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PUMP SHUTOFF MECHANISM

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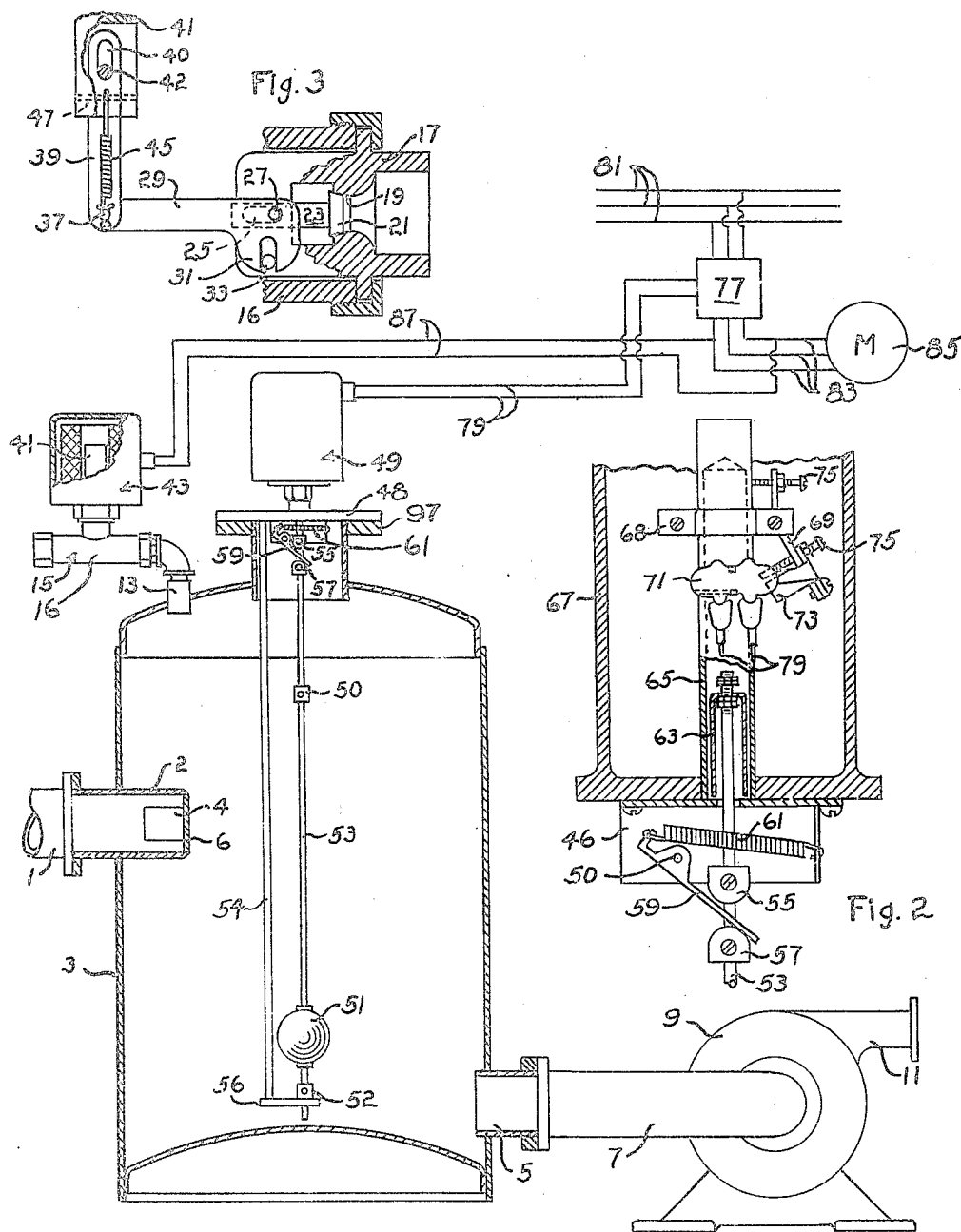


Fig. 1

Fig. 2

Fig. 3

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PUMP SHUTOFF MECHANISM

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This invention relates to a system for pumping liquid. More specifically, it relates to a pumping system in which liquid is supplied by gravity from a tank car or other source and in which the pump is controlled by the level of liquid in an air release chamber or tank which is disposed on the suction side of the pump.

It is an object of the invention to provide a mechanism which will safeguard a pump by shutting it down when the supply of liquid fails.

Another object of the invention is to provide a system which is automatic.

Yet another object of the invention is to provide a pumping system in which the pump is automatically started when liquid is supplied to it.

Yet a further object of the invention is to provide a pumping system which automatically supplies liquid to the pump free from entrained air and vapors.

These and other objects will become apparent from a study of the specification in connection with the drawings which are attached hereto and made a part hereof, and in which:

Figure 1 is an elevation partly in section showing the pump, air release and control system.

Figure 2 is a detail view of the control switch.

Figure 3 is a detail view of the solenoid actuated vent valve.

Referring now to Figure 1, the numeral 1 represents the supply line which may be connected at one end to a tank car, tank truck or other source of supply of the liquid to be pumped, and at the other end to the inlet pipe 2 of an air release tank 3. The inlet pipe 2 is closed by a plate 6 and an opening 4 is formed in one side of the pipe so as to divert the liquid in a tangential direction to develop a swirling action of the entering liquid. The liquid outlet 5 is disposed at the bottom of the air release tank and is connected to the suction side 7 of a pump 9 which may be a centrifugal, positive displacement or any other type of pump, and the discharge side 11 of the pump is connected to a storage tank or other receiver for the liquid.

The vent line 13 is connected to the top of the air release tank 3 and to the atmosphere through a solenoid actuated vent valve mechanism 15. As is shown in Figure 3, the vent valve body is adapted to receive the casing 17, which is provided with a valve seat 19, which the valve 21 engages when energized. A rod 23 connected to the valve is slotted as at 25 to receive a transverse pin 27 which is fastened to the forked portion of a lever 29. Bifurcations 31 are formed on the lever so as to engage a second pin 33 which is secured in the casing 17 and acts as a fulcrum for the lever 29. The far end of the lever 29 is rotatably connected by a pin 37 to a pair of links 39 which extend substantially at right angles therewith and are connected to the

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core 41 of the solenoid, indicated generally by the numeral 43, by means of elongated slots 40 which receive a pin 42 mounted in the core 41. Springs 45 connect pins 47, which are mounted in the core, to the pin 37 to hold pin 42 normally at the bottom of slots 40, but said springs yield to permit centralization of the core when the solenoid is energized. It will then be seen that upon energization of the solenoid 43, the core 41 will lift the links 39 to swing the lever 29 about the pin 33 to engage the valve 21 with its seat 19. Any excess movement of the core will merely extend the springs 45.

A flange 97 is provided at the top of the air release and a switch mechanism 49, which is called a "Magnetrol" is mounted upon the flange to be actuated by a float 51.

The float slidably engages a float rod 53 which has thereon two stops 50, 52, near the upper and lower extremities. A stationary rod 54 is fixed to the companion flange 48 and provided with a lateral extension 56 to support the stop 52 and the rod in its lower position. Rod 53 passes through an opening in the extension and is guided thereby.

Figure 2 discloses the structure of the switch. Two adjacent lugs 55 and 57 on the upper end of float rod 53 are adapted to engage an over-center lever 59 which is pivotally mounted on a pin 50 supported on bracket 46 and is held in its up or down positions by a spring 61 which is attached to one end of the lever 59 and to bracket 46. The float rod carries also an armature 63 which rides inside of a non-magnetic tube 65 which is sealed off from the switch compartment 67 but opens into the air release. Pivotaly mounted on the outside of the tube by means of a clamp 68 is an arm 69 which carries a mercury switch 71 and a powerful permanent magnet 73. Stop screws 75 adjust the maximum travel of the switch.

The switch is connected with a motor starter 77 of any desirable type by wires 79. The starter is connected with a power line 81 and is connected by wires 83 to the motor 85, which drives the pump. The solenoid is connected by wires 87 to the motor wires 83. It will be noted that the motor and solenoid will be energized simultaneously.

Operation

The source of liquid is disposed at a level above the air release 3 so that it will flow into the air release tank. If we assume the air release is empty, the float 51 and float rod 53 will be down, the stop 52 resting on the support extension 56. The armature 63 will be out of the field of the magnet 73 and switch 71 will be open so that the motor 85 will be stopped and the valve 21 open.

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As liquid enters the air release with the swirling action caused by the side opening 4, air and other gases will collect at the center and escape through valve 21 and vent pipe 13 to the atmosphere preferably at some remote point. The liquid will rise in the air release, lifting the float 51 along its rod 53.

As the float engages the upper stop 50, it lifts the float rod 53, thus causing the lug 57 to throw the overcenter lever 59 counterclockwise into the position where it rests against lug 55. The armature 63 has by this time entered the field of the magnet 73, and the magnetic attraction overcomes the weight of parts 71 and 73 which normally tends to hold the lever 69 in the Figure 2 position. The lever 69 will then rotate clockwise until the lower stop engages tube 65. In this position the mercury in the switch will complete the circuit through wires 79 and the starting coil in starter 77 so that the main switch will connect wires 83 with the power line 81 to energize the motor 85 to start the pump, and to also energize the solenoid 43 through wires 87 to close the valve 21.

The pump 9 will draw liquid from the air release through the connections 5 and 7 and will discharge it to the receiver. When the liquid supply fails or if gas accumulates in the tank 3, the float will follow the liquid level down and the pump will continue to withdraw liquid from the air release until the float 51 engages the lower stop 52. The weight of the float will push stop 52 downwardly to its resting place on the support extension 56, the float rod 53 will drop, and lug 55 will throw the overcenter lever 59 clockwise to its down position (Figure 2). The armature 63 is withdrawn from the field of the magnet 73 and since the attractive force between the armature and magnet is reduced, the switch is opened by gravity and the control circuit 79 is deenergized. The starter 77 then opens the motor and valve circuits to stop the motor 85 and open the valve 21.

The overcenter spring 61 and lever 59 serve to hold the rod 53 and associated parts in one position until a definite force is applied to move them to the other position. The device then serves to hold the parts in the new position.

If additional liquid is supplied to the tank, the process will be repeated automatically.

This system prevents damage to the pump which might otherwise result from running it dry, and also relieves the operator of the duty of watching the operation constantly so that he can stop the pump when the supply is exhausted.

It is obvious that various changes may be made in the form structure and arrangement of parts without departing from the spirit of the invention.

Accordingly, applicant does not desire to be limited to the specific embodiment disclosed herein primarily for the purposes of illustration; but instead, he desires protection falling fairly within the scope of the appended claims.

What I claim to be new and desire to protect by Letters Patent of the United States is:

1. In a pumping system, the combination of a supply line, an air release comprising a tank connected thereto, means in said supply line adjacent said tank for discharging liquid into said tank substantially tangentially thereto, a normally open solenoid air vent valve connected to said tank, a pump having its suction connected to said tank, and means responsive to the liquid

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level in said tank for actuating simultaneously said pump and said valve to close it.

2. In a pumping system, the combination of a supply line adapted to be supplied by gravity, an air release comprising a tank connected to said supply line and connected to the suction side of a pump, a solenoid air vent valve connected to said tank, a motor connected to drive said pump, a switch, a float actuated overcenter switch actuator having up and down positions, said actuator when in up position, serving to cause said switch to energize said valve to close and said motor to start; said actuator when in the down position allowing said valve to open and said motor to stop.

3. In a pumping system, the combination of a supply line adapted to be supplied by gravity, an air release comprising a tank connected to said supply line and to the suction side of a pump, a solenoid actuated air vent valve connected to said tank, a motor connected to drive said pump, means responsive to a predetermined maximum liquid level in said tank for closing said valve and starting said motor and responsive to a predetermined minimum liquid level for opening said valve and stopping said motor.

4. In a pumping system, the combination of a supply line adapted to be supplied by gravity, an air release comprising a tank connected to said supply line and connected to the suction side of a pump, a solenoid air vent valve connected to said tank, a motor for driving said pump, a magnetic switch adapted to actuate said valve and said motor simultaneously, means comprising an overcenter lever for holding said switch in either of its positions, a float rod, means on said rod for controlling said lever, and means comprising a float adapted to engage stops at predetermined positions on said rod for actuating said lever control means.

5. In a pumping system, the combination of a supply line adapted to be supplied by gravity, an air release comprising a tank connected to said supply line and connected to the suction side of a pump, a normally open solenoid air vent valve in said tank, a motor for driving said pump, and a float controlled means adapted to actuate said motor and said solenoid valve simultaneously to start the pump and close the valve when a predetermined maximum level is attained in said tank.

6. In a pumping system, the combination of a supply line adapted to be supplied by gravity, an air release comprising a tank connected to said supply line and connected to the suction side of a pump, a normally open solenoid air vent valve in said tank, a motor for driving said pump, and a float controlled means adapted to actuate said motor and close said solenoid valve simultaneously when a maximum level in the tank is reached to stop the pump and open said valve when a predetermined minimum level is attained in said tank.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
506,927	McGowan	Oct. 17, 1893
763,741	Ellis	June 28, 1904
1,654,760	Skidmore, Jr.	Jan. 3, 1928
2,260,312	Gruman	Oct. 28, 1941