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ELECTRIC CABLE SYSTEM

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3 Claims. (Cl. 174—11)

This invention is directed to an improvement in underground high tension electric cables of the type disclosed in Patent No. 2,015,063, dated September 24, 1935.

5 The present application is a division of my copending application Serial No. 720,734, filed April 16, 1934.

10 In the patent above referred to I have disclosed a cable system comprising a pipe line filled with an insulating fluid buried in the earth, the pipe line containing insulated but unsheathed cable conductors which are drawn into the pipe line and are free to move relatively therein. The insulating fluid with which the pipe line is filled
15 is maintained under sufficiently high pressure to increase its dielectric strength, for example, from five atmospheres upward.

20 Such a construction provides improved heat dissipating characteristics as compared with prior cable systems, the present invention, providing, however, additional cooling means and minimizing the chances of "hot spot" formation due to inequalities of heat dissipation in the earth.

25 In the accompanying drawing:

Fig. 1 is a more or less diagrammatic showing in elevation of an embodiment of my invention; while

30 Fig. 2 shows the installation of Fig. 1 as it appears at a manhole.

Referring to the drawing in detail, 1 designates a pipe line of steel or other suitable material capable of withstanding high internal pressures, equipped at intervals with joints 2. As indicated
35 in Fig. 2 the pipe line 1 contains the insulated but unsheathed cable conductors 3. These cable conductors may be insulated with oil impregnated paper and the pipe line 1 is filled with oil designated 4 maintained under pressure sufficiently high to increase its dielectric strength.
40 This pressure may be of the order of five atmospheres or higher. Commercially a pressure of the order of two hundred pounds to the square inch is employed.

45 At intervals along the pipe line I provide by-pass pipes 5 each of which is provided with a radiator 6. The by-pass pipes communicate with the pipe line as shown on the drawing and the insulating fluid 4 is free to flow through these by-pass pipes and through the radiators 6. To
50 increase the movement of the insulating fluid through the radiators 6 the joints 2 may be provided with baffle plates 7. It will be understood, of course, that the by-pass pipes 5 and radiators
55 6 may be disposed at any desired intervals along

the pipe line. For purposes of illustration I have shown the by-pass pipes located at the joints 2.

Adjacent one end of the system I provide a reservoir 8 for the insulating fluid 4. This reservoir is equipped with float switches 9 and 10
5 controlling the circuit of an electric motor 11 which drives a pump 12, the intake side of which is connected by a pipe 13 to the reservoir 8. The discharge side of the pump 12 is connected to the pipe line 1 by pipe 14.

A relief valve 15 in series with a solenoid valve 16 is provided across the intake and discharge of the pump 12. At the other end of the system or at least remote from the reservoir 8 is a similar reservoir 17 equipped with float switches 18 and
15 19 controlling the circuit of electric motor 20 which drives a pump 21. The intake side of this pump is connected by pipe 22 to the reservoir 17 while the discharge side of the pump is connected by a pipe 23 to the pipe line 1.

A relief valve 24 and solenoid valve 25 are connected in series across the intake and discharge of the pump 21. It is to be understood that the reservoirs 8 and 17 and their associated mechanism may be disposed at desired intervals along
25 the length of the line.

As above mentioned the insulating fluid 4 is maintained under sufficiently high pressure to increase its dielectric strength. In operation oil
30 or other insulating fluid 4 is drawn, for example, from the reservoir 8 by the pump 12 and pumped through the pipe line 1, the displaced fluid flowing into the reservoir 17. The operation of the motor 11 and hence that of the pump 12 is controlled by the float switches 9 and 10 and the
35 motor 11 will continue running until the switch 10 is uncovered by the lowering of the liquid level in the reservoir 8. On the other hand, the rising of the liquid level in the reservoir 17 will finally actuate the float switch 18 so that when the
40 motor 11 shuts off the motor 20 will start up to pump the insulating fluid back through the pipe line 1 to the reservoir 8. It will be appreciated that the insulating fluid in its travel passes through the by-pass pipes 5 and radiators 6 so
45 that the heat developed by operation of the cable will be quickly dissipated.

As will be seen from Fig. 2 of the drawing, the radiator 6 at any of the joints 2 in the pipe line is at a manhole 26 and so disposed relatively to
50 the openings 27 and 28 in the manhole covers that there will be a natural draft of air passing over the radiator to promote its efficiency as a cooling medium.

It will be seen from all of the foregoing that 55

the present invention provides for surging of the oil or other insulating fluid in the pipe line through the cooling system provided by radiators 6 and by-pass pipes 5 and that this surging is obtained by equipping the system at suitable intervals with reservoirs and cooperating pumps suitably spaced along the system and automatically operable, so that at one instant insulating fluid is drawn from one reservoir and forced through the pipe line of the cable and the radiators 6 toward the adjacent reservoir, this operation being followed by reversal of this flow of insulating fluid.

It will be understood that changes may be made in the details of construction and arrangement of parts herein described without departing from the spirit and scope of my invention.

What I claim is:

1. In an electric cable system the combination of a pipe line, unsheathed cable conductors insulated with oil permeable insulation loosely disposed therein, radiators exterior of and communicating with the pipe line, oil under pressure filling the space in the pipe line unoccupied by the conductors and their insulation and in which the insulated conductors are immersed, and a pump at each side of the radiators functioning alternately to effect movement of the oil longitudinally of the pipe line through said radiators, first in one direction and then in the opposite direction, the total cross section of the oil at any instant moving in one direction.

2. In an electric cable system, the combination of a buried pipe line, joints in the pipe line, manholes for said joints, unsheathed cable conductors insulated with oil permeable insulation loose-

ly disposed in the pipe line, oil filling the space in the pipe line unoccupied by the conductors and their insulation and in which the insulated conductors are immersed, radiators adjacent said joints and disposed in said manholes, a pump at each side of the radiators operated alternately to effect a surging movement of the oil in the pipe line through said radiators, first in one direction and then in the opposite direction, the total cross section of the oil at any instant moving in one direction, said manholes being constructed to supply a natural draft of air across the radiators.

3. In an electric cable system, the combination of a pipe line, unsheathed cable conductors insulated with oil permeable insulation loosely disposed in the pipe line, oil under pressure filling the space in the pipe line unoccupied by the conductors and their insulation and in which the insulated conductors are immersed, heat dissipating means disposed at intervals along the exterior of the line and communicating with the interior thereof, pumps at each side of said heat dissipating means, a reservoir connected to the intake side of each pump, the discharge side of each of said pumps being connected to the interior of the pipe line, and float switches controlled by the level of the oil in said reservoirs for controlling the operation of said pumps whereby the pumps are operated alternately to effect movement of the oil in the cable through said heat dissipating means, first in one direction and then in the opposite direction, the total cross section of the oil at any instant moving in one direction.

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