March 21, 1950 C. E. BENNETT 2,501,305

ELECTRIC POWER CABLE

Filed May 21, 1946

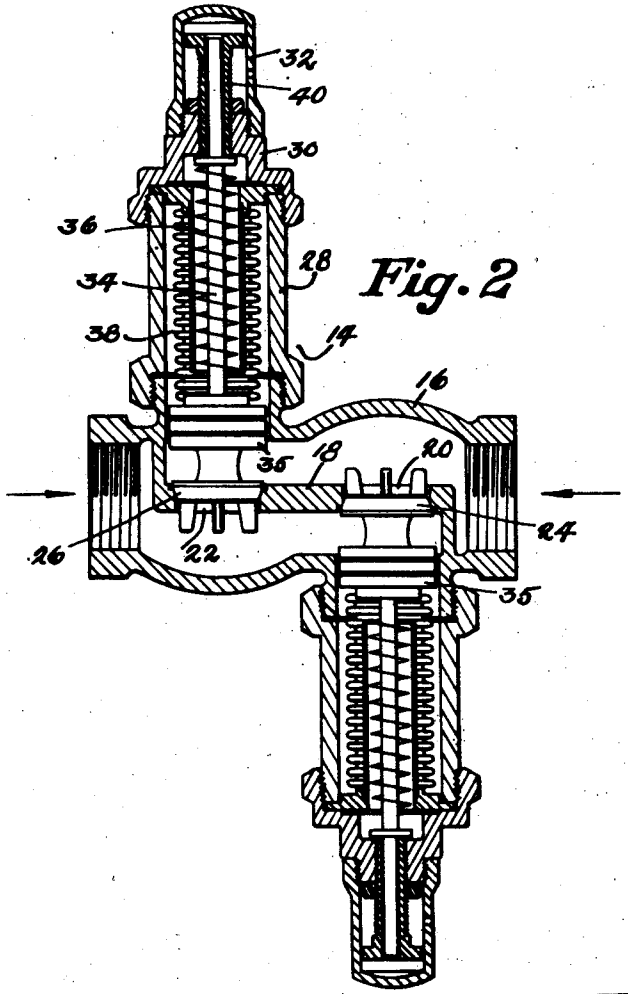
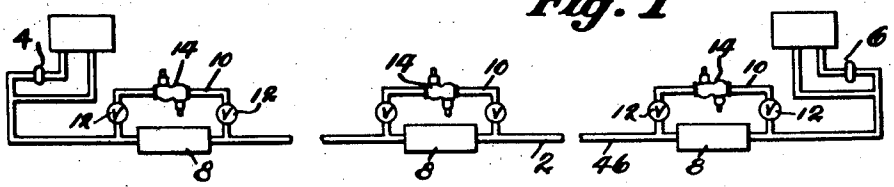


Fig. 2

Fig. 1



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Patented Mar. 21, 1950 2,501,305

UNITED STATES PATENT OFFICE

2,501,305

ELECTRIC POWER CABLE

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Application May 21, 1946, Serial No. 671,177

4 Claims. (Cl. 174—11)

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This invention relates to an improvement in electric power cable systems of the type wherein the insulated cable conductors are enclosed in a pipe line filled with insulating fluid which is maintained under superatmospheric pressure of the order of 200 pounds per square inch.

In the type of cable system to which this invention relates a pump is located at each end of the system for maintaining the insulating medium under pressure, and my invention provides means for automatically sectionalizing the system, regardless of which pump is operating, should the pressure on the system drop below a predetermined value, due to a leak in the pipe line or bursting of the pipe line or other causes, thereby to prevent loss of a substantial amount of insulating fluid.

These cable systems are equipped at intervals with stop joints, and in accordance with my invention a by-pass is provided around each of these joints and equipped with valve mechanism of such construction that each by-pass will be shut off upon a predetermined pressure drop in the system irrespective of which pump may have been operating to maintain the system under pressure. This will sectionalize the system and confine the loss of insulating fluid to the burst or leaking section between adjacent joints.

In the accompanying drawing

Fig. 1 is a diagrammatic elevational view of an embodiment of the invention and

Fig. 2 is an enlarged sectional elevational view of the valve mechanism.

Referring to the drawings in detail, 2 designates the enclosing pipe line of an electric power cable system of the type to which my invention relates.

This pipe line contains the insulated cable conductors of the system, these conductors being immersed in an insulating fluid such as insulating oil which is maintained under superatmospheric pressure either by the pumping station 4 at one end of the line, or pumping station 6 at the opposite end of the line.

The pipe line 2 is provided at intervals with stop joints 8, each of which is by-passed by a pipe 10 equipped with manually operated shut-off valves 12 and with automatic valve mechanism 14, which is disposed intermediate the manual valves 12 and the construction of which is illustrated in Fig. 2.

The mechanism 14 is automatic in operation and is adapted to sectionalize the system at each joint 8 in the event the fluid pressure drops below a predetermined value and irrespective of

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which of the pumping stations may have been employed to maintain the fluid under pressure.

Referring to Fig. 2, 16 designates the valve body which is threaded at each end for installation in the by-pass 10. This valve body is provided interiorly with a diaphragm, web or wall 18 which prevents the passage of insulating fluid through the valve body except through valve ports 20 and 22. These ports are controlled by oppositely seating valves 24 and 26, respectively.

Each valve structure comprises a bonnet 28 threaded to the exterior of the valve body 16. The bonnet is capped with cap nut 30 upon which is threaded cap 32.

The valve stem, which is designated 34, is connected to a piston-like disc 35 integral with the valve, the stem extending within the bonnet 28 and being provided with leading spring 36. Surrounding the valve stem and spring is Sylphon tubing 38 one end of which is soldered or welded to the disc 35. The loading spring 36 is adjustable by adjusting screw 40.

In installing this system initially it will be understood that all of the sectionalizing valves 24 and 26 are closed, and the pipe line between the joints 8 is filled with insulating fluid in any convenient fashion. The valves springs 36 it will be understood, are set at the pressure at which it is desired that the valves 24 and 26 shall close automatically. For example, if the fluid pressure to be maintained on the line is 200 pounds per square inch, the valve springs 36 might be set so that when the pressure drops to 100 pounds per square inch the valves will close.

After the line has been filled with oil between joints, it will be apparent that if the pumping station 4 be started in operation the valves 24 and 26 nearest this station will remain closed until a pressure of the assumed minimum of 100 pounds per square inch has been built up in the line between this station and the nearest valve 24. The valve 24 will then open, the area of its piston-like disc 35 being sufficiently larger than that of the valve itself to produce a pressure differential sufficient to open the valve. On continued operation of the pumping plant the valves 24, the entire length of the system, will open successively, and as the valve bodies become filled and the pressure throughout the system exceeds the 100 pounds pressure for which the valves have been set, the valves 26 will open also. The pumping station 4, it will be assumed, continues operation until the pressure in the system reaches 200 pounds per square inch, at which

time it will be apparent all of the valves 24 and 26 will be open, and while the pressure on the system will vary somewhat under normal operating conditions, it will not drop to the 100 pounds per square inch pressure for which the sectionalizing valves have been set, so that the valves 24 and 26 will remain open.

Let it be assumed now that a leak or burst occurs in a section of the pipe line between a pair of joints 8, the section 46 for example. The operator at the pumping station 4 will note the increase in the operations of this station which being automatic in operation, will operate continuously instead of intermittently—its normal operation—in an endeavor to make up for the loss of insulating fluid escaping through the burst section. The operator shuts the pumping station down, so that the pressure in the system gradually lowers to the 100 pounds for which the valves have been set. Consequently the valves 24 and 26 will close automatically throughout the whole system, thereby sectionalizing the system at each by-pass, and the loss of insulating fluid will be confined to the section 46. Without the sectionalizing valves the entire system would be drained.

The same operation takes place if the pumping station 6, instead of 4 is employed for building up and maintaining pressure on the system, the only difference being that in operating the pumping station 6, the valves 26 rather than 24, open first on the initial building up of pressure on the system.

It will be apparent from all of the foregoing that my invention provides a cable system of the type wherein the cable conductors are enclosed in a pipe line filled with insulating fluid which is placed and maintained under superatmospheric pressure by operation of either one of two pumping plants located at the ends of the system, means being provided whereby the line will automatically be sectionalized in the event of predetermined pressure drop in the system, thereby preventing excessive loss of insulating fluid, irrespective of which pumping plant was employed to build up the pressure in the system.

It is to be understood that while I have described a specific embodiment of my invention, changes may be made in the details of construction and arrangement of parts within the purview of my invention.

What I claim is:

1. In combination an electric power cable system of the type wherein the cable conductor is enclosed in a pipe line filled with insulating fluid, sectionalizing valves connected into the pipe line at intervals, pressure means connected to the pipe line at each end thereof, each of said pressure means being operative to maintain the insulating fluid under predetermined pressure, said sectionalizing valves being disposed in pairs and opening automatically upon the building up of pressure in the pipe line to the predetermined pressure by either of said pressure means, said valves closing automatically to sectionalize the system upon a predetermined pressure drop in the pipe line.

2. In combination an electric power cable system of the type wherein the cable conductor is

enclosed in a pipe line filled with insulating fluid, joints at intervals along the line, by-passes around the joints, a pair of sectionalizing valves in each by-pass, pressure means connected to each end of the pipe line, each of said pressure means being operative to maintain the insulating fluid under superatmospheric pressure, said sectionalizing valves opening automatically upon the building up of a predetermined pressure in the pipe line by either of said pressure means, said valves closing automatically to sectionalize the system upon a predetermined pressure drop in the pipe line.

3. In combination an electric power cable system of the type comprising an insulated conductor enclosed in a pipe line containing an insulating fluid in which the conductor is submerged, stop joints at intervals along the pipe line, by-passes around the joints, a pair of oppositely opening sectionalizing valves in each by-pass, pressure means connected to each end of the pipe line, each pressure means being operable to raise the pressure of the insulating fluid above atmospheric said sectionalizing valves opening when this pressure reaches a predetermined value under the operation of either of said pressure means and closing automatically to sectionalize the pipe line at each joint upon a predetermined drop in the insulating fluid pressure.

4. In combination an electric power cable system of the type comprising an insulated conductor enclosed in a pipe line containing an insulating fluid in which the conductor is submerged, joints at intervals along the pipe line, by-passes around the joints, a valve body in each by-pass provided with a partition extending across the same, the by-pass at one side of the valve body being connected into the body at one side of said partition while the by-pass at the other side of the body is connected thereto at the other side of said partition a pair of ports through said partition or diaphragm, a valve for each port, said valves opening in opposite directions, pressure means connected to each end of the pipe line each of which is operable to raise the pressure of the insulating fluid above atmospheric, said valves opening when this pressure reaches a predetermined value under the operation of either of said pressure means, and loading springs for said valves for closing the same automatically to sectionalize the pipe line at each joint upon a predetermined drop in the insulating fluid pressure.

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