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CABLE SYSTEMS

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1 Claim. (Cl. 174—14)

This invention relates to an improvement in electric cable systems of the type wherein one or more insulated cables are loosely immersed in oil, or equivalent liquid insulating medium in pipe.

In such systems the ends of the cables are enclosed in terminations or potheads which also contain oil.

The oil in the pipe is not under electric stress and therefore a moderate amount of contamination is not of great importance. The oil in the terminal is under electric stress and contamination would be liable to lead to terminal failure.

It is not practicable to merely seal the entry of the cable into the pothead in order to effect separation of the two oil systems because expansion of the oil, both that in the pothead itself and that from the cable insulation, would result in excessive pressures in the potheads which, usually having porcelain walls, would be thereby endangered and failures would likely occur.

The objects of the present invention are to equalize pressures in pipe and terminals, to prevent excessive pressures in the terminals, to ensure the retention of oil in the terminals in the event of loss of pressure in the pipes and to prevent contamination of the oil in the terminals by that in the pipe.

It is therefore necessary, not only to seal the entry of the cable into the pothead by means of a stuffing box, but also to provide a by-pass to the seal to relieve the pressure. Means to accomplish this are well known, one being to provide a pair of valves in the by-pass, which permit the egress of oil from the pothead when the pressure reaches a predetermined value and the other to permit of entrance of oil to the pothead when the pressure in the latter drops to a predetermined value.

This means has the disadvantage of permitting contaminated oil from the pipe oil system to enter the potheads. Another means provides a movable diaphragm in the by-pass which expands or contracts in accordance with the pressure requirements of the pothead. These both have the disadvantage of moving parts with inevitable wear and unpredictable life.

The present invention, like the latter system, provides means for pressure equalization and prevention of oil contamination but does so without moving parts.

The means employed consists in the use of an oil filter in the by-pass. Such a device may be of the filter-paper type or the adsorbent powder type commonly used for oil filtration. Oil will pass through the filter only when there is a difference of pressure across it.

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 illustrated my cable system in its preferred form, after which I shall point out in the claim those features which I believe to be new and of my own invention.

In the drawings:

Figure 1 is a sectional view of a cable terminal to which my invention is attached.

Figure 2 is a section along the line 2—2, Figure 1.

Figure 3 is a modification shown in diagram which I may employ, adapted to a three cable termination.

Figure 4 is a further modification showing a cross-section similar to that shown in Figure 1 with a different filter attachment.

In the carrying out of my invention, **10** is a pipe containing a cable **11**, ending in a terminal **12**. A stuffing box seal is shown at **13**. A by-pass is shown at **14** which for simplicity, is shown exterior to the terminal (see Figures 1 and 3) but which may be incorporated in the base of the terminal (see Figure 4). For purposes of illustration, a paper type filter is shown at **15** within the by-pass **14**.

In Figure 1, I illustrate a paper type filter **15** which is shown in its simplest form and comprises a paper filter element **16** held between two supporting plates **17** and connected in the by-pass line **14**.

In Figures 3 and 4 my filter element **16** is shown supported between two capsules **18** and **19**. These metal capsules or cylinders are perforated at **20** and have closed ends **21** and the filter element **16** is packed in between the capsules.

With special reference to Figure 3, I show a diagrammatic sketch of a three cable termination in which the stuffing box element **13** is shown in each cable termination a distance down from the pothead with the element **13** in all three lines by-passed through a single filter element **15**. My filter element in this view is supported between two capsules **18** and **19**. The by-pass line in each of the three cables passes through a single filter.

Referring especially to Figure 4: This is an enlarged detail of a mounting which I may use in which **30** and **31** are structural mounting plates and in which the pipe **10** is securely fastened and held. A passage **40** (two are shown) extends through this mounting plate **30** and is adapted to receive the filter element **16** at the upper end, the lower end is exposed to the space **41** which is open to the inside of the pipe line **10**. It will be readily understood that with any differential of pressure the fluid in the pipe **10** will pass through the filter **16** and into terminal **12**. The fluid travels through space **41**, passageway **40** and filter element **16** which is supported between the perforated plates **18** and **19**. Any impurities of the insulating fluid in the pipe line will therefore be kept out of the fluid in the terminal and will thereby eliminate terminal failures.

In operation when high ambient temperature or heat from the conductor within the terminal or exudation of oil from the cable, or any combination of these, causes a rise in pressure within the terminal, so that the pressure is in excess of that in the pipe, oil will be forced through the filter element **16** and the pressure in the terminal relieved. If, due to low ambient temperatures, drop of load or any combination of these or other causes, the pressure in the terminal should drop below that in the pipe, oil will be forced through the filter element **16** and will restore the pressure in the terminal and, at the same time filter it, so that the oil that enters the terminal will be free of any impuriy that may have contaminated the pipe oil.

Due to the alternating flow of the oil through the filter, there will be a tendency for the filter to be self-cleansing. However, provision would be made for the replacement of the filtering medium without loss of pressure, such as by means of valves **46** and **47** in the by-pass pipes.

I wish it distinctly understood that my cable system herein described and illustrated is in the form in which I desire to construct it and that changes or variations may be made as may be desirable or convenient without departing from the salient features of my invention and I therefore intend the following claims to cover