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A. E. LE VAN ET AL
WATER SYSTEM

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2 Sheets-Sheet 1

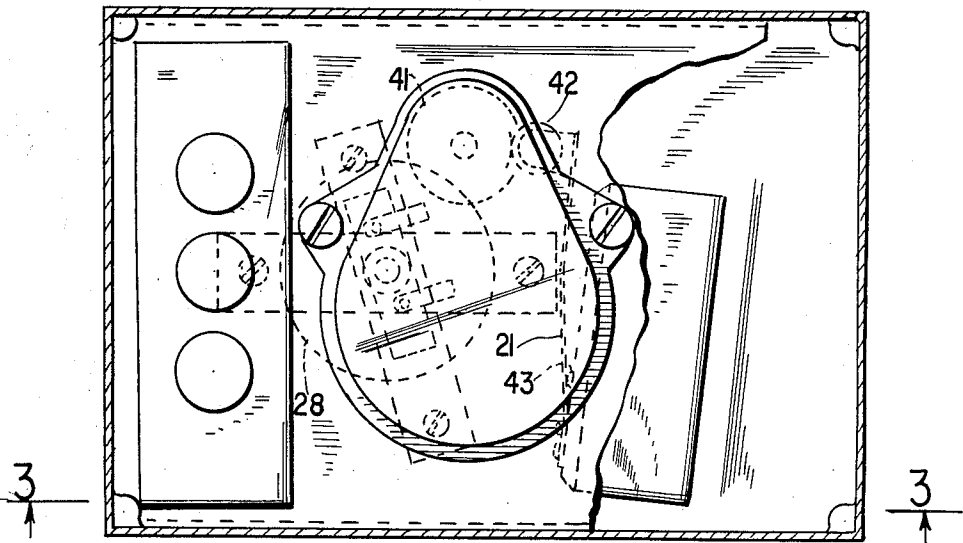


Fig. 2

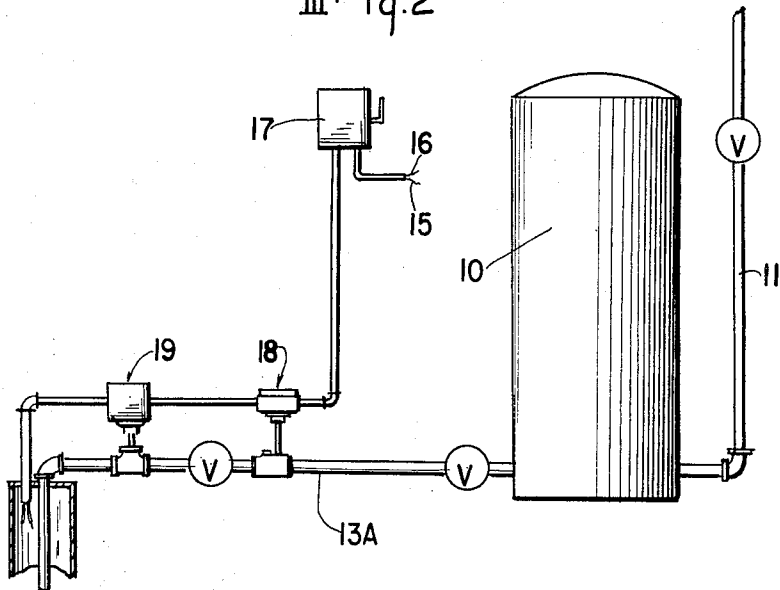
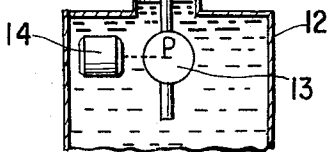


Fig. 1



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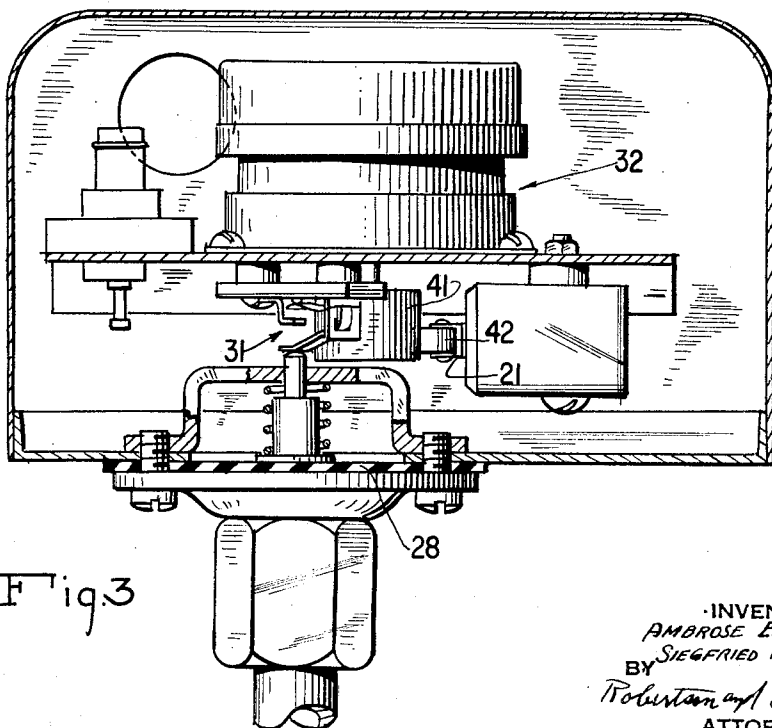
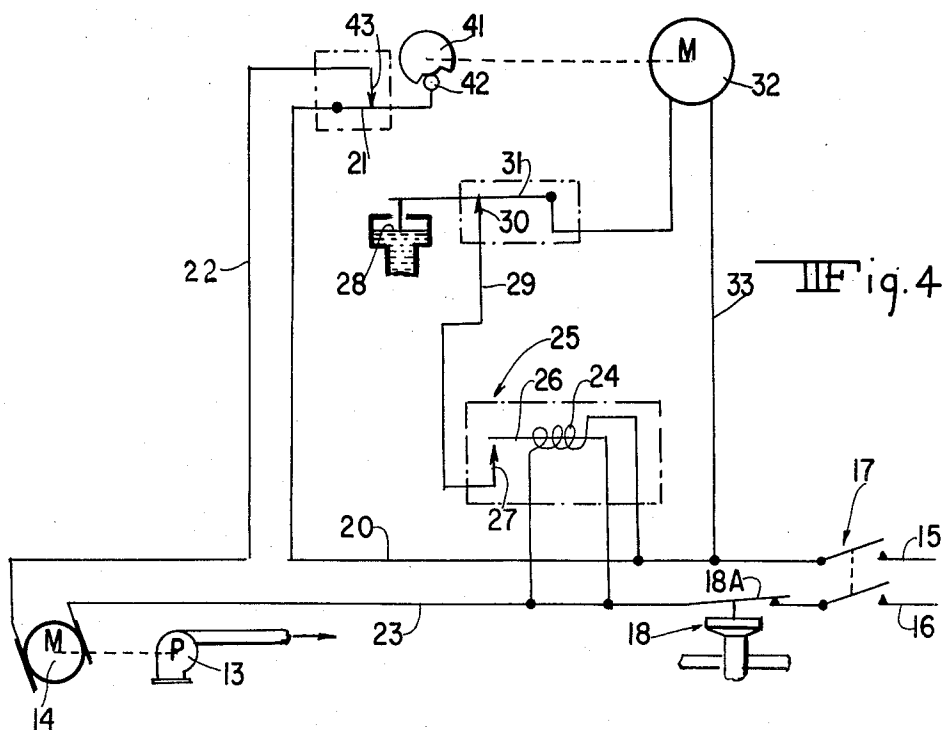
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WATER SYSTEM

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This invention relates to a fluid level safety control for submersible pumps such as used in pressure fluid supply systems and the like.

In water pressure systems for domestic or other use, a water tank is provided in which water is stored under pressure of the water being supplied from a well by a pump. Entrapped air at the top of the tank is compressed as water is supplied to the tank by the pump and the air pressure then will force water out of taps in service lines connected to the tank when they are opened.

The pump motor normally is started when pressure in the tank reaches a predetermined minimum and stops at a predetermined maximum. When a submerged pump motor is employed and located in a well, it is necessary to prevent continuous running thereof in the event that the well runs dry because such might cause the motor to burn out.

Previously, a pair of electrodes have been employed in the well to prevent the pump motor from operating indefinitely or burning out. When the water level in the well would drop, thus exposing one of the electrodes, the circuit controlling the pump would be broken and operation of the pump motor would be discontinued. However, this type of pump motor control is quite expensive and disadvantageous when maintenance or repair of electrodes becomes necessary due to their undesirable location in the rather inaccessible well.

It is an object of this invention to provide an improved means of rendering inoperative a submersible pump motor when the pressure fluid chamber in which it is located runs dry.

In one aspect of the invention, a safety unit may be provided above ground that will be responsive to a predetermined minimum pressure in a submersible pump discharge pipe to render inoperative a pump motor located in a well that has gone dry. It contemplates using an automatic recycling feature which is built into the unit whereby the pump will at regular predetermined intervals be operated to try to deliver water until such time as water is again available in the well and normal operating conditions resume.

These and other objects, advantages and features of the invention will become apparent from the following description and drawings.

In the drawings:

FIG. 1 is a diagrammatic showing of a water pressure system including the water level safety switch of the present invention;

FIG. 2 is an enlarged front elevation, partially broken, showing the switch of the present invention;

FIG. 3 is a sectional view taken in the direction of the arrows along line 2—2 of FIG. 2; and

FIG. 4 is a wiring diagram employing the switch of the present invention.

Referring to FIG. 1, water supply or pressure tank 10 is of the type commonly used in domestic or similar water pressure systems. Outlet or service line 11 therefrom leads to the point of use such as the faucets or taps in a house. Water is pumped from the bottom of a well 12 to the tank 10 by means of pump 13 and discharge pipe 13A; submerged or submersible motor 14 operating the pump. Power can be supplied to motor 14 through leads 15, 16, (FIG. 4) fused disconnect switch 17, pressure actuated switch 18 and water level safety switch 19 (FIG. 1).

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When pressure in the tank reaches a predetermined minimum, pressure switch 18 will be actuated to activate pump 13. The pump will continue running to feed water to the tank until a predetermined pressure is reached in tank 10. As will be explained hereinafter, if there is not water in the well, the pump will be shut off after a predetermined time to prevent the "burning out" thereof.

Power is supplied to the circuit (FIG. 4) through power supply leads 15, 16, and disconnect switch 17. When pressure drops to a predetermined minimum, pressure switch 18 will be actuated to close switch blade 18A in line 23 connecting motor 14 with lead 16. Pump motor 14 will be supplied with power from lead 15 through a closed energizing switch 17, line 20, normally closed switch 21 and line 22, the motor 14 and line 23. Heating element 24 and normally open thermal delay switch 25 in line 20 will be energized. After a predetermined time, for example 15 seconds, switch blade 26 will close on contact at 27. In the meanwhile, if the pump has not delivered water pressure to a conventional diaphragm 28 controlling switch 31, a circuit energizing timer motor 32 will be completed through line 29, contact 30, and switch blade 31 to timer motor 32, the other side of the timer motor being connected through line 33 to line 20.

The timer motor will operate cam 41 which will move switch blade 21 controlled by cam follower 42 downwardly and out of contact with contact 43. This will break the circuit from lead 15 to the pump motor. The timing cam 41, after a predetermined period such as 7 minutes, will permit switch 21 to again close on contact 43. Then pump 13, for a predetermined period, for example 8 seconds, will again try to supply water. In the event water is available, delivery of water pressure to diaphragm 28 will open switch blade 31 from contact 30 and break the circuit to motor 32. This will stop motor 32 and leave switch 21 and contact 43 closed and allow normal pumping operation. In the event water is not available, switch 31 will remain closed on contact 30 so as to continue operation of timer motor 32.

The cam 41 and timer motor 32 operating same will stop only at a time when pump 13 is in operation, since fluid delivery from the pump to diaphragm 28 is necessary to open switch 31 and interrupt operation of the timer motor.

Under normal pumping conditions, when the fluid pressure in the pump discharge pipe 13A drops to a predetermined minimum such as 20 p.s.i., the pressure switch blade 18A closes energizing or starting pump motor 14. Thermal time delay switch 25 starts to heat up, allowing the pump 13 time to deliver fluid. Pressure building up in the pump discharge pipe 13A will cause the diaphragm 28 to open switch blade 31, thus preventing operation of the timer motor 32. The pump will continue fluid delivery until the system pressure is satisfied, whereupon pressure switch blade 18A will open, to break the circuit, and stop the pump motor 14 until fluid pressure demand requires its subsequent operation.

When there is an emergency or low fluid level condition in the well, pressure switch blade 18A will close and start the pump motor 14. Thermal time delay switch blade 26, upon heating up of the thermal switch 25 and an unsuccessful period of attempted pump fluid delivery, will close and complete the circuit through switch blade 31 to operate the timer motor 32. The cam 41, rotatably driven by the motor 32, will through cam follower 42 actuate or open switch 21, thereby interrupting the main pump circuit and stopping the pump motor 14. Motor 32 continues to rotate cam 41, allowing the switch 21 to return to its closed position (FIG. 1), whereby pump motor 14 is again operated permitting the pump to attempt fluid delivery. The motor 32 will continue to operate the cam

41, thereby actuating switch 21 to stop and start, for predetermined periods, the pump motor 14, until fluid is available and the pump 13 can deliver same to satisfy the system pressure. The diaphragm 23, becoming pressurized, will then open switch blade 31 to stop the timer motor 32, whereupon the system will again function normally.

It is to be understood that the described exemplary embodiment is merely intended for the purpose of illustration, and that the principles of the invention are not intended to be limited thereto, except as defined in the appended claims.

What is claimed is:

1. In a pressurized fluid supply system having a motor and a pump driven by said motor for supplying fluid to said system, a power supply to said motor, a switch for energizing said motor upon an indication of fluid need in said system, a second switch in the power supply to said motor and which is normally closed and a pumped fluid delivery indicator in said system on the discharge side of said pump, the invention comprising means actuated by said indicator and after a time delay for periodically opening said second switch and stopping said motor on a predetermined schedule continuously repeated so long as there is a need of fluid in said system, said means including a motor driven cam and follower arranged to continuously open and close said second switch on said predetermined schedule.

2. In a pressurized fluid supply system having a motor and a pump driven by said motor for supplying fluid to said system, a power supply to said motor, a switch for

energizing said motor upon an indication of fluid need in said system, a second switch in the power supply to said motor and which is normally closed and a pumped fluid delivery indicator in said system on the discharge side of said pump, the invention comprising means actuated by said indicator and after a time delay for periodically opening said second switch and stopping said motor on a predetermined schedule continuously repeated so long as there is a need of fluid in said system, said means including a motor driven cam and follower arranged to continuously open and close said second switch on said predetermined schedule, a time delay switch in the power supply of said cam motor, and a flow pressure responsive switch in said cam motor power supply in series with said time delay switch to open the circuit of said cam motor power supply when there is flow from said pump.

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