United States Patent

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[54] **ELECTRICAL CONNECTOR**

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[52] **U.S. Cl.**.....**339/94 A**, 339/150 R, 339/213 R, 339/218 M

[51] **Int. Cl.** **H01r 13/52**

[58] **Field of Search**.....339/94 R, 94 A, 94 M, 111, 339/116, 150, 151, 154 R, 156 R, 213, 218, 263, 59, 60, 143, 205, 198 R, 198 E, 198 N, 132; 174/152 R, 153 R

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[57] **ABSTRACT**

A connector for making one or more electrical connections to a threaded male or female connection for power distribution applications such as power transformer connections especially in locations in which considerable moisture or water is likely to be present. A conductive connector is designed to mate at one end with the transformer connection within the transformer tank. A body, preferably tubular in shape, is suitably molded or cast about the connector and should be composed of a suitable water impervious resin such as epoxy or the like. The molded body terminates at one end in a bushing section for each transformer connection. The molded body at the other end terminates in a tubular cylindrical wall for each connector. Each cylindrical wall terminates in a peripheral raised rim from which a connector tang centrally protrudes. The raised rim mates with a shoulder on the inside of a waterproof, elastic, tubular sleeve to fully insulate the terminal connection against exposure.

3 Claims, 8 Drawing Figures

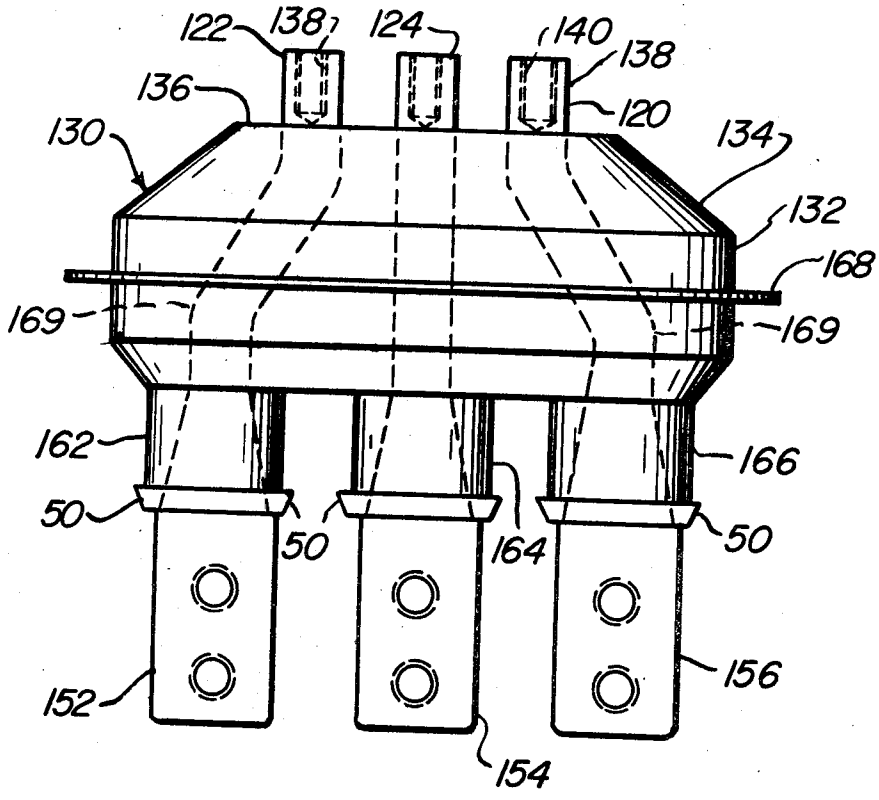
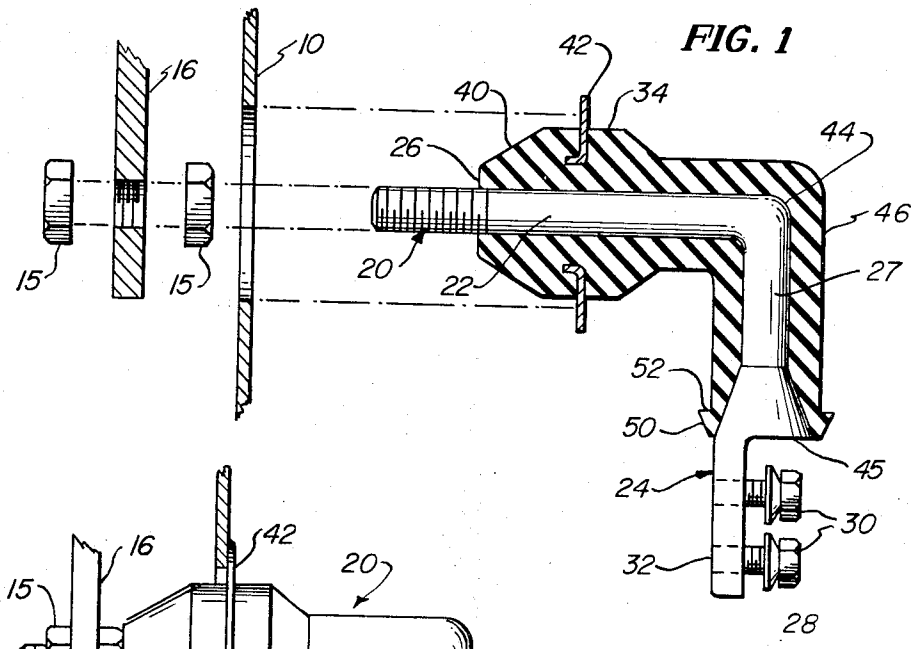


FIG. 1



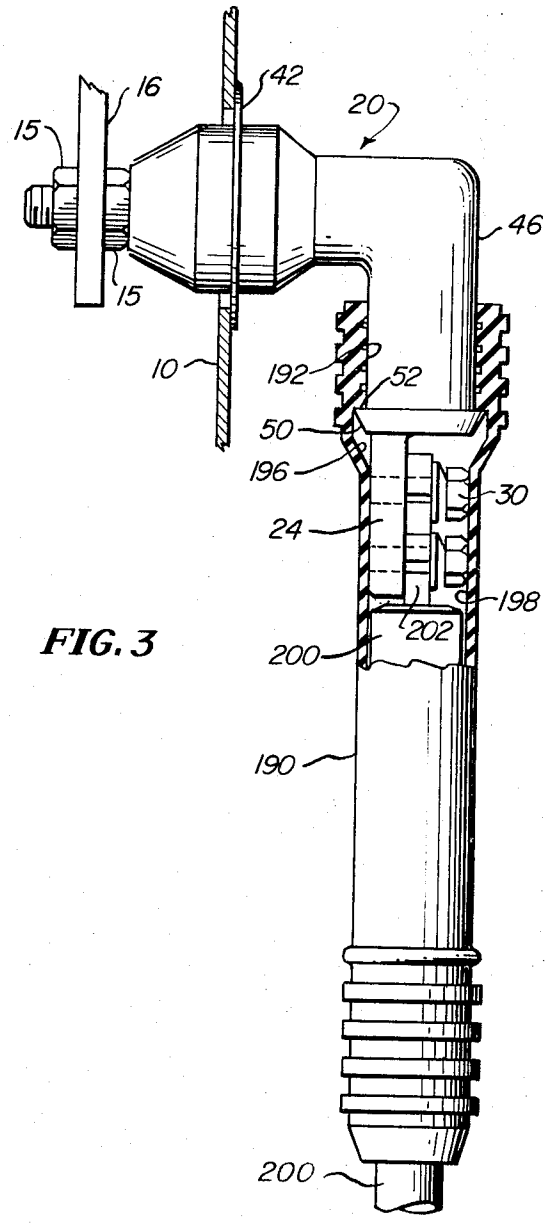


FIG. 3

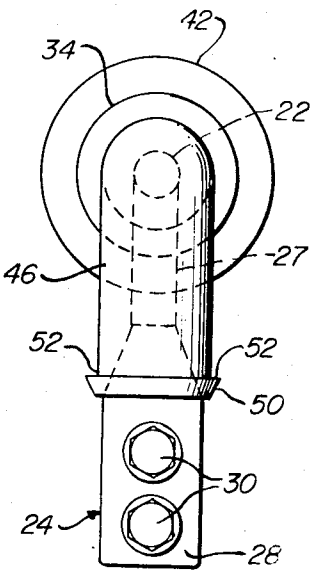


FIG. 2

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FIG. 5

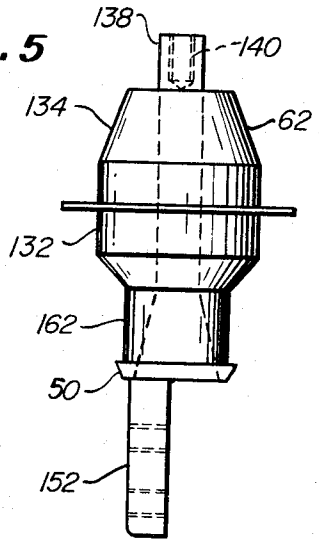


FIG. 4

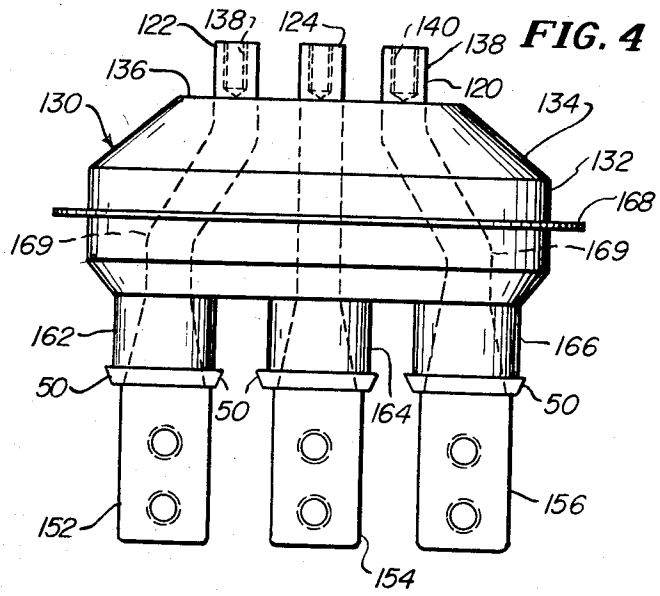
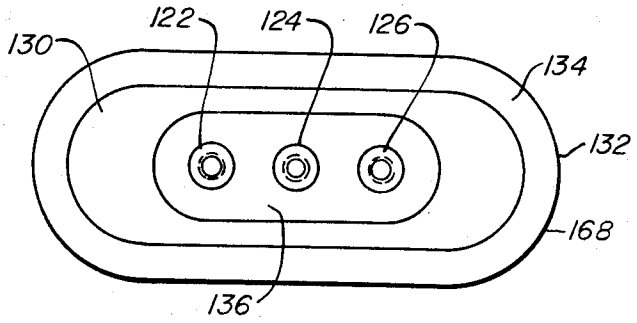


FIG. 6



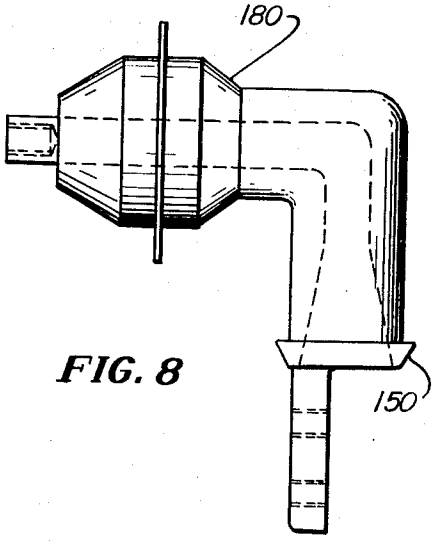
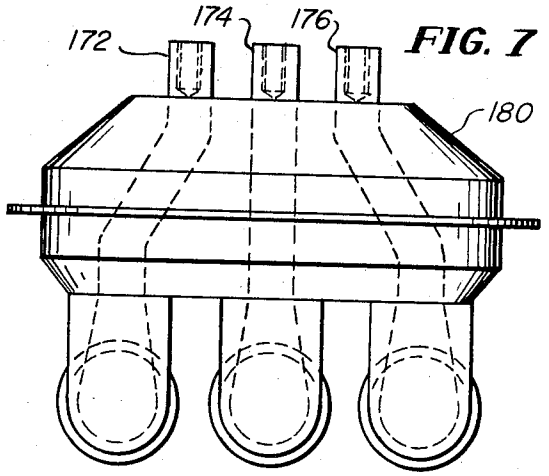


FIG. 8

FIG. 7



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ELECTRICAL CONNECTOR

BACKGROUND OF THE INVENTION

In general usage, electrical connections from power system transformers terminate in an internally or externally threaded stud extending normally from the body of the transformer within the transformer tank. In the usual condition, the electrical connection or connections are effected by an intermediate connector which is in turn affixed to suitable cables. The intermediate connector may take the form of a conductive sleeve with the cable soldered or otherwise entered into the opposite end. Another approach has been to mount a terminal member with either a threaded bore or clearance opening on the stud. In the latter case, a clamping screw or the like would be used.

In either of the cases noted, problems have arisen relative to firmness of the connection. Other problems arise relative to the assembly and possible disassembly of the connection. Of course a necessary condition is that a tight and firm electrical connection is made and that the connection be waterproofed and suitably insulatable from moisture.

SUMMARY OF THE INVENTION

It is therefore an object of the invention to provide a new and improved terminal connector for electrically connecting one or more cables to a threaded terminal connection.

It is a further object of the invention to provide a new high power carrying connector which is readily assembled onto the power source connection and may then be fully waterproofed and insulated.

It is a further object of the invention to provide an improved mating connector which may have a water impervious, insulating jacket molded thereon, the jacket serving to waterproof and insulate the connector and mate with the sleeve to waterproof and insulate the connection to one or more cables.

The invention shown and claimed herein employs the principle of a conductive connector fitted on the mounting connection to a power transformer or the like. A water impervious, insulating body is molded onto the connector leaving only the ends exposed. One end comprises the connection to the transformer, the other one or more tangs for connection to suitable feeder cables. The molded body has a raised peripheral rim about each cable connecting tang to mate with an elastic waterproof sleeve and fully protect each tang connection from exterior conditions and periodic submersion.

The connector or connectors may each be of one piece construction thereby eliminating joints which are troublesome in high power condition.

With any of the approaches shown, a waterproof, insulating jacket is molded onto the terminal connector to produce bushing at one end and the ridged periphery at the other. An enlarged central body section is provided to permit a support flange of suitable metal such as stainless steel to be sealingly embedded in the connector.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 shows a cross section through a single terminal connector, embodying the invention exploded away from the mounting;

FIG. 2 is an end view of the connector of FIG. 1;

FIG. 3 is a side view in elevation of the terminal of FIG. 1, with a waterproof sleeve secured thereon, the sleeve being broken away in part;

FIG. 4 is a front view in elevation of a multiple connector embodying my principle;

FIG. 5 is a side view in elevation of the connector of FIG. 4;

FIG. 6 is a plan view in elevation of the connector of FIGS. 4 and 5;

FIG. 7 is a front view in elevation of an alternate form of multiple connector; and

FIG. 8 is a side view in elevation of the connector of FIG. 7.

Turning to the drawings in detail, in FIG. 1 and 2, I show a first embodiment of my invention. There I show a sheet metal transformer tank **10** which has a circular opening **12** for passing therethrough a stud-ended connector **20**. The cavity **12** may have an enlarged counterbore **14** large enough to receive a jam nut **15** for reasons which will be explained. The transformer connection may be made through a terminal lug **16** which may be any conventional lug design. The lug connects conductively to the transformer and provides one or more openings threaded or otherwise for connection thereto of a suitable connector stud **21**.

For mounting a terminal connection on the stud, I provide a jacketed, one-piece conducting connector **20** of copper, or aluminum, or other suitably conductive material or alloy. Connector **20** includes a main body **22** extending therethrough from stud **21** to its furthermost extremity being a terminal member **24** angled from the main body **22**. The main body **22** is cylindrical and has extending from its end wall **26**, an exteriorly threaded stud **23** centrally disposed within the main body **22**. At a right angle to the main body is the terminal member **24** which in cross section is intermediately circular in section **27** and is a circular segmental tang **28**. On the flat side of the terminal member **24** are suitably threaded openings **32** each of which may receive a suitably cable lug attaching bolt **30**. The connector **20** is jacketed within a water impervious insulating jacket **34** which may be molded or cast of suitable plastic resin such as epoxy to adhere to and cover the connector body. At the transformer mounting end, the jacket terminates in a tapered frusto-conic bushing **40**.

The jacket **34** has embedded therein, a stainless steel annular flange **42** protruding from the jacket body concentric to the main body of the connector. The flange is spaced from the body to maintain a layer of insulating material therebetween. The flange is adapted to be adhered in a waterproof fashion to the transformer tank **10** by suitable means such as welding, brazing or suitable water-impervious sealing methods.

The main body of the connector is formed with a right angle elbow **44** to the rear of which (FIG. 1 the connector diameter is increased gradually in portion **27** leading to its end wall **45** leading from which the terminal segmental tang **28** protrudes. The jacket covers this elbow and the circular section **27** with a thick layer of molded, waterproof, insulation **46** and terminates co-planarly with the connector end wall **45**. The jacket **34** has a raised annular peripheral rib **50** beginning at the connector end wall **45**. The rib is flared diametrically outwardly in a direction toward the elbow section

and ends in an inwardly directed planar shoulder **52** which blends into the jacket.

In FIGS. **1–3**, I have shown a single connection and in FIGS. **4–8** I have shown multiple connector structures. The multiple connector structure **120** shown in FIGS. **4–6** includes three individual connector members **122**, **124** and **126** similar generally to connector **20** of FIGS. **1**. The three connectors **122**, **124** and **126** are fitted in spaced apart relationship within a molded or cast jacket **130**. The jacket may be of suitable water-impervious material such as epoxy. The jacket has a main common section which tapers from its major oval section **132** of largest dimension into a tapered bushing section **134**. The bushing section terminates in a flat end wall **136** from which protrudes the three separate conducting studs commonly indicated by the reference numeral **138** of connector members **122**, **124**, and **126**. The studs are shown with an internally threaded cavity **140** into which may be connected a suitable bolt (not shown) to connect the stud to a transformer terminal lug in any known manner.

The connector members extend separately spaced apart within jacket **130** and each terminates in its respective terminal **152**, **154** and **156**. The terminals are shaped as described in the earlier embodiment and each has about its circular portion **158** respective jacket arms **162**, **164** and **166**. These jacket arms are integrally formed with the jacket of the jacket material.

Each such jacket arm terminates in a peripheral rib **50** as described for the earlier embodiment, with each such peripheral rib tapering outwardly from its outermost edge **51** to a radial disposed shoulder **52**.

The major oval section **132** has molded therein a flange of stainless steel of the like. The flange is insulatedly spaced from the connector members and is firmly embedded in the jacket in waterproof bond with the jacket. The flange is designed to be suitably adhered or bonded to a suitably shaped transformer tank opening not shown in a sealing relation therewith with the conducting studs **138** within the tank and terminal tangs **152**, **154** and **156** outside the tank.

In this showing, the two outer connector members **122** and **126** are angled at a suitable elbow **169** to space the stud end of the connector members closer together than the terminal ends.

In FIGS. **7** and **8**, I show a minor variation on the showing of FIGS. **4–6** with right angled connector members **172**, **174** and **176** in a main jacket **180**. The outer connector members **172** and **176** are angled inwardly toward the central member in addition to the right angled elbow of each member. Each member is preferably of one piece construction and each is spaced from the others. The construction is otherwise similar to that described for FIGS. **4–6**.

With any of these approaches a tubular waterproof, elastic sleeve or sheath **190** as shown in FIG. **3** is mounted on the embodiment of FIG. **1** sealingly fitted over the tang jacket **46**. The use of sleeves of suitable synthetic rubber or plastic of this type is known in the art. The sleeve includes an interior annularly ridged entry area **192**. This entry area leads to an annular shoulder **194** forming one edge of an annular groove **196** from which the sleeve tapers to a lesser diameter tube **198** for the major extent of the tube length. The tube terminates at its far end **199** in sealing relation with a cable sheath **200** therein, the conductor **202** sheath **200** being connected to terminal **24**. The connector jacket shoulder **52** mates with the sleeve shoulder **194** to seal the jacket to sleeve joint in a watertight, waterproof manner.

The sleeve may be of the type shown generally in U.S. Pat. No. 3,480,905 issued to J. A. Toedtman on Nov. 25, 1969 for "Electrical Connector Manifold" and assigned to the assignee of this invention.

By the construction shown, the flange **42** is sealed to tank **10** (as shown in FIG. **3**) and with the connector jacket and seal to the cable sheath being waterproof and water impervious, a thorough insulating waterproof shield is formed about the connector.

In the multiple connector structures, similar sleeves are mounted on each of the three terminals **152**, **154** and **156** and sealingly mate with the respective jacket arms **162**, **164**, and **166** at the respective sealing ribs **50** in a manner similar to that shown in FIG. **3**.

While there has been shown what is at present thought to be the preferred embodiment of the invention, it is understood that changes may be made therein and it is intended to cover in the appended claims all such modifications which fall within the true spirit and scope of the invention.

I claim:

1. A power connector structure for making electrical connections to stud ended power distributing members, in which there is a structure wall disposed outwardly of said members and having openings for said members, the invention comprising: a plurality of terminal members of high current carrying capacity, each including a first portion for mating with said members inwardly of said wall for carrying current from the distributing members, and a terminal portion of said body extending from the first portion, means common to all said terminal members for insulatingly covering each first body portion and each terminal portion with a one-piece jacket of water-impervious material, a planar shielding wall extending from said jacket for waterproof mounting to said structure wall, an individual integral arm extending from the jacket for covering each terminal portion; a terminal tang end of each of terminal members protruding from said terminal portion for connection to individual sheathed cables, a peripheral rib circumscribing an end of the jacket of each jacket terminal portion to provide a sealing surface for receiving thereabout one end of a tubular insulating sheath to sealingly mate each jacket to said sheath and thereby to waterproofingly cover said terminal ends.

2. A connector as claimed in claim **1**, wherein said one-piece jacket comprises a jacket of epoxy material molded onto said terminal member.

3. A connector as claimed in claim **1**, wherein said rib comprises a peripheral shoulder normal to said body terminal portion, and a wall tapering from said shoulder and terminating at the end of said terminal portion for mating said shoulder with an internal annular depression in the sheath wall.

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