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GAS FILLED CABLE

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This invention relates to improvements in electric cables of the single conductor type and more particularly to improvements to the gas filled cable.

Such cables usually consist of a stranded copper conductor insulated with oil-impregnated paper and protected against soil water, etc., by a lead sheath. More recently the demand for underground cables at still higher voltages has led to the use of oil-filled cables in which oil is supplied to the insulation through a duct in the conductor from reservoirs at the joints, the oil being under pressures usually not higher than 15 lbs. Still more recently the oil-impregnated paper insulation has been filled with nitrogen gas under pressures low, medium, or high. In the three conductor cable the gas is usually supplied through the filler spaces in which a copper tube is often included to by-pass any oil slugs between joints, the copper tubes opening into a free space at each joint. In single conductor gas-filled cable, it is customary to supply the gas at the outside of the insulation by making gas channels in the lead sheath by means of flutings: or by using a copper tape over the insulation with buttons on it which act as spacers for the lead sheath, thus providing an annular gas channel. In still another type of gas-filled cable, the gas channel is provided by using concentric instead of compact stranded conductor, and also by building up the insulation wall of paper pre-impregnated with an oil or a wax compound which does not drain into the butt spaces even at the maximum operating temperature of the cable in other words, the butt spaces in the insulation and the interstrand spaces of the conductor serve as the gas channel.

Where high gas pressures are used, such as 100 to 200 lbs. per sq. in., and where a lead sheath is used to contain this pressure for service in ducts, and not as buried cable, the lead sheath must be reinforced; but even with the best reinforcement, the lead sheath for this severe service may crack if it has longitudinal gas channel flutings on its inner surface, or if it is not supported on its inside surface by tight contact with the insulated cable within. The latter is particularly true where such a cable is flexed at manholes due to movements of expansion and contraction. This eliminates the possibility of feeding in the gas between the lead sheath and the outer surface of the insulation.

One of the objects of this invention is to remove all these difficulties. We must therefore resort to feeding the gas into the the cable via

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a duct in the center of a stranded conductor, similar to that used in feeding an oil into an oil-filled cable. However, since the profile of any cable line is sure to show many dips or low points, oil is apt to drain out of the insulation (assuming that we use a mass impregnated cable) and block the duct. Thus, if the gas feed is located at one terminal of the line, there will be continuous pressure drop along the line. Furthermore, in case of a leak due to a rupture in the lead sheath, much time would be required before the pressure drop would communicate itself to the station end.

The obvious way to overcome this difficulty of pressure drop due to oil slugs blocking the duct in the conductor at dips in the line would be by thoroughly draining the cable after mass impregnation. However, in actual practice one can never be certain that in the operating cable further drainage will not occur on load cycles, thus filling up the center gas feed duct at dips in the line.

In order to bypass this blocking of the centrally located gas tube in the hollow cable, I propose to utilize a gas tight through tube somewhat smaller than the centrally located gas tube with spirally open wall, running throughout the length of the cable. This tube is to be provided with connectors at the cable joints having relief valves so that the gas pressure may enter the centrally located gas tubes on either side of the blocked line thereby communicating the gas pressure to the insulation throughout the length of the cable, at the same time prevent any oil present in the hollow of the conductor from flowing into the gas line.

The foregoing and other features of my invention will now be described in connection with the accompanying drawing forming part of this specification in which I have represented my gas filled cable in its preferred form after which I shall point out in the claims those features which I believe to be new and of my own invention.

In the drawings:

Figure 1 is a cross-section of my cable in its preferred form.

Figure 2 is a longitudinal section through one of the joints showing the pressure valve which maintains pressure throughout the cable.

In the carrying out of my invention a preferred form of construction for a high voltage gas filled cable I employ a stranded conductor 11, said strands laid hellically over a spiral open tube 12 forming a local gas duct. Over the conductor I apply paper insulation 13, mass impregnated and preferably drained. A lead sheath 14 is over the insulation reinforced by paper and/or metal tapes