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DEVICE FOR AIRING WATER TANKS

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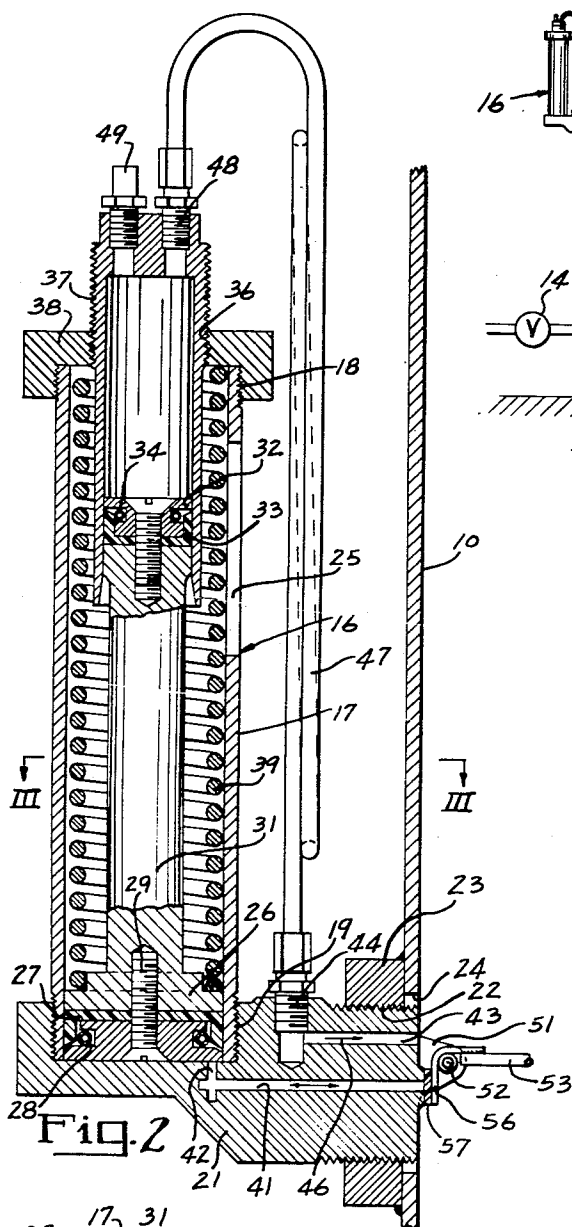
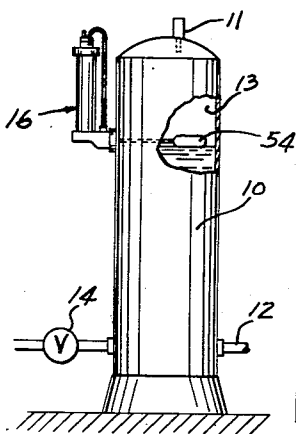


Fig. 1

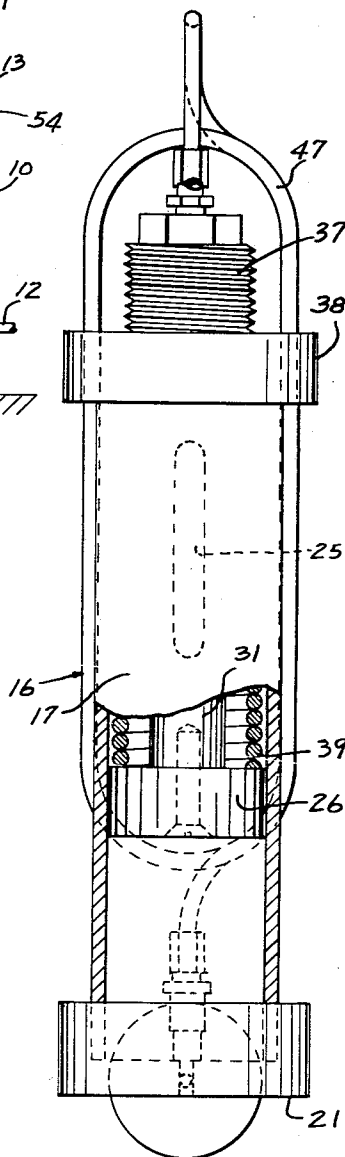


Fig. 4

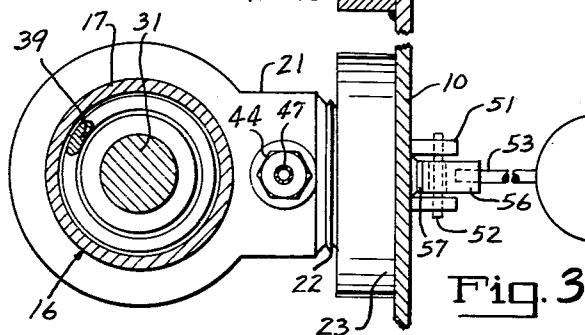


Fig. 3

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DEVICE FOR AIRING WATER TANKS

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6 Claims. (Cl. 230—20)

This invention relates to a device for maintaining automatically an adequate supply of air in the pressure tanks of water systems and the like.

The usual home water system pressure is developed in the lines by pumping water from the well or other source of supply into a tank at the top of which is maintained a head of air. As the water in the tank rises under pressure from the pump, the air head is compressed. When a line leading from the tank is opened the body of air under pressure is effective to force the water out under pressure. Due to various causes such as absorption of the air by the water in the tank, it is necessary to replace some of the air from time to time; otherwise, all of the air will be absorbed and the tank will become water logged. On the other hand, if an excess of air is pumped into such a tank too much water is displaced with the result that when the faucet is opened some air will go out with the water which is very objectionable. With respect to pressure, the tank usually is provided with a switch which turns the pump motor on at around 20 pounds per square inch pressure in the tank and turns the same off when the pressure reaches about 40 pounds. However, it is sometimes desirable to vary these operating pressures within limits and my improved device is capable of accommodating such change.

In view of the above it is an object of my invention to provide a device adapted for installation on the pressure tank and which shall keep the tank properly aired at all times to prevent water logging or over airing of the tank.

Another object is to provide a device of the character designated which comprises essentially an air pump operated by the fluid pressure in the tank, together with means automatically operable to control the operation of such pump in accordance with the requirements of the tank for air, thereby maintaining the correct amount of air therein at all times.

Another object is to provide a fluid pressure actuated air pump in which the piston thereof travels a full stroke regardless of the pressure in the tank, this being accomplished by making the cylinder of the pump axially adjustable relative to the piston in accordance with the predetermined operating pressure of the tank. This adjustment may be made within limits as determined by the operating range of a spring or the like which urges the piston in an opposite direction to the pressure of the fluid in the tank acting thereon.

A more specific object is to provide a device of the character designated in which a float actuated valve controls the admission of fluid under pressure to the device in accordance with the amount of air in the tank, thus automatically causing the device to pump air when required and preventing the same from pumping when there is a predetermined, sufficient amount of air in the tank. Another object of my invention is to provide an intermediate air reservoir into which the air from the air pump is discharged at a pressure slightly higher than the lowest pressure in the tank.

A device illustrating features of my invention is shown

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in the accompanying drawing forming a part of this application in which:

Fig. 1 is a wholly diagrammatic view, partly in section, illustrating my invention associated with the pressure tank of a water system;

Fig. 2 is an enlarged vertical sectional view through my improved device, certain parts being broken away for the sake of clarity;

Fig. 3 is a detail sectional view taken generally along line III—III of Fig. 2; and,

Fig. 4 is a side elevational view partly broken away and in section and showing the device with the pistons thereof in fully raised position.

Referring now to the drawing for a better understanding of my invention I show in Fig. 1 in diagrammatic manner a tank 10 which is typical of the usual pressure tank associated with home water systems. On top of the tank and diagrammatically illustrated at 11 is a pressure switch which controls the operation of an electric motor connected to a pump for pumping water into the tank through a line 12. The pump and motor are not shown. Pressure is developed in the tank 10 by maintaining a head of air 13 at the top thereof so that when a valve 14 is opened, the water is forced out under pneumatic pressure.

My improved device, indicated generally by the numeral 16, is adapted for mounting on the side of the tank. As shown, the same comprises an outside or power cylinder 17 which is threaded at its upper and lower ends as indicated at 18 and 19. The lower end 19 is screwed into a suitably tapped opening in a body portion 21. The body portion is provided with a threaded section 22 which is adapted to screw into a fitting 23 welded water tight to the side of the tank 10, surrounding an opening 24 therein. A slot 25 is provided in the cylinder 17.

Mounted for vertical sliding movement in the cylinder 17 is a piston 26 which may be provided with the usual packing 27 and packing expansion spring 28. Certain parts of the piston as indicated may be secured by means of a screw 29 to a piston rod 31 which extends upwardly.

Mounted on the upper end of the piston rod 31 is a smaller diameter piston 32 which also has a packing 33 and a packing expansion spring 34. It will be seen that the two pistons and rod 31 provide a differential piston arrangement. The importance of this will become apparent as the description proceeds.

The piston 32 is adapted for vertical sliding movement in an air pumping cylinder 36. The cylinder 36 has an exteriorly threaded upper portion 37 which threads into a cap 38 screwed onto the threaded section 18 of the outermost cylinder 17.

Mounted with its upper end resting on the underside of the cap 38 and its lower end resting on top of the piston 26 is a compression spring 39. The spring 39 is adapted to force both of the pistons 26 and 32 downwardly.

The body portion 21 is provided with passages 41 and 42 which lead from the inside of the tank 10 and which open beneath the piston 26. Another passage 43 leads from inside the tank to a screwed in fitting 44 containing a check valve so arranged as to let air flow in the direction of arrow 46 and prevent the reverse flow of water therethrough. Connected to the fitting 44 is a pipe 47, forming a reservoir which may be bent upon itself to form a loop as indicated and which is connected at its other end to a check valve fitting 48. The valve 48 is adapted to permit air to flow into the pipe 47 and to prevent the reverse flow thereof. A check valve fitting 49 is provided in the head of the cylinder 36 so that upon downward movement of the piston 32 air may be drawn into the top of the cylinder.

Mounted on the inner end of the body member 21 is a bracket 51. Pivotaly mounted as at 52 to the bracket is a float arm 53. A float 54 is mounted on the outer end

of the arm. Mounted on a bent plate 56, likewise in turn mounted on the pin 52 is a disc 57 of resilient material which is adapted to close off the passageway 41 when the float is in its lowermost position as illustrated in Fig. 2. It will be apparent that in this position water under pressure in the tank cannot flow into the passages 41 and 42 and hence the piston 26 and piston 27 will not be raised when the correct amount of air is maintained in the tank 10.

With the foregoing explanation in mind the method of constructing and using my improved device may now be explained and understood. The spring 39 is selected so as to exert the proper amount of force in a downward direction upon the pistons 26 and 32. For instance, if the lower piston 26 is $1\frac{13}{16}$ inch in diameter (approximately 2.577 square inches in area) and the upper or air pumping piston 32 is one inch in diameter, (approximately .785 square inch in area) I select a spring 39 which will exert approximately 70 pounds pressure in a downward direction when the piston 26 is seated in the bottom of its cylinder and approximately 95 pounds when the pistons have moved to their full up position as illustrated in Fig. 4. Thus constructed the device is fully capable of properly airing a tank in the usual tank water pressure range of 20 pounds per square inch minimum to 40 pounds per square inch maximum, more or less. As will be seen, at 20 pounds per square inch water pressure the force under piston 26 is about 51.5 pounds; at 40 pounds per square inch water pressure the total force under piston 26 is about 103 pounds. This range of total forces is sufficient to operate the apparatus and pump air into the reservoir pipe 47.

With the device installed on the tank 10 in the manner illustrated it will be apparent that when water is drained from the tank 10 through the line 14, pressure in the air space 13 decreases. When the pressure reaches the predetermined minimum the switch 11 energizes the motor connected to the pump and more water is pumped into the tank 10 through the line 12. As soon as the float 54 removes the pad 57 from the inlet end of the passageway 41, water under pressure forces the piston 26 and hence piston 32 upwardly. Upward movement of piston 32 forces air into the pipe 47. The volume of the pipe reservoir 47 is such that there will be but small rise in pressure therein upon an upward movement of the piston 32. However, when the pressure in the tank is lower than the pressure of the air in the pipe 47, air flows into the tank in the direction of arrow 46, thus replenishing the air which might have been lost. When the pressure in the air space 13 decreases sufficiently, spring 39 forces the pistons 26 and 32 downwardly. Water beneath piston 26 is forced through passage 41 past the float valve, into the tank. A new supply of air is drawn into cylinder 26 through check valve 49.

It will be noted that in the event there is sufficient air already in the tank the float 54 remains in such position as to close off the passage 41. In this case my improved airing device simply does not function and no air is pumped. However, when the pump replenishes water in the tank and the volume of air is low enough that the float is raised, opening the port 41, water under pressure enters under the piston 26, causing the device to function. Therefore, my improved airing device is automatically operable to maintain air in the tank and to replenish air when needed, but on the other hand can not over air the tank.

As will be apparent, the device operates best when the piston 32 makes a complete stroke. In the event it is desired to reduce the operating pressure of the tank, I can still obtain complete stroke operation of the piston 32 by screwing down on the threaded cylinder 36, thus in effect shortening the stroke required to pump air and assuring that the piston 32 pumps out all the air in its cylinder 36. It will be noted that lowering the cylinder 36 also makes the pump operate during that part of the

stroke of the two pistons in which the spring 39 exerts the least force. That is to say, full pumping efficiency of the piston 32 is obtained at reduced water pressure in the tank by lowering the cylinder 36 and this may be carried out at lower operating pressure because the force of the spring increases from its minimum force to its maximum force as the spring becomes compressed. With the threaded cylinder 36, therefore, I am enabled to adapt my device to operation on systems which operate at lower or higher pressures than the normal range of 20 to 40 pounds.

From the foregoing it will be apparent that I have devised an improved device for airing water tanks and the like which is simple of manufacture, sure and positive in operation and which operates only in accordance with the requirements for air in the pressure tank. By actual field tests I have found that my improved device is entirely satisfactory and that it effectively eliminates water logging of tanks.

While I have shown my invention in but one form, it will be obvious to those skilled in the art that it is not so limited but is susceptible of various changes and modifications without departing from the spirit thereof, and I desire, therefore, that only such limitations shall be placed thereupon as are specifically set forth in the appended claims.

What I claim is:

1. In a device for maintaining a given volume of air in the pressure tank of a water system or the like, a cylinder and a piston slidable substantially fluid tight therein, means forming a passageway for the flow of water under pressure from the tank into one end of the cylinder thereby to cause the piston to move, said passageway being the only passage leading to the said end of the cylinder whereby water may flow from the cylinder back into the tank, an air pump driven by said piston comprising a second cylinder and a piston therein, an air reservoir connected at one end to the tank and at the other end to the air pump, and a valve connected to said passage operable to admit water under pressure through said passage to the first named cylinder in accordance with a predetermined volume of air in the tank.

2. In a device for maintaining a given volume of air in the pressure tank of a water system or the like, a pair of cylinders each of which has therein a piston connected by a common piston rod, one of said cylinders being an air pumping cylinder and the other being a power cylinder, a passage connecting one end of the power cylinder to the water under pressure in the tank thereby to drive the piston of the power cylinder, said passage being the only passage leading to said end of the power cylinder whereby water may flow from the power cylinder back into the tank, an air connection from the air pumping cylinder to the pressure tank, a float actuated valve connected to the passage operable to admit water to the power cylinder in accordance with a predetermined volume of air in the tank, and a spring operatively connected to the pistons and effective to return the pistons after a power stroke, thereby to force water in the power cylinder through the passage back into the tank.

3. Apparatus as defined in claim 2 in which the cross sectional area of the power cylinder is larger than the cross sectional area of the air pumping cylinder, and in which there is a reservoir interposed between the air pumping cylinder and the tank into which the pumping cylinder delivers air, said reservoir being of sufficient volume relative to the air pumping cylinder as to receive air from the pumping cylinder at only slight increase in pressure.

4. In apparatus for maintaining a pre-determined volume of air in the pressure tank of a water system, a cylinder and a piston slidable therein with a substantially fluid tight fit, a connection leading from the cylinder beneath the piston to the water in said tank, an air pumping cylinder having a piston therein driven on its air

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pumping stroke by the first named piston, means mounting said air pumping cylinder for axial adjustment relative to its piston whereby the length of stroke of its piston may be varied, an air connection from the air cylinder to the tank, and means urging both of said pistons in the direction opposite that produced by movement of the first named piston in response to water pressure thereunder.

5. Apparatus as defined in claim 4 in which the two cylinders are axially aligned, in which the means mounting the air pumping cylinder for axial adjustment comprises an exteriorly threaded section on the pumping cylinder screwed into a cap carried on one end of the other cylinder, and in which the inner and outer surfaces of the cap are in contact with the atmosphere.

6. Apparatus as defined in claim 4 in which the two cylinders are axially aligned, in which adjustment means

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for the air pumping cylinder comprises a threaded section in the pumping cylinder screwed into a cap carried on one end of the other cylinder, and in which the means urging the pistons in said opposite direction comprises a coil spring having one end resting on the piston of the first named cylinder and the other end resting under said cap, said spring being large enough in internal diameter to fit loosely about the air pumping cylinder.

References Cited in the file of this patent

UNITED STATES PATENTS

1,039,539	Jaekel	Sept. 24, 1912
2,347,472	Dorward	Apr. 25, 1944
2,447,173	Gordon	Aug. 17, 1948
2,698,710	Pedroia	Jan. 4, 1955