

UNITED STATES PATENT OFFICE

2,432,568

GAS FILLED CABLE SYSTEM

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Application August 15, 1944, Serial No. 549,589

7 Claims. (Cl. 174—15)

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My invention relates to improvements in electric cable systems of the single conductor type and more particularly to improvements to the gas-filled cable systems.

The object of my invention is to provide a gas-filled cable system of the single conductor type which takes full advantage of the inherent theoretical superior characteristics of such a cable when practical means are used to maintain at all times during operation of the cable a suitable gas pressure throughout the length of the cable in order to exclude foreign substances within the cable system such as air and water and secure the superior electric characteristics that the insulating neutral gas, such as nitrogen for example, under a selected positive pressure imparts to the insulation of the cable particularly when the cable operates under a variable load as in the case of all the underground electric cable systems heretofore installed.

A further object of the invention is to provide a means to indicate the presence of gas leaks in a cable of the single conductor type and to eliminate the need for periodic draining of impregnating compound to clear the gas channels.

A further object of my invention is to provide gas containers full of neutral insulating gas, as for instance nitrogen, connected to every cable joint casing to supply gas to said casings and the adjacent cables, thereby keeping the entire cable system under a desired positive gas pressure at all points and at all times regardless of any slugs of compound which may form at any point in the cable system and at the same time using the said gas containers as a sump for the compound which may ooze out of the cable insulation due to load conditions.

A further object is to provide an improved construction of cable sheath which will have fluid tight gas channels formed within the body of the sheath extending uninterrupted throughout the cable length.

In the cable art it is a well known fact that a cable when it is maintained under a selected positive pressure by means of an insulating oil or neutral gas, its electrical stability is remarkably improved. An example of the former is the so-called oil-filled type cable and of the latter the gas-filled type cable.

Heretofore the duct type of gas-filled cable has been of the multiple conductor type when used for transmission or distribution of electrical power. The use of single conductor gas-filled type cable has been confined to special applications as for instance generating leads. These applications

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have required the use of comparatively short cable lengths and, therefore, the simple means of feeding gas from one cable terminal end or from both ends has been sufficient in order to obtain a positive assurance that the cable would be under gas pressure at every point and at all times.

The transmission of great blocks of electrical power for long distances very often requires the use of single conductor underground cables and the gas-filled type in many cases is the most economical and reliable type provided that its inherent superior characteristics are fully maintained during operation under variable load conditions. This is obtained if the cable during its operating life is maintained under a selected positive gas pressure at all times and along its entire length. If any gas leak does occur in any part of the cable circuit, the gas-feeding system must maintain a positive pressure at the point of leak in order to exclude foreign substances such as air and water and at the time as normally desirable send an alarm calling the attention of the man in charge of maintenance for the necessary repair before an electrical failure of the cable could occur.

Single conductor gas-filled cables of the present standard constructions are not entirely suitable for long distances of power transmission. The usual conventional gas channels are the small spaces provided under the lead sheath covering by means of either using a fluted lead sheath construction or by inserting a metallic button embossed spacer tape wound helically around the cable core with the usual lead sheath covering overall.

It is readily seen that for mechanical and economical reasons these gas channels must be of comparatively small size and, therefore, the cable must be provided with additional means in order to obtain the fundamental requirements of a gas-filled cable; that is, the selected gas pressure must exist at every point of the cable system and at all times. These small gas channels during the operation of the cable may be obstructed by the impregnating compound that oozes out of the insulation due to load conditions and forming slugs of compound.

In an ideal cable line the compound oozing from the insulation should drain into the casing of the cable joints. However, as is found in practice, the profile of the ground in which the cable is laid is variable and lower points invariably do exist in every instance. This facilitates the formation of slugs of compound obstructing in part or entirely the flow of gas along the cable length.