United States Patent

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[54] **SEWAGE-PUMPING STATION**
3 Claims, 2 Drawing Figs.

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[50] **Field of Search** ..... 417/200, 199 A, 199, 7, 36; 415/53

[56] **References Cited**

UNITED STATES PATENTS

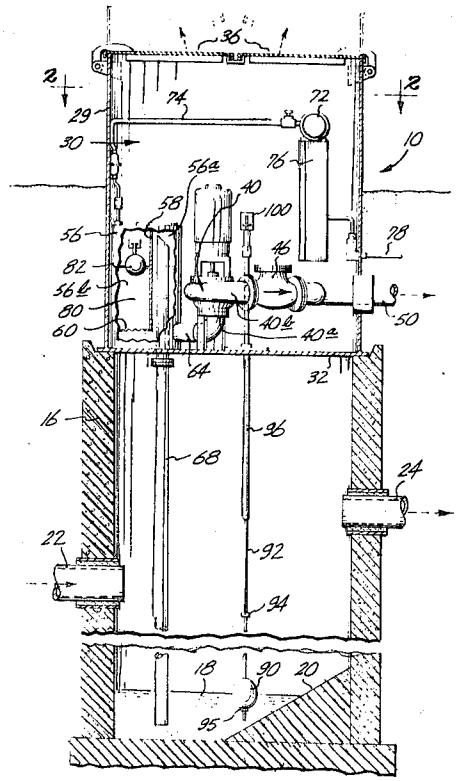
1,840,257	1/1932	Saxe et al	417/200
1,910,775	5/1933	Saxe	417/200
2,461,925	2/1949	Rupp	415/53
3,247,864	4/1966	Conery	417/7
1,964,034	6/1934	Cook	417/36

FOREIGN PATENTS

530,791	12/1921	France	415/53

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ABSTRACT: A sewage-pumping station including a sump and above the sump a machinery compartment. A pair of sewage pumps and a priming chamber for holding sewage are provided in the machinery compartment. A feed conduit extending from adjacent the base of the sump into the priming chamber provides for the flow of sewage into the priming chamber. A vacuum pump also mounted in the machinery compartment when actuated produces a subatmospheric pressure in the priming chamber effective to draw sewage from the sump into the priming chamber. The pair of sewage pumps have their inlet sides connected to the priming chamber and sewage in the priming chamber is used to prime these pumps.



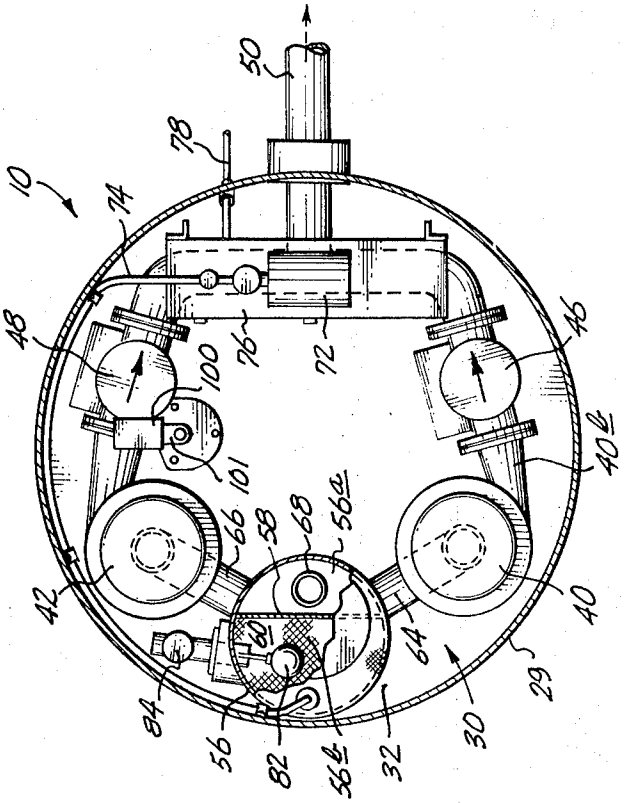


Fig. 2.

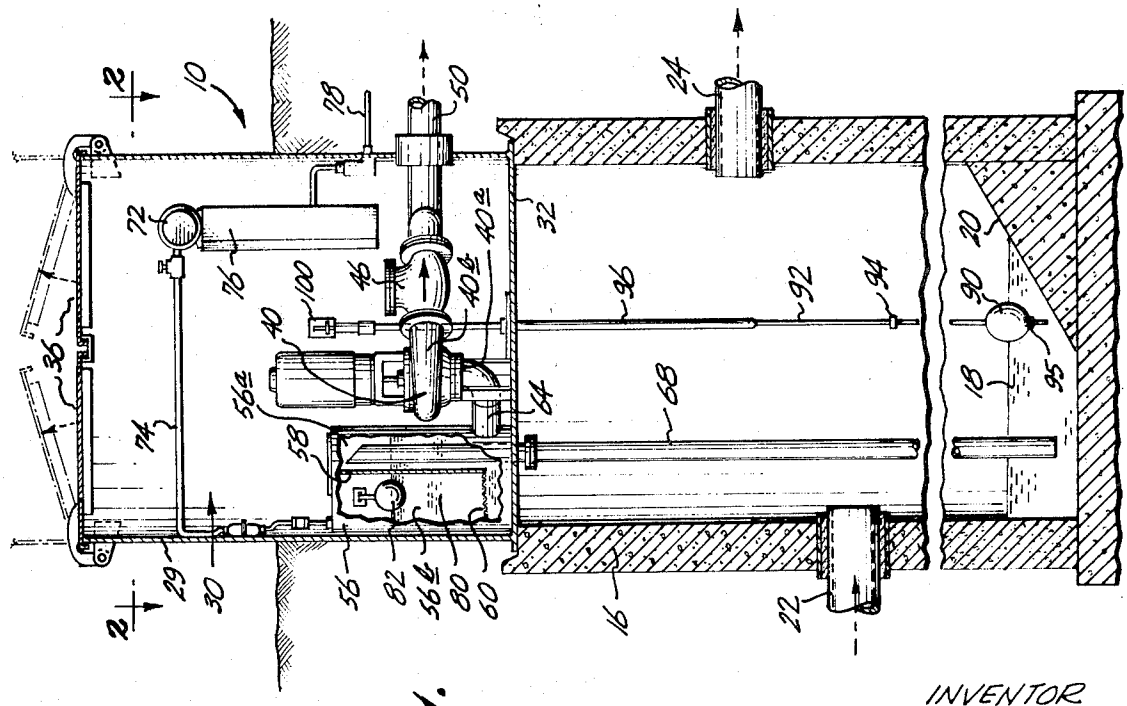


Fig. 1.

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SEWAGE-PUMPING STATION

This invention relates to a sewage-pumping station.

In sewage-pumping stations, of the type that are embedded in the ground, for ease of maintenance and other reasons, the pump which handles the sewage may be located in a compartment disposed above the sump from which the sewage is drawn, rather than being submerged in the sewage. A pump having such an elevated position with respect to the liquid that it pumps presents a problem of priming. Embedded sewage-pumping stations generally operate unattended over long periods of time and for this reason any means for maintaining a primed state in the pump must be reliable and trouble-free.

A general object of this invention is to provide a novel sewage-pumping station including a pump mounted above a sewage-holding sump from which sewage is drawn, and priming means for maintaining the pump in a primed state.

As contemplated in a preferred embodiment of the invention, the sewage-pumping station includes a machinery compartment located above the sump and housing a priming chamber and a sewage pump. A feed conduit extends from the base of the sump into the priming chamber and the sewage pump has its inlet side connected to the priming chamber, with sewage, on operation of the sewage pump, passing up the feed conduit into the priming chamber and then through the sewage pump. A vacuum pump also provided in the machinery compartment maintains a subatmospheric pressure in the priming chamber so that at all times a level of sewage is maintained in the chamber which maintains a primed condition in the sewage pump.

Another object is to provide such a novel sewage-pumping station, which includes sewage level sensing means within the priming chamber, and control means connected to the level-sensing means for controlling operation of the vacuum pump automatically to maintain a desired sewage level within the priming chamber.

Yet another object is to provide a novel sewage-pumping station of the above-indicated character which includes multiple sewage pumps provided within the machinery compartment of the station and a common priming chamber for said pumps, the sewage pumps all having their inlet sides connected to the same priming chamber.

These and other objects and advantages will become more fully apparent as the following description is read in conjunction with the drawings, wherein:

FIG. 1 is a sectional elevation view of a pumping station construction in accordance with an embodiment of the invention; and

FIG. 2 is a view, somewhat enlarged, taken generally along the line 2—2 in FIG. 1.

Referring now to the drawings, and first more specifically to FIG. 1, at 10 is indicated a sewage-pumping station which is embedded in the ground. The pumping station includes an upright cylindrical sump 16 which holds sewage, such as that indicated generally at 18. An inclined portion 20 at the bottom of the sump serves to direct solids which may settle out of the sewage toward the left of the sump as seen in FIG. 1. A supply pipe, or conduit, 22 opens into the sump which supplies sewage. An overflow pipe 24 at a higher elevation than supply pipe 22 provides for the overflow of sewage from the sump should it reach the level of pipe 24.

A casing 29 provides a machinery compartment, indicated generally at 30, on top of sump 16. The casing includes a floor plate 32 which rests on the top of the sump, and is closed off at the top by a pair of hinged hatch plates 36.

A pair of motor-driven centrifugal sewage pumps 40, 42, are mounted within the machinery compartment. The pumps are supported at substantially the same elevation above floor plate 32, and each has an inlet side facing downwardly, as shown at 40*a*, and a discharge side formed by a volute, such as volute 40*b*. The discharge sides of pumps 40, 42 are connected, through check valves 46, 48 respectively, to a common discharge pipe, or conduit, 50. The check valves permit flow away from the pumps only, as indicated by the arrows in the figures.

Also within the machinery compartment is a priming chamber 56. Such is mounted on floor plate 32 between pumps 40, 42. The priming chamber is divided into two compartments, indicated generally at 56*a*, 56*b*, by an upright plate 58 and a horizontal mesh screen 60, both of which are suitably anchored in place within the priming chamber. The lower horizontal edge of plate 58 is spaced above the bottom of the priming chamber and screen 60 extends horizontally from this lower edge.

The inlet sides of pumps 40, 42 are connected to the priming chamber through conduits 64, 66, respectively. These conduits open into the lower portion of compartment 56*a* of the priming chamber.

An elongated vertical feed conduit 68 has an upper portion positioned within compartment 56*a* of the priming chamber. Its upper end opens to the priming chamber adjacent the top of the priming chamber. Conduit 68 extends downwardly through the bottom of the priming chamber and into the sump, and its lower end opens to the sump adjacent the bottom of the sump within sewage 18.

A motor-driven vacuum pump 72 is connected through a vacuum conduit 74, and various strainers and valves to priming chamber 56. Conduit 74 opens to the top of compartment 56*b* of the priming chamber. Vacuum pump 72 is mounted on top of a control panel 76 housing control circuitry for various components of the pumping station. Electrical current is supplied from a main lead-in line 78 to the motors for the pumps in the pumping station.

With running of the vacuum pump, a subatmospheric pressure is produced in the priming chamber. This causes sewage to be drawn upwardly through feed conduit 68 and into the priming chamber, as represented by the sewage indicated at 80 in the priming chamber. A float 82 within the priming chamber senses the level of sewage within the chamber. The float is connected to control means indicated generally at 84 in FIG. 2 which includes a switch which, when closed, starts the vacuum pump. With dropping of the float to a certain level the switch closes to start the pump, and on the float rising to a certain higher level the pump stops. Thus, a vacuum or subatmospheric pressure is maintained in the priming chamber. Since pumps 40, 42 are connected directly to the priming chamber through conduits 64, 66, with the sewage in said chamber being held at a level which is above the inlet sides of said pumps, the pumps are maintained in a primed state.

A float 90 within the sump floats on the surface of sewage 18 in the sump. Float 90 is slidably mounted for vertical movement on a vertical shaft 92. Stops 94, 95 secured to shaft 92 above and below float 90, respectively, limit movement of the float along the shaft. Shaft 92, in turn, is slidably mounted for telescopic vertical movement within an elongated vertical tube 96 which extends upwardly through floor plate 32. Float 90, shaft 92 and stops 94, 95 are referred to collectively herein as sewage level sensing means.

The level-sensing means is so constructed that when the level of sewage within the sump rises, float 90 slides upwardly on shaft 92 without causing vertical movement of shaft 92 until such time as the float reaches stop 94. Further rising of the level of sewage in the sump causes the float to force shaft 92 to telescope upwardly into tube 96. Subsequent lowering of the sewage level results in a lowering of float 90. However, shaft 92 is gripped slightly by frictional means within tube 96 and will not lower by virtue of its weight alone, but must wait until float 92 moves downwardly and against stop 95. Then the combined weight of the float and shaft will move the shaft down as the sewage level lowers.

Mounted adjacent the top of tube 96 is switch means, also referred to herein as pump control means, indicated generally at 100. The switch means has an actuating arm 101 which is actuated with vertical movement of shaft 92 within tube 96. Further, the switch means is electrically connected in the control circuitry for the sewage pumps whereby it controls starting and stopping of the pumps.

The switching means is so constructed that on arm **101** being moved up slightly by upward movement of shaft **92**, only one motor-driven sewage pump is started. The switching means includes alternating means which functions, on the arm moving upwardly, then downwardly, and then upwardly again, to start first one and then the other of the sewage pumps. On the arm moving upwardly beyond the slight upward movement required to start one pump, the sewage pump which heretofore had been inactive is started up to place both pumps in operation.

Explaining now the operation of the sewage-pumping station described, the priming chamber is first filled with sewage to the level illustrated in FIG. **1** by operation of vacuum pump **72**. Float **82** and control means **84** cause the vacuum pump **72** to operate intermittently, as required to maintain a suitable quantity of sewage within the priming chamber.

When sewage flows into sump **16** through supply pipe **22**, the level of sewage within the sump rises causing float **90** to rise and eventually contact stop **94**. A further rise in the sewage level moves shaft **92** upwardly causing switch means **100** to operate one of pumps **40, 42**. Operation of one of such pumps draws sewage from the priming chamber and discharges it through discharge pipe **50**. This removal of sewage from the priming chamber reduces the pressure within the chamber whereby additional sewage is drawn upwardly through conduit **68** and into the priming chamber. With only one sewage pump operating, the check valve associated with the other sewage-pump prevents sewage from being fed back into the other pump.

If the flow of sewage into the sump is at a greater rate than can be handled by one of the sewage pumps alone, the level within the sump rises producing corresponding upward movement of float **90** and shaft **92**, until such time as the switch means causes both of pumps **40, 42** to operate together.

If during the operation of sewage-pumps **40, 42** the level of sewage within the priming chamber lowers beyond a level deemed desirable, this is detected by float **82** and the vacuum pump starts to maintain the sewage in the priming chamber at the desired level.

An advantageous feature of the pumping station contemplated is that once a body of sewage has been collected in the priming chamber, such will continue to prime the sewage-pumps, as they are operated intermittently for a long period of time and even though vacuum pump **72** should for some reason break down. Further explaining, assuming the vacuum pump inoperative, the level of the body of sewage contained in the priming chamber drops somewhat on starting up of a sewage pump. The drop in the level of sewage is that which is necessary to increase the vacuum above the sewage to an extent sufficient to cause sewage in the sump to be drawn up through feed conduit **68** and be expelled into the priming chamber. The priming chamber is sized so that the drop in the level of sewage is not sufficient as to expose the end of conduit **64** where such joins with the priming chamber. On the sewage-pump later on stopping, as the liquid level in the sump rises, the level in the priming chamber also rises, reaching its original level. Providing there is no leakage of air into the priming chamber, and were it not for the sewage gas which is introduced in the priming chamber from the sewage, this type of operation could be repeated indefinitely. The vacuum pump is provided, therefore, to provide priming for start up when a station is initially installed, or following repairs, and for removing gas from the priming chamber introduced as a result of a leak, or from the sewage being handled.

The pumping station of the invention is easily maintained since the pumps in the station are mounted in a dry region above the sewage-holding sump. Further, the priming means incorporated in the pumping station automatically provides a positive prime for the sewage-pumps at all times.

The separation of the priming chamber into two compartments by the screen, or screening means, prevents solids in the sewage from impairing operation of float **82**. During pump operation, sewage circulation is primarily from conduit **68** into the compartment containing the upper end of conduit **68** and thence into one or both of the pumps.

The provision of two sewage pumps in the pumping station which are controlled so that they operate alternately on successive fluctuations in the level of sewage within the sump, or together in the event of a rapid rise in the level of sewage, produces longer pump life and thus greater reliability and less downtime for the pumping station.

While a preferred embodiment of the invention has been described herein it should be obvious that variations and modifications are possible without departing from the spirit of the invention.

It is claimed and desired to secure by Letters Patent:

1. A sewage-pumping station comprising

a sump having a bottom and sides,

a supply conduit connecting with the sump at a point elevated above the bottom of the sump for the admission of sewage thereinto,

an overflow conduit connecting with the sump at a point elevated above the connection of said supply conduit with the sump,

casing structure forming a machinery compartment disposed above the sump,

a discharge conduit leading into said machinery compartment,

a sewage-pump mounted in said machinery compartment having an inlet side and a discharge side, said discharge side being connected to said discharge conduit,

a priming chamber having sides and closed off at its bottom disposed in said machinery compartment, a feed conduit having a lower end connecting with the sump at a point below the connection of said supply conduit with the sump and an upper end opening to the priming chamber at a point elevated from the bottom thereof, said priming chamber being adapted to hold a body of sewage for priming the sewage-pump, said sewage-pump having its inlet side connected to said priming chamber adjacent the base of the priming chamber and below the top of said feed conduit,

a vacuum pump mounted in said machinery compartment and means connecting said vacuum pump to said priming chamber whereby operation of the vacuum pump produces a vacuum in said priming chamber, and

means responsive to the degree of vacuum in the priming chamber for starting and stopping the vacuum pump thereby to maintain the vacuum in the priming chamber.

2. The pumping station of claim **1**, wherein screening means is mounted within the priming chamber dividing said chamber into two compartments, and said means controlling operation of the vacuum pump includes a float located in one of said compartments, said upper end of said feed conduit being in the other of said compartment.

3. The pumping station of claim **1**, which further comprises another sewage-pump mounted in said machinery compartment having an inlet side connected to said priming chamber adjacent the base of the pump and a discharge side connected to said discharge conduit, sewage level sensing means operable to sense the level of sewage in said sump, and pump control means connected to said sensing means for starting up the sewage-pumps on a rise in the level of sewage in said sump, said pump control means including an alternating switch means operable to actuate said pumps alternately on successive startups of the sewage-pumps.

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