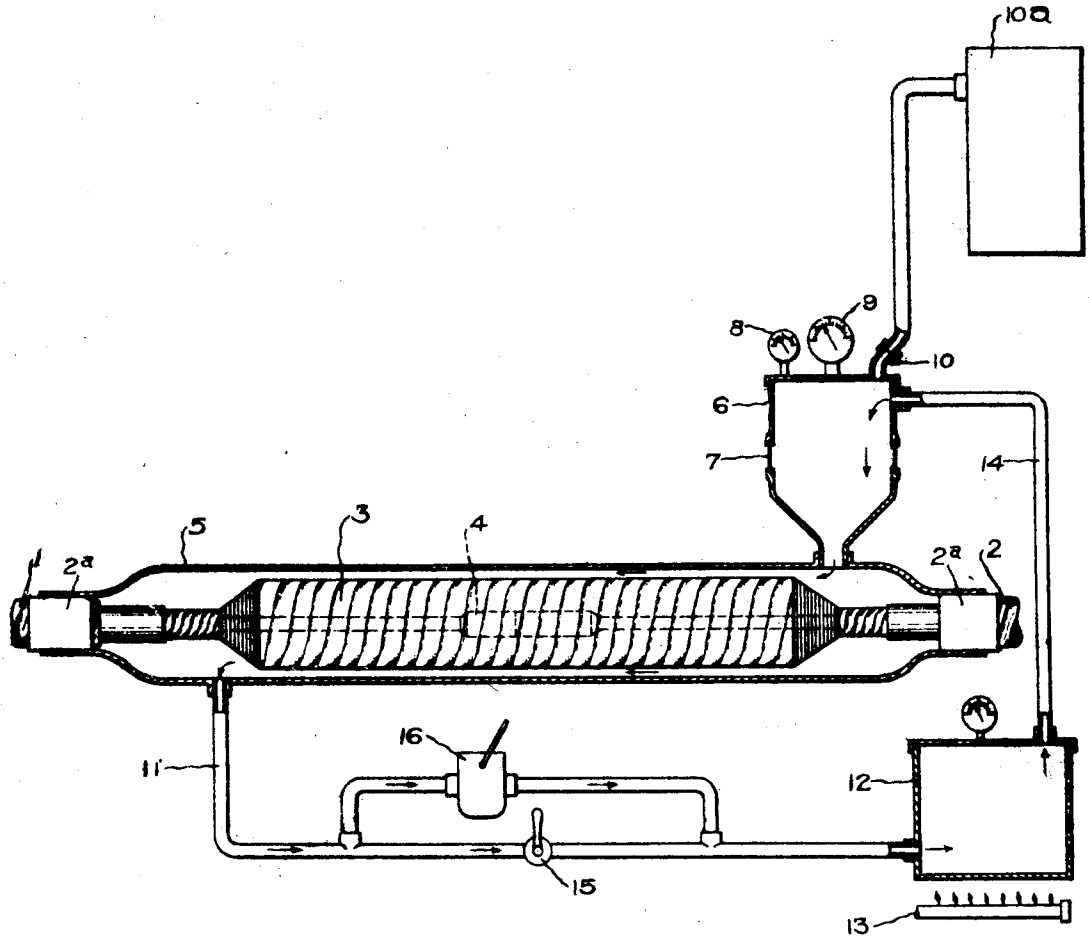
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METHOD OF AND MEANS FOR DRYING OUT AND IMPREGNATING JOINTS FOR CABLES

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UNITED STATES PATENT OFFICE

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METHOD OF AND MEANS FOR DRYING OUT AND IMPREGNATING JOINTS FOR CABLES

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As is well known, the joints used for electrically uniting the sections of high tension underground cables are insulated by winding over the connector which unites the conductors and the adjacent ends of the cable sections a paper ribbon to a thickness generally in excess of the insulation on the cable itself. The fact that these joint windings are generally done by hand and as a rule under very unfavorable circumstances, being done in manholes where there is considerable moisture, and in some cases water, has the result that considerable moisture and a small amount of air are present in the finished joint which can only be removed with great difficulty. The method of treating the joint by vacuum and heating the cable in order to increase the evaporation of the moisture has been employed, but experience shows that after the introduction of the fluid filling there still remains some moisture in the joint which after the filling operation cannot be removed.

The present invention has for its object to provide an improved method and means for removing any entrained moisture and air from the joints of a high tension cable system.

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

In the drawing is illustrated a cable joint and means for removing any entrained moisture and air which may be present.

1 and 2 indicate the adjacent ends of sections of a high tension underground cable, the same being a part of a system composed of numerous sections. Each section has a conductor, insulation thereon and an enclosing lead or equivalent sheath 2*a*. 3 indicates the paper or other tape wrapping which surrounds the connector 4 that electrically unites the conductors. Enclosing the joint is a metallic casing 5 which is sealed fluid-tight to the sheaths of the conductors. It is to the removal of the entrained moisture and air from this casing and the insulating wrapping around the connector that the present invention is directed. For this purpose an opening is provided in the upper side of the casing and attached thereto is an elevated filling vessel 6 of any suitable construction. It is provided with one or more sight openings which have glass covers 7. To the casing are attached suitable gauges 8 and 9, one for vacuum and the other for pressure. The top of the vessel has a short pipe 10 which is used in filling the vessel and also to receive the suction-pipe of a vacuum pump 10*a* for evacuating the casing. It is also used for a pressure pump which may also be indicated by the reference character 10*a*. The lower side of the casing is provided with an opening to receive the pipe 11. 12 indicates a vessel which contains fluid for filling the joint and is heated by a gas burner 13 or other source of heat. This vessel is connected at its lower end to the pipe 11 and at its upper end by the pipe 14 to the vessel 6. In the pipe 11 is a shut-off valve 15. 16 indicates a pressure pump which may be hand-operated by a suitable lever and which is connected in shunt to the valve whereby when the valve is shut fluid may be positively circulated through the casing 5, the filling vessel 6 and the heating vessel 12.

The joint having been properly taped and the casing sweated or otherwise secured fluid-tight to the cable sheaths, the operation is as follows: Fluid is poured into the vessel 6 through the filling opening 10. It first flows through the casing 5 and pipe 11 into the heating vessel 12, and later gradually rises in the latter and pipe 14 until it returns to the filling vessel. The filling process is continued until the level reaches the inspection windows 7. When the fluid is thinned sufficiently by reason of the heat supplied by the burner, it flows upward by convection through the pipe 14 into the filling vessel and thereby starts an automatic circulation through the vessels and casing. If the process proceeds too slowly it can be artificially accelerated by temporarily closing the valve 15 and operating the pump 16. The exit of the water vapor can be recognized by the mist forming on the level surface of the fluid in the filling vessel and may be observed through the inspection or sight openings 7.

The removal of the water vapor and air may be hastened by connecting a vacuum pump to the short pipe 10 at the top of the filling vessel.

After the fluid, sleeve and associated parts are relatively cool, the pipe 11 is removed and the opening therefor in the casing sealed. The vacuum pump connection is then broken and a pressure pump connected to the conduit 10 and fluid which has previously been degasified forced under pressure into the casing. This subsequent submission of the parts to fluid under pressure insures greater security against the inclusion of air than would otherwise be the case.

The method and apparatus herein described are useful also in making end sealings for the cable as well as for cable fillings and other purposes.

The heat due to the burner 13 causes the fluid to circulate due to convection currents and the operation is continued until all or the principal part of the entrained gas and moisture is removed. This operation is facilitated by the use of the vacuum pump which maintains a pressure within the casing which is below that of the atmosphere. During the operation the paper or other wrapping on the cable joint is thoroughly impregnated with the fluid.

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

1. The method of drying out and impregnating the insulation of a cable joint which comprises filling the joint enclosing casing with fluid, repeatedly circulating hot fluid therethrough, subjecting the casing and the fluid during the period of circulation to vacuum to assist in the removal of gas and moisture, and finally sealing said casing when filled with fluid.

2. The method of drying out and impregnating the insulation of cable parts which comprises connecting a fluid filling vessel and a fluid heating vessel to the cable parts, circulating the heated fluid through the parts and vessels to remove any entrained gas and moisture, maintaining said parts and vessels under a vacuum during the period of circulation, removing the vessels, and sealing said parts.

3. The method of drying out and impregnating the insulation of a cable joint which comprises connecting fluid filling and heating vessels to the casing of the joint in a manner to cause fluid to flow through the vessel and casing by convection, maintaining a forced circulation through the vessels and casing until the fluid is thoroughly heated, removing the vessels, and sealing the casing to prevent the escape of fluid and the admission of gas and moisture.

4. The method of drying out and impregnating the insulation of cable parts which comprises circulating heated fluid through the casing of said parts to remove gas and moisture, partially cooling the parts, subsequently subjecting the fluid in the casing to pressure, and finally sealing the casing.

5. The method of drying out and impregnating the insulation of cable parts which comprises connecting fluid filling and heating vessels to said parts in a manner to cause the fluid to flow through them by convection, removing the vessels, sealing the cable parts except for one opening, establishing a pressure on the fluid in the parts after they are relatively cool, and sealing the said opening.

6. Apparatus for drying out and impregnating the insulation of cable parts which are enclosed in a metal casing, comprising, a fluid filling vessel situated above and connected to the casing, a heating vessel situated below and connected to the casing at a lower point, means for heating the latter vessel, and a connection between the two vessels to permit the flow of fluid from the heating vessel to the filling vessel by convection.

7. Apparatus for drying out and impregnating the insulation of cable parts which are enclosed in a metal casing, comprising, a fluid filling vessel situated above and connected to the casing, a heating vessel situated below and connected to the casing at a lower point, a shut-off valve in the connection between the heating vessel and the casing, a circulating pump arranged in shunt to the valve, means for heating the last named vessel, and a connection between the two vessels which permits the fluid to circulate by convection when said valve is open.

In witness whereof, we have hereunto set our hands this 19th day of February, 1929.

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