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ANNULAR BURIED PRESSURE TANK AND SYSTEM

Filed April 11, 1960

2 Sheets-Sheet 1

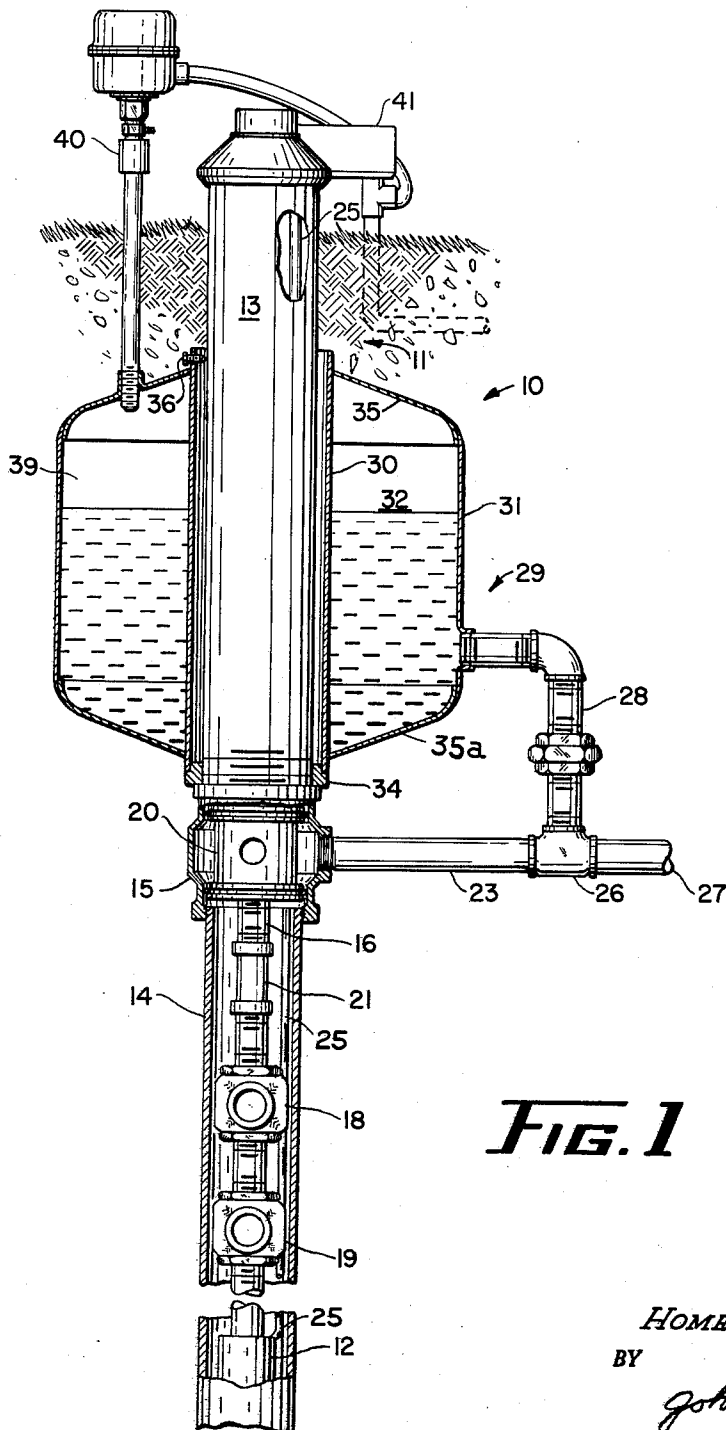


FIG. 1

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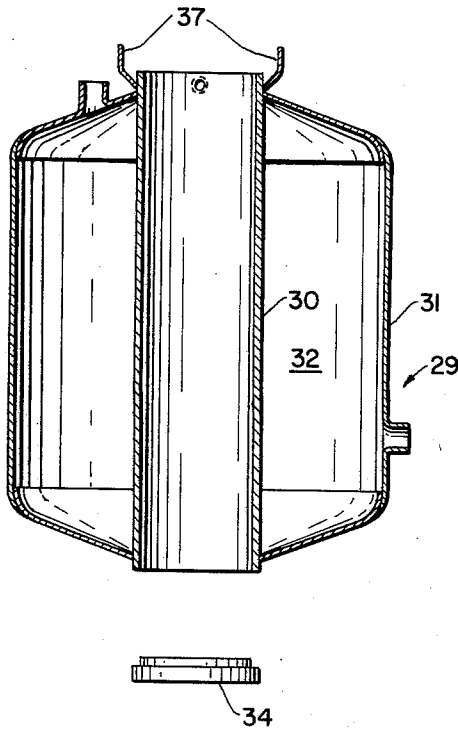


FIG. 2

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ANNULAR BURIED PRESSURE TANK AND SYSTEM

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5 Claims. (Cl. 103—1)

The present invention is concerned generally with an improved water supply system, including a well and a pressure storage tank in combination therewith, and more particularly with such a system wherein the pressure storage tank is buried and is arranged separably and disposed annularly about the well casing, a pressure tank of one size being adapted for use in combination with a variety of various standard well casing sizes.

In the past, various underground or buried pressure storage tanks and systems have been utilized and proposed these being relatively widely used particularly since the advent of the submersible pump. It is accordingly possible to provide a completely buried individual water supply for a residence, a community, or a commercial purpose, the system being accordingly substantially free from frost danger and the like. However, the available underground systems in use wherein the storage and pressure tank is arranged integrally with the casing normally require a relatively complex valve or discharge arrangement which must be installed directly in the casing unit, thereby making future access to the submerged pump somewhat difficult. In addition, remotely disposed underground tanks, if used, require a relatively large total excavation and accordingly are undesirable from that standpoint. On the other hand, in the annularly disposed storage tanks made integral with the casing, a weight problem and connection is created which makes handling difficult with ordinary equipment. These problems are for the most part eliminated in accordance with the system of the present invention.

Basically, the water system of the present invention includes a standard pitless well unit preferably being provided with a submerged turbine pump or the like. The well casing extends substantially from the ground surface to a point within the water supply strata as is conventional. At a point near the top of the casing per se but below the frost penetration level, a lateral discharge is provided having a branch line or arm in communication with the annular storage or pressure tank arranged circumferentially about the well casing unit. The tank is secured to the casing by a collar or flange co-operating between the tank and the casing. Suitable check valves or the like are provided at a point in the well casing in order to maintain pressure in the branch line and the storage and pressure tank connected thereto. No unusual valving or distribution centers which are not otherwise needed in systems of this type are required in the casing, and hence the submerged pump unit is rendered normally and simply serviceable. In addition, the system provides a sound installation which is substantially free from frost shifting dangers, thereby providing less possibility for rupturing of the storage tank due to shearing stresses set up upon shifting. Of course, it will be appreciated that a minimum of various different pressure and storage tanks are required for all of the various casing sizes in common usage, a supply of various different collars or flanges being basically all that is required for stocking supplies.

Therefore, it is the primary object of the present invention to provide an improved water supply system utilizing a standard casing in combination with a pump in communication with an annular storage tank which is arranged to be disposed, for example, substantial coaxially with the

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well casing, and which is arranged to be secured thereto.

It is a further object of the present invention to provide an improved water supply system wherein a standard pitless water supply system is provided with an annular storage and pressure tank, particularly constructed to facilitate easy removal of the tank as well as easy mounting of the tank in operative position around the upper portion of the casing.

It is still a further object of the invention to provide an improved water supply system utilizing a substantially completely buried system, the well including a casing and a submerged pumping source, the casing having a lateral discharge near the top thereof, but preferably below the point of frost penetration and having an annular storage tank surrounding said casing and communicating with said lateral discharge pipe.

Other and further objects of the present invention will become apparent to those skilled in the art upon a study of the following specification, appended claims and accompanying drawings, in which:

FIG. 1 is a side elevational view partially broken away of a certain preferred embodiment of a pump operating in a water source or supply and in operative combination with a pressure and storage supply assembly arranged in accordance with the present invention; and,

FIG. 2 is a detail view of the tank structure as employed in connection with the present invention.

In accordance with the preferred embodiment of the present invention, the well and water supply arrangement generally designated 10 provided with a casing generally designated 11 which extends from a point substantially adjacent the top surface of the soil down to a point in the subterranean water supply. A pump, preferably a submersible pump such as the pump 12 is disposed in the subterranean water at a point below the static level thereof. Of course, other pumping means may be utilized such as a reciprocating pump, a jet pump or the like, all of these being conventionally employed in the art and used in their normal manner. In the assembly or system disclosed herein and in connection with the present invention, the casing 11 has an upper segment 13 and a lower segment 14, these being separated by a T-coupling 15. In addition, a drop pipe 16 is provided which extends from the pump 12 to a point adjacent the T-coupling 15 and includes an in-line air valve 18, a bleeder valve 19 operatively associated with said air valve, and a distribution head 20 at the top thereof. The assembly is further provided with a check valve 21 between the bleeder valve 19 and the distribution head 20 in order to maintain constant pressure in the lateral supply line 23 and the associated network arranged between the casing and the discharge point. A suitable conductor 25 is provided in order to bring electrical power to the pump 12, as required. This power supply is likewise conventionally known and has been employed in the art in the past. No unusual problem is presented in regard to its use with the system of the present invention.

The water supply, upon leaving the distribution head 20 moved along the lateral supply line 23 to its juncture with T-coupling 26, and depending upon the demands of the system at any given instant of time, the water will either continue along the lateral discharge segment 27 or will be pumped through branch line 28 into the pressure and storage tank generally designated 29 in order to restore pressure therein. Tank 29 is provided with an inner cylindrical wall 30, an outer cylindrical wall 31, and heads 35 and 35A defining an annular chamber 32 therebetween, this chamber providing a pressurized enclosure for the water. Suitable adapter ring or collar 34 is provided in order to fixedly secure the bottom of tank 29 onto the surface of the casing 11. The tank may be positioned

about the casing at the top of the tank by any of a variety of means, such as by group of set-screws, such as the set-screw 36. Inasmuch as the tank is buried in normal use, the earth will be expected to provide adequate vertical support for the tank particularly after the excavation has been filled.

The inner annular wall 30 has an inner diameter which exceeds that of the largest casing with which the unit is adapted for use. Accordingly, for purposes of supply, an installer may stock a particular tank for use in connection with a variety of standard casing sizes. For assisting in the actual installation operation, lifting hooks 37—37 are provided to aid in dropping the tank into place over the casing assembly.

Tank 29 may be fabricated from materials which are not necessarily as heavy as the materials required for the casing unit. Hence, certain advantages arise in jurisdictions which require that underground storage tanks or vessels be of a gauge which is at least equal to the thickness of the casing required whenever the storage tank or vessel is prepared integrally with the well casing. This is particularly true in connection with the apparatus of the present invention and is manifested in the ease by which the units of the present invention may be installed. The location of the tank, being co-axially disposed with the casing, minimizes the excavation requirements of the system being installed. Accordingly, only a single excavation is required in connection with this system, and further excavation for a remotely positioned tank will not be required.

In connection with the pump utilized, any of the commercially available and commonly utilized submersible pumps may be advantageously employed in the system. The air valve, bleeder valve and check valve may all be prepared in accordance with the disclosure in the co-pending application of Vaughan L. Andrew, Serial No. 760,151, filed September 10, 1958, entitled "Remote Pump Control Switch With Automatic Air Supply" and assigned to the same assignee as the present invention. The volume of the air cushion as shown at 39 is maintained at a desired quantity or level by means of the valve and control switch generally designated 40. The particular features of the valve 40 are completely disclosed in the aforementioned co-pending application of Vaughan L. Andrew. The function and operation of this valve is not unusual and is utilized in accordance with the normal operation thereof. Suitable electrical power is made available to the unit through the junction box 41 located at the top of the casing 11.

In operation, upon a demand for water along the discharge pipe 27, a drop in pressure in the tank enclosure 32 will cause switch 40 to energize pump 12. Pump 12 will operate continuously until the upper pressure limit setting of switch 40 is reached, the water being delivered during the period of operation along the lateral discharge pipe 23 and into the lateral pipe 27 as well as through branch piping or conduit 28 into enclosure 32.

It will be appreciated that various modifications of the system shown herein particularly in connection with the pressure switch, the distribution head, check valves, bleeder valves, and air valves may be made without departing from the teachings of the improved system of the present invention. Accordingly, it will be appreciated that various of the commercially available equipment may be successfully employed in connection with the present invention. While the tank 29 has been defined as having a cylindrical annular enclosure, it will be appreciated that various other configurations may be successfully employed as well. In this connection, however, it is desirable that any tank employed have a circular, rectangular or other configuration, having a symmetrical axis through the center thereof, this axis being arranged coaxially with the longitudinal axis of the casing 11. Accordingly, when the tank 29 becomes filled with a large volume of water,

there is no increased danger of rupturing the tank due to an unequal load about the central axis of the casing and tank assembly.

Inasmuch as the various examples given herein are for purposes of illustration only, it will be appreciated that various departures and deviations may be made therefrom by those skilled in the art without actually departing from the spirit and scope of the present invention.

What I claim is:

1. A hydro-pneumatic pressure storage system for a well unit including a casing with a certain predetermined outer diameter and extending substantially from the ground surface to the subterranean water source, pumping means being disposed within said casing and communicating with said subterranean water, an annular tank unit arranged about said casing, and an external discharge conduit coupled to and in fluid communication with said tank and communicating through said casing with said pumping means for delivering water from the well to said tank and to a remote discharge point, said annular tank unit having an inner cylindrical wall defining a central aperture, said inner cylindrical wall having a diameter exceeding said certain predetermined diameter whereby the annular tank unit may be readily mounted on and removed from said casing.

2. A pneumatic pressure storage system for a well unit including a well casing with a certain predetermined outer diameter and extending substantially from the ground surface to the subterranean water source, pumping means being disposed within said casing and communicating with said subterranean water, an annular tank unit arranged about said well casing, and an external discharge conduit coupled to and in fluid communication with said tank and communicating through said casing with said pumping means for delivering water from the well to said tank and to a remote discharge point, said annular tank unit being disposed coaxially with said casing and having an inner cylindrical wall defining a central aperture, said inner cylindrical wall having a diameter exceeding said certain predetermined diameter whereby the annular tank unit may be readily mounted on and removed from said casing, and means for securing said tank enclosure to said well casing.

3. A pneumatic pressure storage system for a well unit including a well casing with a certain predetermined outer diameter and extending substantially from the ground surface to the subterranean water source, pumping means being disposed within said well communicating with said subterranean water, an annular tank unit arranged about said casing, and an external discharge conduit coupled to and in fluid communication with said tank and communicating through said casing with said pumping means for delivering water from the well to said tank and to a remote discharge point, said annular tank unit having an inner cylindrical wall defining a central aperture, said inner cylindrical wall having a diameter exceeding said certain predetermined diameter whereby the annular tank unit may be readily mounted on and removed from said casing, and collar means arranged in co-operative relationship with said tank and said casing for positioning and securing said tank to the outer surface of said well casing.

4. A pneumatic pressure storage system for a well unit including a well casing with a certain predetermined outer diameter and extending substantially vertically from the ground surface to the subterranean water source, pumping means being disposed within said casing communicating with said subterranean water, an annular storage tank positioned about said casing, an external discharge conduit communicating with said pumping means for delivering water from said system to a remote discharge point and to said tank, said external discharge conduit communicating with said accumulator at a point remotely disposed from said casing, said pressure storage tank having an inner cylindrical wall defining an annular en-

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closure having a central aperture running therethrough, the diameter of said inner cylindrical wall exceeding said certain predetermined diameter, and collar means co-operating with said tank enclosure for securing said tank to the outer surface of said well casing in coaxial relationship therewith.

5. An upper well system including an upper well casing, a lower well casing, a coupling connecting said upper and lower well casings in axial relation one to the other, an abutment means formed at the top of said coupling, 10 pumping means being disposed within said lower casing and communicating with a subterranean water source, an annular storage and pressure tank unit arranged about said upper casing and having an inner cylindrical wall defining a central aperture of a diameter exceeding the 15 outside diameter of said upper casing whereby the annular tank unit may be readily mounted on and removed from said upper casing unit, means for affording

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communication from said pump to said tank and a remote discharge point and a collar having such inner diameter as to engage said abutment means and having an outer diameter greater than the diameter of said inner cylindrical tank wall to support said tank unit thereon.

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