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TERMINAL FOR ELECTRIC CABLES

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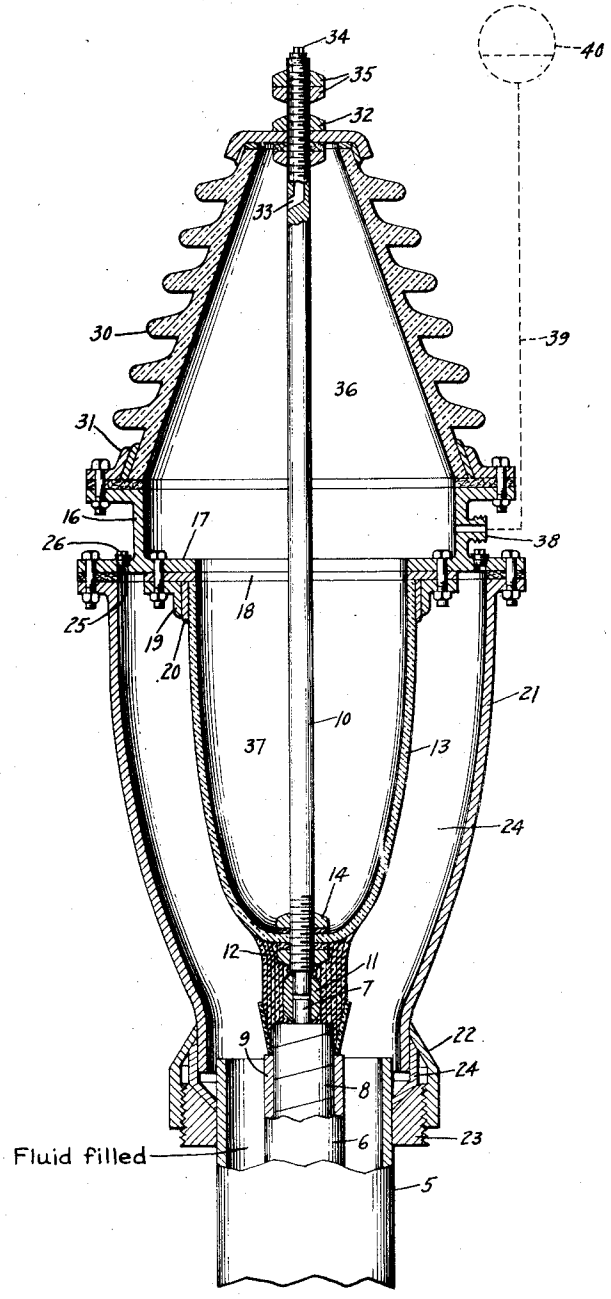

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TERMINAL FOR ELECTRIC CABLES

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9 Claims. (Cl. 247—6)

The present invention relates to insulated terminals for electric cables. For such terminals, it is the common practice to use glass or porcelain as the insulating material on account of their high dielectric properties. Such insulators, however, are relatively fragile and their tensile strength is relatively low. For this reason, it has been necessary to exercise care to restrict the gas or hydraulic pressure to which the insulating material is subjected when in service to a relatively low value, usually of the order of a few pounds.

I have invented or discovered an arrangement of parts for electric cable terminals whereby insulators made of porcelain or equivalent material may be utilized in a manner to withstand relatively high gas or liquid pressures without danger of breakage in service.

For a consideration of what I believe to be novel and my invention, attention is directed to the accompanying description and the claims appended thereto.

The accompanying drawing, which is illustrative of my invention, is a view in longitudinal section of a cable terminal. 5 indicates a steel pipe or other fluid tight conduit in which is located a cable 6. The cable comprises one or more conductors 7, each carefully covered with insulation 8. The insulation may or may not be enclosed in a lead or other sheath 9. Extending longitudinally through the terminal is a connector means in the form of a rod 10 which is united with the conductor 7 by a sleeve 11. The sleeve is covered by a reinforcement 12 made of insulating tape and applied layer by layer until the desired thickness is obtained.

The rod 10 is of suitable cross-section to carry the current and at its inner end is provided with screw threads adjacent the part passing through the insulator 13. The rod and insulator are united by nuts 14 located on opposite sides of the wall of the insulator. Between the nuts and the adjacent ground faces of the insulator are located gaskets of suitable construction, such for example as those made of asbestos with a copper covering. By screwing the nuts firmly into place a non-leaking joint is provided. The other or large end of the insulator rests on a seating ring 16, the latter having an internal flange 17. The seating ring may also be utilized as a support for the terminal as a unit, or the metal casing as desired. A sealing gasket 18 is located between adjacent surfaces of the ring and insulator. The enlarged end of the insulator is surrounded by a sealing ring 19 and between it and the insulator is a packing 20, as of lead for example. The pressure exerted on the lead by the high pressure fluid from the pipe 5 is in a direction to compress it and hence maintain the tightness of the joint. The seating ring is secured to the flange 17 by numerous bolts.

The insulator is subjected to heavy pressure which for one class of work may be of the order of from 200 to 300 lbs. per square inch. Breakage of the insulator is prevented by so disposing the material of which it is composed that it is under compression as distinguished from being under tension. Another and additional feature comprises means for preventing the insulating material as a unit from being exposed to the full pressure of the fluid in the pipe 5. In this connection, it is to be especially noted that the pressure exerted by the fluid from the pipe is external and not internal and therefore the material of the insulator is compressed instead of being subjected to tensile or bursting strains. To meet this condition, the insulator is arched or so shaped that its outer surface is everywhere exposed to a fluid under pressure which tends to compress the material.

The insulator is located in and surrounded by a metal casing 21, the latter having an outturned flange which is bolted to an outturned flange on the seating ring 16, there being a suitable gasket between the adjacent surfaces. The lower end of the metal casing has secured thereto, as by welding or other means, an annular member 22 forming a part of a compression fitting or packing. The lower end of the member is screw threaded to receive the gland nut 23. The pipe 5 is of a diameter to make an easy fit in the adjacent end of the casing. Inside of the member 22 is a packing 24, which is compressed by a gland nut 23 when the latter is screwed into place. Although the casing illustrated is made of metal because of simplicity and reduced cost it may be made of any other material which possesses the necessary strength to resist the bursting strains to which it is subjected.

To get rid of any air which may have been trapped in the fluid containing chamber 24 between the casing and the insulator, the seating ring 16 is provided with one or more ports 25 through which air can escape as oil or gas initially and gradually enters the chamber 24 from the pipe 5. The ports are normally closed by

screw threaded plugs 26. The port may also be used in filling the pipe 5 and the chamber 24.

In a terminal, it is necessary to have a firm support for the outer end of the conductor rod 10, and for this purpose, I may employ a porcelain insulation 30 of substantially standard construction. It is secured to the ring 16 by a sealing ring 31, a gasket and clamping bolts. The rod 10 extends through the small end of the insulator and where it does so, the rod is threaded and nuts 32 provided to engage opposite surfaces of the end of the insulator and by means of gaskets make a fluid tight joint. The upper end of the rod has a passage 33 to permit air to escape while the insulator is being filled with fluid. It is normally closed by the screw plug 34. The rod is also provided with nuts 35 to clamp a conductor leading to or from electrical apparatus.

Reference has been made to the fact that porcelain and glass are not well adapted to withstand tensile strains but as I have pointed out, they will withstand high compression strains tending to crush them. The provision of two insulators 13 and 30 arranged as described permits of the use of much higher fluid pressures than would otherwise be considered safe in practice using insulator 13 alone. This is accomplished by filling the chamber 36 inside of the insulator 30 and the chamber 37 inside the insulator 13 with fluid under pressure, such as oil or gas for example. With a pressure in the pipe system 5 of the order of 300 lbs. per square inch, the pressure within the chambers 36 and 37 may be of the order of 150 lbs. This means that the strains on the insulator 13 and its sealing ring, packing, etc., are reduced by one-half or approximately by that amount. In other words, the wall of the insulator 13 is subjected to differential fluid pressures. Fluid under pressure is admitted to the chambers 36 and 37 through the port 38 in the seating ring 16 by means of a pipe 39 shown in dotted lines. Fluid under pressure, whether it be gas or liquid, is supplied from a suitable source such as an accumulator or other means diagrammatically indicated at 40. The specific means for supplying the fluid to the chambers within the insulators and maintaining it at the desired pressure is not material to my invention.

What I claim as new and desire to secure by Letters Patent in the United States is:

1. In a terminal, a chambered casing capable of withstanding high bursting stress, a closing means for one end of the casing, a hollow insulator located within the chamber of the casing, a body of fluid under high pressure within the chamber of the casing exerting compression pressure on the material of the insulator, a conduit admitting fluid to the casing, a cable located inside of the conduit, a connector means extending from the cable through the insulator to the outside thereof, and means supplying fluid under positive pressure to the inside of the insulator whereby the wall thereof is subjected to differential pressures.

2. In a terminal, a chambered metal casing, a closure for one end thereof, an insulator located within the casing having an arched outer wall and an internal chamber, means uniting the casing and insulator, a filling of high pressure fluid for the chamber between the outer wall of the insulator and the inner wall of the casing, which acts on the material of the insulator in a manner to compress it, a filling of fluid under positive pressure for the chamber in the insulator, a conduit opening into the chamber of the casing, and a conductor means extending from the cable through the insulator to the outside thereof.

3. In combination, a conductor, a conduit in which the conductor is located, a filling of fluid under high pressure for the conduit, a chambered casing connected to the conduit and open to receive fluid therefrom, an insulator located within the casing and supported thereby, the material of the insulator being so disposed as to be held in compression by the action thereon of the fluid from the conduit, means for maintaining the interior of the insulator under a positive but a lower pressure than its outer surface, and a connector means secured at one end to the conductor and extending through the insulator to the outside thereof.

4. In a terminal, the combination of a casing, a chambered insulator located within the casing in spaced relation thereto to define a chamber between them, a closing means for the chamber of the insulator, a conductor, a current carrying means secured to the conductor and extending through the insulator and the closing means thereof, a filling of fluid of high predetermined pressure for the chamber surrounding the insulator and holding the material thereof under compression, and a filling of fluid of lesser pressure for the chamber within the insulator.

5. In a terminal, the combination of a conduit containing fluid under relatively high pressure, a conductor therein, a metal casing connected to the conduit and forming a continuation thereof, a member sealed to one end of the casing, an arch shaped insulator supported by the member and extending inwardly into the casing, said casing and insulator defining between them a chamber in which fluid from the conduit acts on the material of the insulator in a manner to compress it, a second insulator also supported by the casing and forming a closure for the chamber of the arch-shaped insulator, and a connector means extending from the conductor through the insulators to the outside thereof.

6. In a terminal, the combination of a conduit containing fluid under relatively high pressure, a conductor therein, a chambered metal casing connected to and forming an extension of the conduit, a member sealed to one end of the casing, a chambered arch shaped insulator supported by the member and extending inwardly into the casing, the material of the insulator being held in compression by the fluid from the conduit acting on its outer wall, a second chambered insulator supported by the member and forming a closure for the first, a connector rod connected to the conductor and extending longitudinally through both insulators, and a filling of fluid for the chambers of the two insulators under a positive pressure which is lower than that in the conduit.

7. In a terminal, the combination of a conduit, a filling of fluid therefor, a conductor in the conduit, a casing into which the conduit opens, a hollow insulator located within the casing in spaced relation thereto, said casing and insulator between them defining a chamber to which fluid from the conduit has free access, a closure for the insulator having insulating means, the inner wall of the hollow insulator and the closure defining a second chamber, a connector, means extending from the conductor

through said insulator and its closure to the atmosphere, and means for maintaining a supply of fluid in the second chamber under a pressure which is less than that in the first mentioned chamber and greater than that of the atmosphere.

8. In a terminal, the combination of a conduit containing fluid under relatively high pressure, a conductor therein, a metal casing connected to the conduit, a member sealing the outer end of the casing, an insulator seated on the member and extending inwardly into the casing, the casing and insulator defining a chamber between them containing fluid received from the conduit, a second insulator seated on the member, the two insulators defining a second chamber, a connector means extending from the conductor through both insulators to the atmosphere, and means for maintaining fluid in the second chamber under a pressure less than that in the conduit and greater than that of the atmosphere.

9. In combination, a pair of chambered insulators having enlarged ends, a metallic support having a central opening, located between said enlarged ends, means for clamping each of the enlarged ends to the support, a chambered casing also secured to the support at one end and containing one of the insulators, a connector extending longitudinally through both of the insulators, a cable connected to one end of the connector, an enclosure for the cable which is joined to the chambered casing, a filling of high pressure fluid insulation for the cable enclosure and the space between the casing wall and insulator therein, a filling of fluid insulation for the chambers of both insulators, said fluid being under a positive but lower pressure than that in the cable enclosure, and means carried by the metallic support through which the filling for chambers of the insulators is introduced.

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