United States Patent

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[54] TRANSFORMER TAP FOR UNDERGROUND APPLICATIONS
1 Claim, 6 Drawing Figs.

[52] U.S. Cl. ..... 339/94 A, 174/153, 339/129, 339/268 R
[51] Int. Cl. H01r 13/52
[50] Field of Search 339/59-60, 92, 94, 125, 126, 129, 268; 174/18, 152, 153

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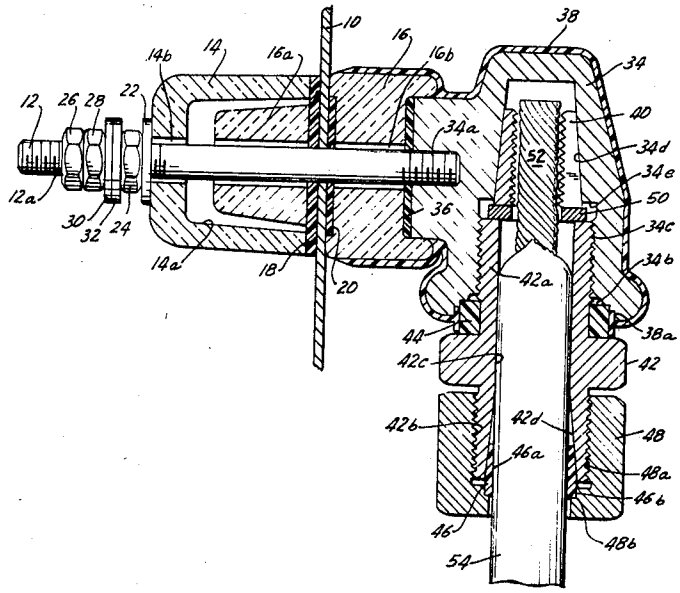
ABSTRACT: A rugged and compact connector or tap to a transformer or other encased electrical component for direct burial applications providing permanent, watertight, insulated junction including internal and external attachment means and external insulation means.



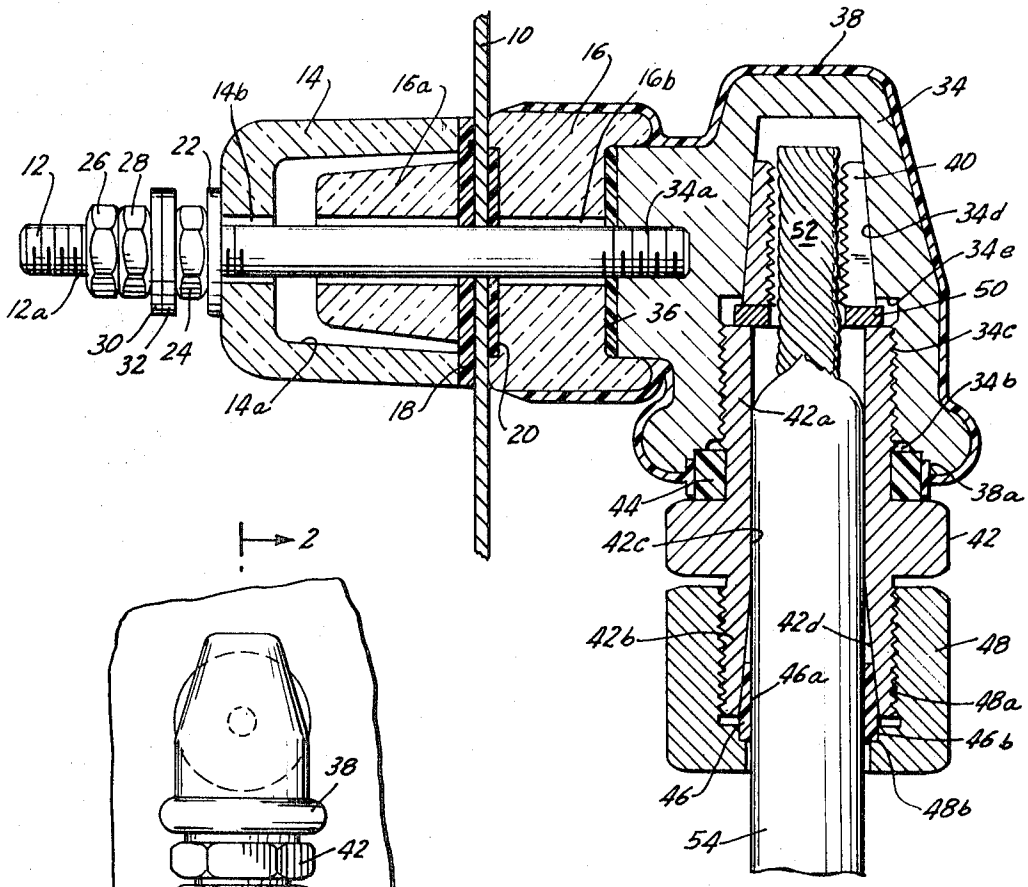


FIG. 2

FIG. 1

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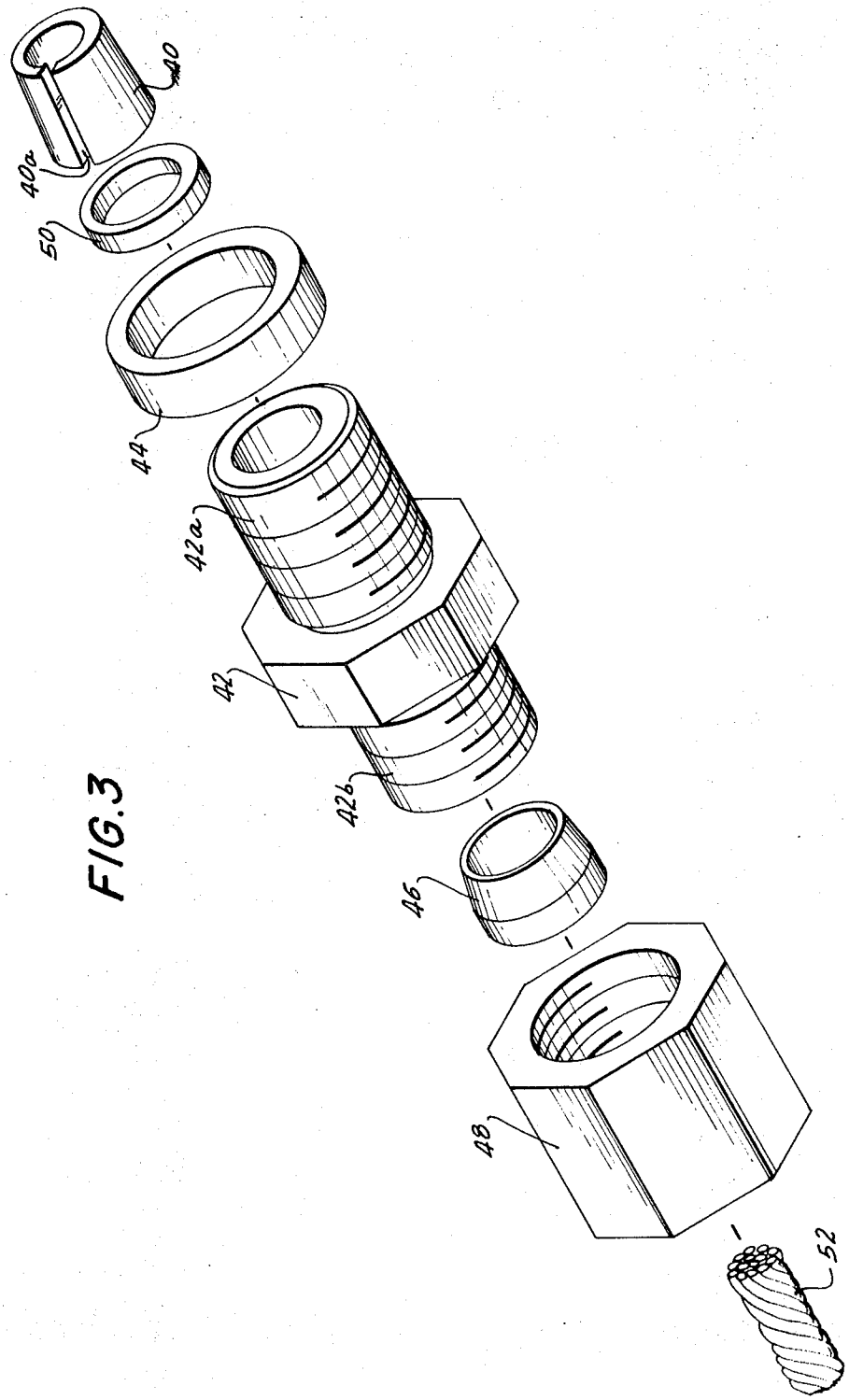

FIG. 3

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FIG. 4

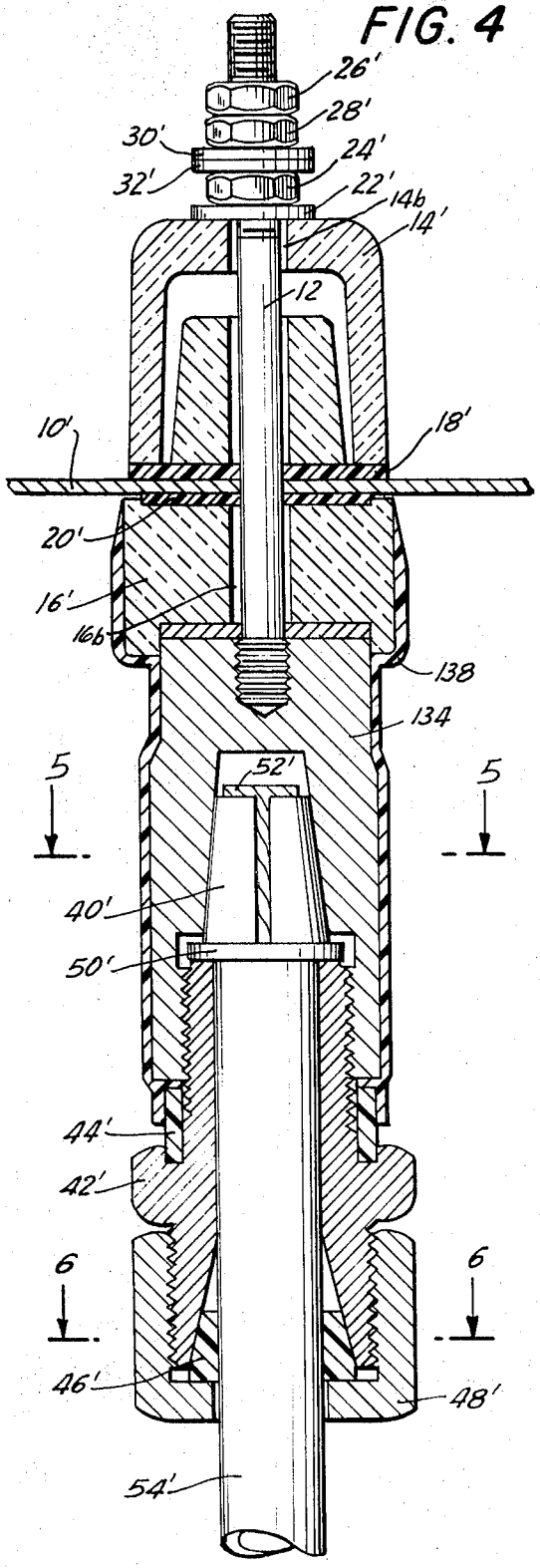


FIG. 5

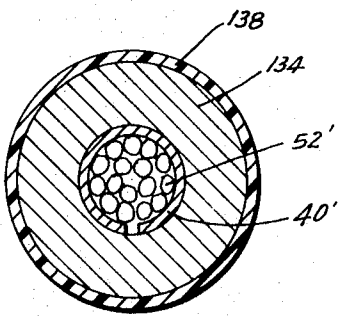
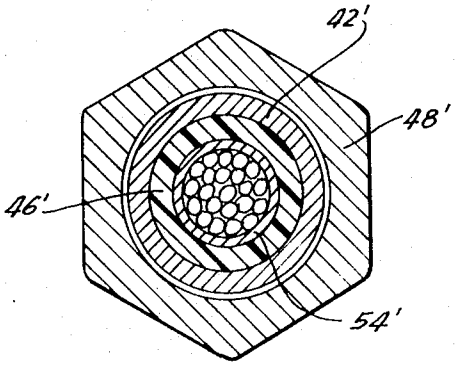


FIG. 6



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TRANSFORMER TAP FOR UNDERGROUND APPLICATIONS

BACKGROUND OF THE INVENTION

It has become highly desirable for a number of reasons to bury electrical components such as transformers underground. Connector assemblies, or taps, for such underground applications must be specifically designed with this end use in view. In "direct burial" applications where the connection to the transformer is made and left without benefit of enclosure in a vault, the tap or connection means used must be moisture proof and provide its own sealing. Additionally, it must be relatively simple to use.

SUMMARY OF THE INVENTION

A transformer tap including a stud member projecting through the transformer cover with first and second portions disposed internally and externally of the transformer cover, internal and external cover fastening means supported by the stud member, internal and external insulation means between the cover and the respective internal and external fastening means, external conductor attaching means and first and second sealing means for respectively providing sealing between the conductor attaching means and the conductor and the conductor attaching means and the external cover fastening means.

DESCRIPTION OF THE DRAWINGS

In the accompanying drawings:

FIG. 1 is a front view of a transformer tap assembly constructed in accordance with the teachings of this invention;

FIG. 2 is a partially sectional view taken along the line 2—2 in the direction of the arrows in FIG. 1;

FIG. 3 is an exploded perspective view of that portion of the assembly shown in FIG. 1 which is utilized for cable attachment;

FIG. 4 is a longitudinal sectional view of an alternate underground transformer tap constructed in accordance with the teachings of this invention;

FIG. 5 is a transverse sectional view taken along the line 5—5 in the direction of the arrows in FIG. 4; and

FIG. 6 is a transverse sectional view taken along the line 6—6 in the direction of the arrows in FIG. 4.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

In FIGS. 1-3 the transformer cover or sidewall is indicated by the numeral 10. A stud member 12 projects through an opening in the cover 10 and supports internal and external cover fastening members 14 and 16, respectively. The stud is formed of conducting material such as copper and the fastening members are formed of nonconducting material such as porcelain. The external cover fastening member 16 has a portion 16–A projecting through the opening in cover 10 and disposed within bore 14–A of internal cover fastening member 14. The internal and external cover fastening members are provided with internal and external cover fastening bores respectively 14*b* and 16*b* through which stud 12 projects. Insulating gaskets 18 and 20 are respectively supported between internal member 14 and cover 10 and external member 16 and cover 10.

Internally the internal cover fastening member 14 is held against the gasket 18 by flat washer 22 and jam nut 24. These are mounted on threaded end 12–A of stud 12. Jam nuts 26 and 28 are also supported on threaded end 12–A to maintain flat washers 30 and 32 between jam nuts 28 and 24. The internal connection of the transformer winding is made to the tap by disposing the winding end between flat washers 30 and 32.

The remaining end of stud 12 which is also threaded at portion 12–B is threaded within threaded cavity 34–A of conducting body member 34 to clamp external cover fastening member 16 and gasket 20 against cover 10. Gasket 36, also constructed of insulating material, is disposed between the cover fastening member 16 and body member 34.

The external cover fastening member 36 and the body member 34 are provided with an insulating coating 38 such as durable hard vinyl by means of a dip-coating process. Of course, other insulating materials can be used for coating or enclosing the fastening member 16 and body member 34 and other means of attachment of the insulating materials to these members can be utilized in the practice of the invention.

A portion 38–A of the insulating material extends within the bore 34–B of the body member 34 covering a portion of the edge of the mouth of the bore.

The bore 34–B is provided with two sections. One bore section is cylindrical and indicated by the numeral 34–C and provided with threads. The second bore section is indicated in the FIGS. by the numeral 34–D and is conical in configuration with the cross-sectional diameter of the bore adjacent section 34–C greatest in diameter but less in diameter than the diameter of bore section 34–C providing an annular shoulder 34–E.

The remaining part of the tap connector are connector cone 40, jam nut 42, washer 44, sealing grommet 46, sealing nut 48 and bearing washer 50.

Connector cone 40 is formed of an electrically conducting material and provided with a full length longitudinal slot 40–A. The connecting cone 40 is provided, as will be explained in greater detail below, to encircle and grip the strands 52 of a cable 54 attached to the connector and the cone 40 is sized to the conductor to provide optimum encirclement and strand to strand contact. The slot 40–A is provided to allow the connecting cone to become reduced in diameter in the fully assembled connector and firmly grip the cable strands. The internal surface of the cone is provided with a corrugated configuration to aid in the formation of a firm contact with the conductor strand.

The jam nut 42 is formed of nonconducting material and has a hex nut central flange with cylindrical portions 42–A and 42–B extending from opposite sides thereof and providing a continuous longitudinal bore 42–C which is flared outwardly slightly at 42–D at one end. A major part of the outer surface of portion 42–B and a minor part of the outer surface of portion 42–A are threaded. Jam nut 42 is preferably formed of a plastic material.

Washer 44 is annular and formed of rubber or other plastic flexible material. The sealing grommet 46 is also formed of a plastic material and in the preferred form the material is soft plastic as compared to the harder plastic from which the jam nut 42 and sealing nut 48 are formed. Flexible sealing grommet 46 is nonconducting and is provided with a central longitudinal bore 46–A of uniform diameter and a section 46–B at one end having a uniform outer diameter. The remaining portion of the outer surface of grommet 46 is tapered having an outer diameter which decreases constantly to provide an outer conical surface having its greater diameter adjacent section 46–B.

The sealing nut 48 is also formed of nonconducting material and has a threaded bore section 48–A and a lesser diameter bore section forming annular shoulder 48–B. The outer surface of nut 48 is in hex configuration. Bearing washer 50 is between members 42 and 40 and transmits the longitudinal force of member 42 against cone 40 forcing the cone further into the bore 34–D of the conducting body member 34.

In assembling or in attaching a cable to the tap the cable is prepared by skinning the insulation in the usual manner to expose stranded portion 52. The cable end is threaded through the sealing nut 48, grommet 46, jam nut 42 and washer 44 and washer 50 and the exposed end 52 of the cable is inserted within connector cone 40.

Connector cone 40 is placed within bore 34–D of member 34 and its outer conical surface is adjacent the conical surface of bore section 34–D. Sealing washer 44 abuts on one side of the ends of body member 34 adjacent the insulating coating 38–A which is extended outwardly as well enabling the washer 44 to be slipped between the insulation and the jam nut 42. The threaded portion of the jam nut is engaged with the threads of the body member 34 and rotation of the jam nut wedges the conical connector cone into bore section 34–D of

the member 34 providing a captive connection between the connector cone and the conductor 52. Washer 44 seals the body member 34 and prevents entry of moisture within the bore thereof. The insulation 38 in contact with washer 44 provides a sealed junction. Tightening of sealing nut 48 completes the watertight seal by the annular shoulder of sealing nut 48 forcing the sealing grommet 46 within the flared portion of the bore of the jam nut.

It is noted therefore that the conductor can be connected to the assembly by mechanical tightening with a standard wrench to provide a permanent yet easily disconnected joint. Sealing is provided on either side of the transformer cover and throughout the tap connection since the sealing nut provides a watertight seal at the entrance of the cable to the connector. The watertight fully insulated assembly permits use with both aluminum and copper conductors.

In FIGS. 4 through 6, another embodiment of the invention is shown wherein the parts thereof which are identical to the parts illustrated in FIGS. 1 through 3 have been indicated by the same numeral with a prime following. Differing parts have been indicated by new numerals.

The transformer cover or sidewall is indicated by the numeral 10' and the stud member, internal fastening member, external fastening member, insulating gaskets, washers and jam nuts are indicated by the numerals 12', 14', 16', 18', 20', 22', 24', 26', 28', 30', and 32'.

The conducting body member is indicated by the numeral 134 since it is differently shaped than member 34 of the first embodiment. Member 134 is cylindrical and elongated with a unidirectional axis, whereas member 34 was right angled. Gasket 36' and the connection of member 134 is similar to the manner of connecting member 34. The insulating coating 138 is altered in configuration in view of the different shape of member 134 than member 34 of the first embodiment.

The remaining parts are similar to the parts shown in FIGS. 1 through 3 and described in connection with the first embodiment. These include connector cone 40', jam nut 42', washer 44', sealing grommet 46', sealing nut 48' and bearing washer 50'. The cable and strand are indicated by the numerals 54' and 52', respectively. The cable is attached to the connector in the same manner as the cable 54, as described in FIGS. 1 through 3.

In both embodiments in the practice and use of the invention a test may be supplied to the line man including, for example, with respect to the first embodiment, the jam bushing 42, gasket 44, sealing nut 48 and sealing grommet 46 as well as the cone 40 and bearing washer 50, the remaining part being available and permanently attached to the transformer. Thus, the line man will use the kit parts to make the connection after having stripped the ends of the conductor 54.

We claim:

1. A transformer tap for mechanically attaching and electrically connecting a conductor to a transformer within a casing including in combination an opening formed in said casing, internal and external fastening means, internal and external fastening means bores formed in said internal and external fastening means respectively, said external fastening means projecting through said opening, a stud member projecting through said bores, first and second sections of said stud member disposed respectively within and without said casing, said internal and external fastening means being supported by said stud, internal and external insulation means having portions thereof sandwiched between said casing and said internal and external fastening means respectively, external conductor attaching means supported by said second section of said stud, said stud and said external conductor attaching means formed of an electrically conductive material, an insulating coating covering the outer surface of said external fastening means and said conductor attaching means, and first and second sealing means for respectively providing sealing between said conductor attaching means and said conductor and said conductor attaching means and said external fastening means.

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