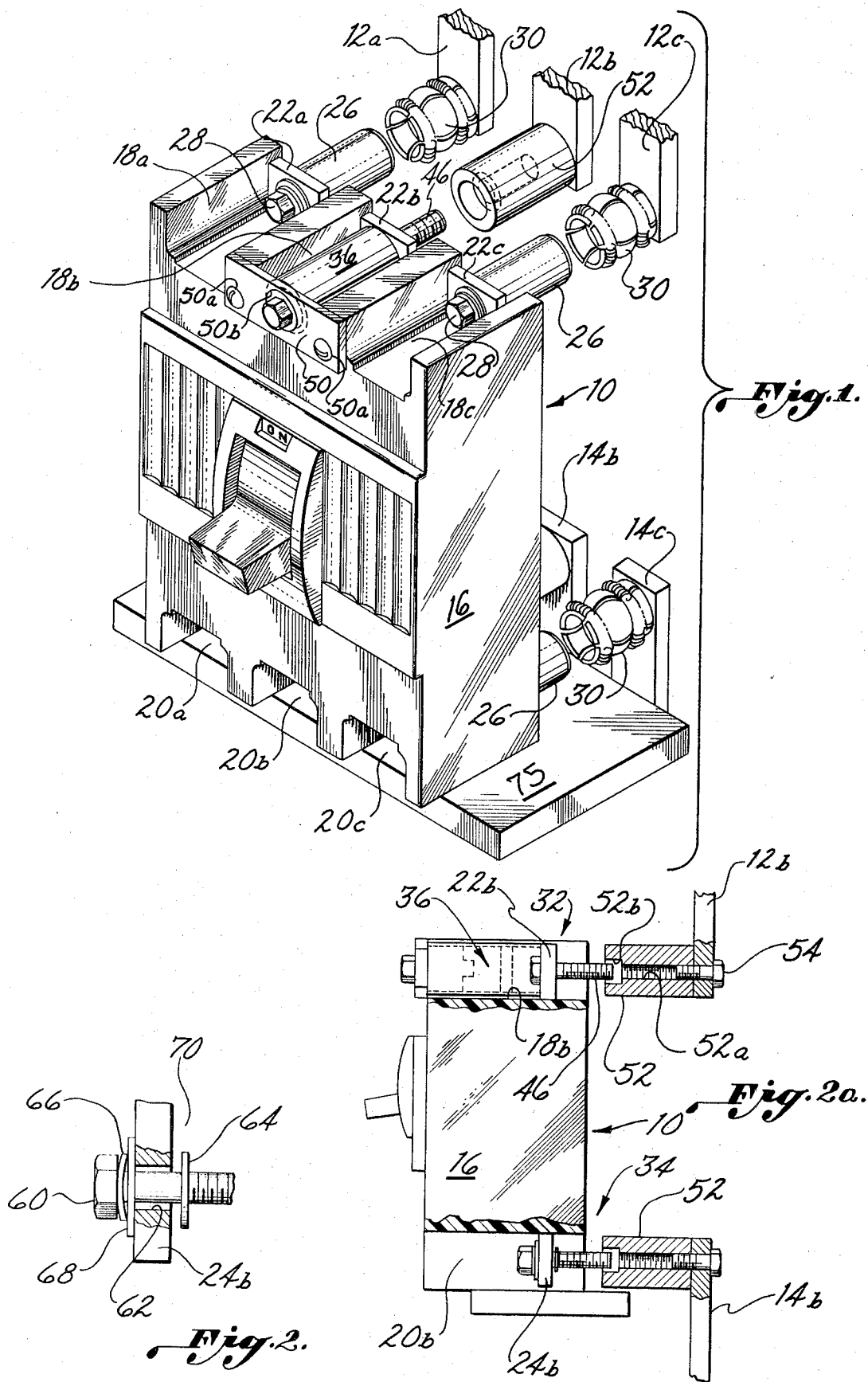
ABSTRACT

An insulative torque coupling assembly includes a bolt couple engaging a bolt passing through an aperture in a terminal of an electrical device. An actuator couple formed for engagement by a wrench is torqued to drive the bolt couple through an intermediate insulative couple to turn the bolt pursuant to effecting with relative safety a line bolted electrical connection of the device terminal to an associated switchboard terminal. An insulative sleeve holds the couples in coaxial assembly.

10 Claims, 4 Drawing Figures



SHEET 1 OF 2



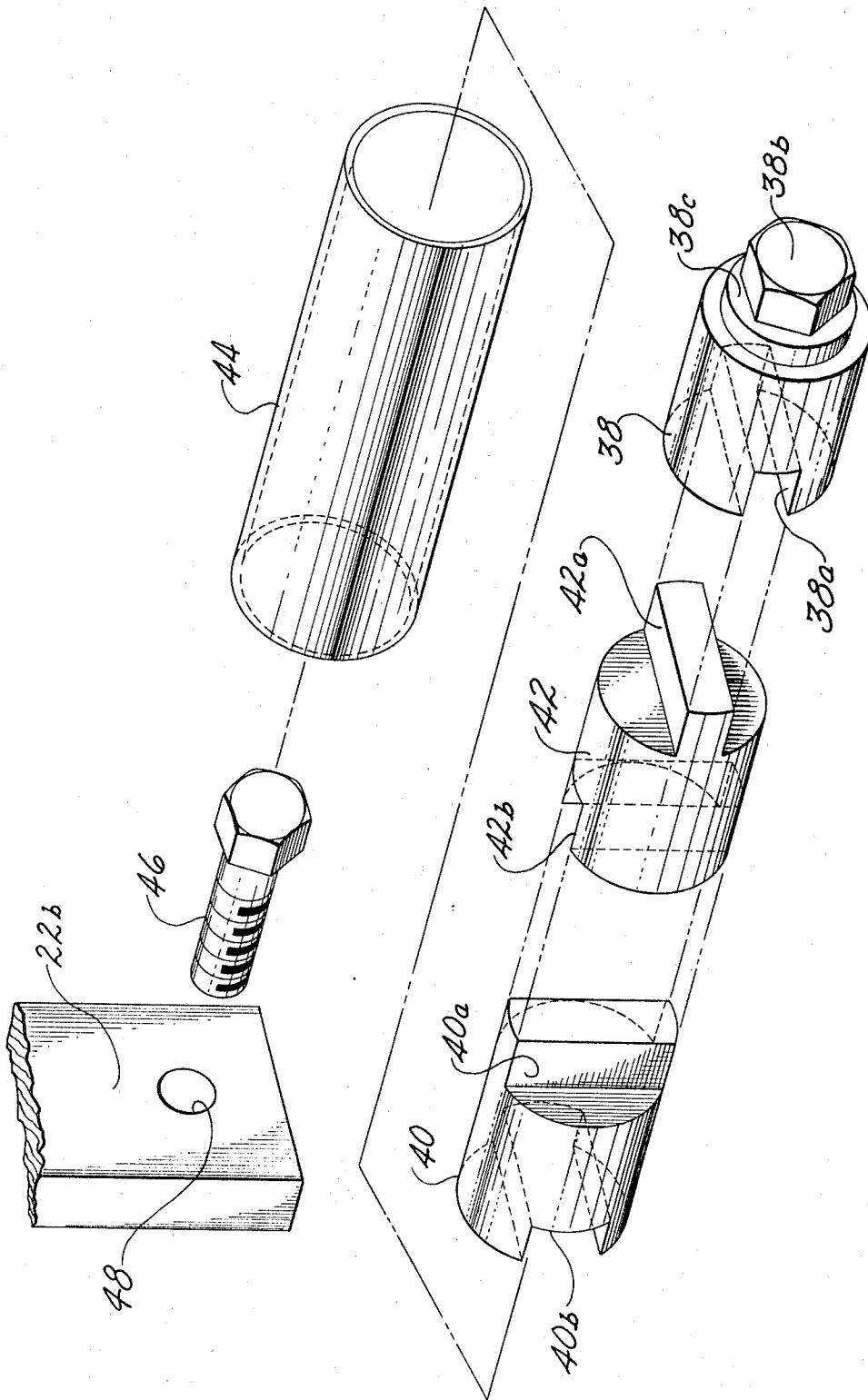


Fig. 3.

INSULATIVE TORQUE COUPLING ASSEMBLY FOR ELECTRICAL DEVICE TERMINALS

BACKGROUND OF THE INVENTION

The physical mounting and electrical connection of large and thus relatively heavy electrical devices, such as circuit interrupting devices, to switchboards is a rather difficult task. In some installations, physical mounting and electrical connection are commonly obtained using bolted joints at the device line terminals. In this way, the device is coincidentally supported by and electrically connected to the buswork of the switchboard. While this arrangement is quite effective in achieving both functions, the mounting and dismounting of the device is not particularly convenient. An additional, and quite significant disadvantage of bolted line terminals is that mounting and dismounting of the device is quite hazardous if performed while the switchboard is live. In many situations, it is impractical or at least undesirable to de-energize the switchboard, and thus the electricians must use insulative gloves and/or special tools.

To reduce the hazards of working with live switchboards, devices are provided with plug-in or stab-type terminal connectors which do not require manipulation during mounting and dismounting of the device. However, stab connectors are not capable of physically supporting large devices, which therefore must be somehow separately mounted to and supported by the switchboard. The separation of the electrical connection and physical mounting function renders this type of installation only somewhat more convenient to the electrician. Moreover, stab connections, particularly those having current ratings, typically require considerable exertion by the electrician to effect connection and disconnection. This can be particularly unfortunate during disconnection, since the sudden release of stab connections can throw the electrician off balance, raising the possibility of personal injury, and damage to the device.

It is accordingly an object of the present invention to provide an insulative torque coupling assembly for use in effecting a live, bolted electrical joint in relative safety.

An additional object of the present invention is to provide a torque coupling assembly of the above character which is particularly suited for incorporation in a terminal connection for electrical devices of current design.

A further object is to provide a torque coupling assembly of the above character which is simple and inexpensive in design, and convenient and safe to use.

Other objects will in part be obvious and in part appear hereinafter.

SUMMARY OF THE INVENTION

In accordance with the present invention there is provided an insulative torque coupling assembly for use in making bolted electrical joints. A signal feature of the invention is the provision of electrical isolation from one end of the assembly to the other, such that it can be manipulated to effect and maintain live bolted joints or connections without danger of electrocution. The invention thus is ideally suited for making terminal connections of an electrical device to a switchboard while the switchboard is live, i.e., energized.

More specifically, the insulative torque coupling assembly of the present invention includes a plurality of discrete couples held in coaxial assembly by a heat-shrunk insulative sleeve. The couple at one end of the assembly, termed an actuator couple, is formed of metal having an end configuration conducive to engagement by a wrench or equivalent torquing tool. The couple at the other end of the assembly, termed a bolt couple, is likewise formed of metal having an end configuration conducive to engaging for driven rotation the head of a bolt to be utilized in making the bolted joint. Intermediate the actuator and bolt couples is an insulative couple keyed at its ends to interfit with its neighboring couples so as to transmit torque therebetween. Since the actuator couple is isolated from the bolt and bolt couple, it can be safely touched and manipulated to torque the bolt even though the latter is contacting live, current carrying parts.

The insulative torque coupling assembly of the invention is particularly suited for incorporation with a terminal or terminals of an electric device, such as a circuit breaker or switch, to be installed in an electrical switchboard. The insulative character of the assembly permits installation and removal of the device in safety while the switchboard is live. In addition, the torque coupling assembly of the instant invention can be readily mounted to the device in conjunction with the bolt for retention in operative relation to the terminal or terminals thereof during shipment and use. This mounting provision, if of a character to permit conjunctive rotation of the assembly and bolt, but constrain movement of the assembly and bolt relative to the device, can also provide a "racking" function in that the device can be forcibly drawn toward and away from a switchboard incident to making and breaking the bolted terminal connections.

The invention accordingly comprises the features of construction and arrangement of parts which will be exemplified in the construction hereinafter set forth, and the scope of the invention will be indicated in the claims.

DESCRIPTION OF THE DRAWING

For a fuller understanding of the nature and objects of the invention, reference should be had to the following detailed description taken in connection with the accompanying drawing in which:

FIG. 1 is a perspective view of a circuit interrupting device and a portion of an electrical switchboard equipped with the insulative torque coupling assembly of the present invention;

FIG. 2 is an enlarged side view of load terminal 24b of FIG. 2a;

FIG. 2a is a side elevational view of the circuit interrupting device and switchboard parts of FIG. 1, partially broken away; and

FIG. 3 is an exploded perspective view of the insulated torque coupling assembly of the invention as accommodated at the center pole line terminal of the circuit interrupting device.

Corresponding reference numerals refer to like parts throughout the several views of the drawings.

DETAILED DESCRIPTION

Referring to the drawings, a circuit interrupting device, for example a circuit breaker as generally indi-

cated at 10, is illustrated in electrically disconnected relation to switchboard terminals provided by line bus 12A, 12B, 12C and load but 14A (not shown), 14B, 14C rigidly mounted in an industrial switchboard. The circuit breaker 10 is enclosed in a molded case 16 which is formed to provide line terminal recesses 18A, 18B, 18C at its upper end and load terminal recesses 20A, 20B, 20C at its lower end in the orientation illustrated. Adjacent the back side of the circuit breaker, line terminals 22A, 22B, 22C emanate from the interior of the molded case into these line terminal recesses. While obscured in FIG. 1, it will be understood that load terminals, respectively electrically associated with each of the line terminals, emanate from the interior of the circuit breaker case 16 into respective load terminal recesses 20A, 20B, 20C. This structure is illustrated in FIG. 2, wherein the center pole or B phase load terminal 24B extends into load terminal recess 20B adjacent the rearward end thereof. The structure of circuit breaker 10 thus far described is conventional.

Still referring to FIG. 1, line terminals 22A and 22C for the outer poles, i.e., the A and C phases, are equipped with plug-in male stabs 26 secured by bolts 28. The A and C phase load terminals are similarly equipped with male stabs 26; only the stab secured to the C phase load terminal appearing in FIG. 1. A and C phase line and load bus bars each carry female stabs 30 positioned for mating electrical engagement with the male stabs 26 upon plug-in installation of circuit breaker 10. It will be appreciated that the stab connector parts 26 and 30 may take other forms from that shown in FIG. 1 and that the positions of the male and female parts may be reversed.

A line terminal mechanical assist, generally indicated at 32 in FIG. 2, is structured to provide electrical isolation between the operator and line terminal 22B, thus permitting the operation thereof in relative safety while the switchboard, particularly B phase line bus bar 12B, is live. The load terminal mechanical assist, generally indicated at 34 in FIG. 2, is preferably structured without electrical isolation, since the load terminal 24B can be readily de-energized by switching circuit breaker 10 to its "off" condition and thus manipulative operation of this assist can be safely performed while the switchboard is live. It will be appreciated that the load terminal assist may be constructed identically to assist 32 for an extra measure of safety.

The electrical isolation of mechanical assist 32 is provided by an insulative torque coupling assembly, generally indicated at 36 in FIG. 2, which consists of, as best seen in FIG. 3, a metallic actuator couple 38, a metallic bolt couple 40 and an intervening insulative couple 42. These couples are inserted end-to-end in an insulative plastic sleeve 44, which is then heat-shrunk to maintain the couples in coaxial assembly. The couples are formed with interfitting tongues and grooves so as to be rotatably interconnected. Thus, as seen in FIG. 3, insulative couple 42 is formed at one end with a tongue 42a which is received in a groove 38a formed in one end of actuator couple 38. The other end of insulative couple 48 is formed with a groove 48b which receives a tongue 40a formed on one end of bolt couple 40. Preferably, the tongue and groove coupling between couples 38 and 42 is misaligned by 90° with the tongue and groove coupling between couples 38 and 42 in order to improve the torque coupling capacity of the insulative

couple, which may be formed of any number of known high-strength plastic materials.

The other end of actuator couple 38 from groove 38a is machined down or otherwise provided with a bolt head configuration 38b spaced from the couple body by an annular shoulder 38c. The other end of bolt couple 40 from torque 40a is formed with a suitable socket for drivingly engaging the head of a bolt 46 passing freely through an aperture 48 in the center pole line terminal 22B of circuit breaker 10. It is found that adequate driving connection with bolt 46 can be obtained by engaging its head in a simple groove 40b formed in the end of bolt couple 40.

As seen in FIGS. 1 and 2, assembly 36 is accommodated in line terminal recess 18B with the shank of bolt 46 passing through aperture 48 in line terminal 22B and its head engaged in groove 40b of bolt couple 40. The assembly 36 is held captive by a plate 50 secured to the breaker case 16 across the front end of terminal recess 18B by screws 50a. Plate 50 is apertured at 50b to accommodate shoulder 38c and thus engages the body of actuator couple 38 beyond this shoulder. The torque coupling assembly 36 is thus captured between plate 50 and line terminal 22B to constrain endwise movement thereof relative to circuit breaker 10. It is noted that this endwise constraint does not impede rotational movement of assembly 36.

Still referring to FIGS. 1 and 2, B phase line bus bar 12B carries a connector 52, secured by suitable means such as a bolt 54. Connector 52 is formed having a threaded bore 42a which is countersunk to provide a recess 52b. Bore 52a is sized to receive the threaded shank of bolt 46. It is seen that rotation of the torque coupling assembly 36 in the direction to advance the shank of bolt 46 into bore 52a draws the circuit breaker 10 toward the line bus bars, thereby forcibly making the stab connections 26, 30. When bolt 46 is torqued up tight, a reliable bolted joint is achieved between line terminal 22B and connector 52 incident to completing the stab connections for the line terminals of the outer poles. To disengage the circuit breaker, the torque coupling assembly is rotated in the opposite direction to back the shank of bolt 46 out of bore 52a, thereby forcibly withdrawing the circuit breaker from the switchboard. It is appreciated that, by virtue of the electric discontinuity afforded by the insulative coupler 42, the bolt headed portion 38b of actuator 38 may be manipulated by an electrician using a conventional socket wrench without danger of electrocution, even while the line bus is live.

Mechanical assist 34, though differently constructed, operates on the same principle as assist 32 described in detail above. As best seen in FIG. 2, a bolt 60 passes freely through an aperture 62 in load terminal 24B and is constrained against endwise movement relative to the circuit breaker by the bolt head on one side of the load terminal and on the other side by a snap ring 64 accommodated in a groove formed in the bolt shank. A spring washer 66 and washer 68 are disposed under the head of bolt 60, while a washer 70 is disposed between snap ring 64 and load terminal 24B. Load bus bar 14B carries a connector 52, secured thereto by bolt 54. It is thus seen that rotation of bolt 60 advancing its shank into threaded bore 42a of connector 52 draws the circuit breaker toward the switchboard to forcibly make the load terminal stab connections. In order not to interfere with the making of the bolted joint at the

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center pole load terminal, the recess 52b in connector 52 is dimensioned to accept snap ring 64 as the end of the connector is clamped in positive electrical connection with load terminal 24B via washer 70. Rotation of bolt 60 in the opposite direction forcibly withdraws the circuit breaker, thereby disengaging the load terminal stab connections. With the circuit breaker in the "off" condition, the bolt 60 can be safely manipulated using a conventional socket wrench without de-energizing the switchboard.

If desired, especially in the case of large circuit breakers, a shelf 75 (FIG. 1) may be mounted to the switchboard frame (not shown) to support the circuit breaker at least during the initial mounting stage and the final dismounting stage.

While the insulative torque coupling assembly 36 of the invention is illustrated as being incorporated in a mechanical assist for forcibly moving an electrical device relative to a switchboard, or the like, it will be appreciated that the invention is generally useful in making bolted joints where one of the parts to be joined is live. Thus, if mechanical assistance is not desired, all three line terminals of the circuit breaker may be equipped with the insulative torque coupling assembly of the invention. Moreover, it is contemplated that the bolt 46 may be mounted by the switchboard terminal and a nut, equivalent to connector 52, mounted by the circuit breaker for driving rotation by the assembly 36. In this connection, couple 40 may be provided with a tapped bore to serve as the nut.

It will thus be seen that the objects set forth above, among those made apparent in the preceding description, are efficiently attained and, since certain changes may be made in the above construction without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

Having described my invention, what I claim as new and desire to secure by Letters Patent is:

1. An insulative torque coupling assembly for use in making an electrical joint, secured by a bolt, said as-

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sembly comprising, in combination:

- A. a metallic actuator couple having one end configured for engagement by a torquing tool;
- B. a metallic bolt couple formed to engage the bolt;
- C. an intermediate insulative couple having ends configured to interfit with ends of said actuator and bolt couples such as to transmit torque therebetween; and
- D. means holding said couples in coaxial assembly.

2. The assembly defined in claim 1, wherein said bolt couple is formed at one end with means for engaging the head of the bolt.

3. The assembly defined in claim 1, wherein said holding means is in the form of an insulative sleeve.

4. The assembly defined in claim 3, wherein said sleeve is heat shrunk about said couples.

5. The assembly defined in claim 1, wherein the ends of said couples are formed to provide tongue and groove interfitting torque coupling connections therebetween.

6. The assembly defined in claim 5, wherein said tongue and groove connection between said actuator couple and said insulative couple is angularly misaligned with said tongue and groove connection between said bolt couple and said insulative couple.

7. The assembly defined in claim 5, wherein said holding means is in the form of an insulative sleeve heat shrunk about said couples.

8. The assembly defined in claim 1, wherein said actuator couple is formed having a bolt headed end configuration facilitating engagement by a wrench, said headed end configuration being separated from the couple body by an annular shoulder facilitating mounting said assembly for rotation.

9. The assembly defined in claim 8, wherein the ends of said couples are formed to provide tongue and groove interfitting torque coupling connections therebetween.

10. The assembly defined in claim 9, wherein said holding means is in the form of an insulative sleeve heat shrunk about said couples.

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