A liquid pressure tank having particular use in a water supply system. An impervious, flexible bag or diaphragm is disposed within the tank and the interior of the bag defines a water chamber while the space between the outer surface of the bag constitutes an air chamber. The lower end of the tank is provided with an opening and the neck of the bag is formed with an enlarged bead that is sealed between a V-shaped recess formed in the flange of the tank bordering the opening and the peripheral edge of an adapter by a clamping ring. The adapter is provided with a series of holes through which water is introduced and withdrawn from the interior of the bag.
LIQUID PRESSURE TANK

BACKGROUND OF THE INVENTION

In a water supply system in which water is pumped from a well and delivered to service lines, it is customary to employ a water pressure tank, wherein a sufficient pressure head is maintained on the water to discharge the water at the desired pressure to various locations throughout the system. In the past, the common type of pressure tank had an air head or cushion in the upper end of the tank which was in contact with the water. With pressure tanks of this type, the air will gradually dissolve in the water, so that the air pressure head will gradually be reduced over a period of time until the tank becomes substantially filled with water or is "water logged". To eliminate the loss of the air pressure head, pressure tanks in the past have utilized an air volume control which would periodically admit charges of air from the atmosphere into the upper end of the tank to maintain the pressure head at the desired level. In some cases, compressed air has also been introduced into the tank to maintain the air pressure head at the desired level.

To overcome the problems associated with a pressure tank in which the air head is in contact with the water, impervious diaphragms of various shapes have been utilized which divide the pressure tank into an air chamber and a water chamber. Diaphragm-type systems have the advantage in that the air is separated from the water so that there is no problem of the air dissolving in the water with the resulting loss in the air pressure head. In some installations, the diaphragm has taken the form of a bag so that the water is confined solely in the bag and will not contact the walls of the tank, thereby eliminating the need for a corrosion resistant lining or coating on the inner surface of the tank.

SUMMARY OF THE INVENTION

The invention relates to an improved liquid pressure tank utilizing an impervious, flexible bag-shaped diaphragm and has particular use in a water supply system. According to the invention, the lower end of the tank is provided with an opening bordered by an outwardly extending flange that defines a V-shaped circumferential recess. The neck of the bag is provided with a bead that is sealed between the V-shaped recess and the peripheral edge of an adapter by a clamping ring. The adapter is mounted across the opening and is provided with a series of holes through which the water is introduced and withdrawn into the interior of the bag-shaped diaphragm.

The mounting construction of the invention insures that uniform pressure is applied to the entire circumference of the neck of the bag to thereby provide a more effective seal of the neck to the tank. Moreover, the mounting construction can be readily disassembled in the field with simple tools which thereby facilitates the removal of the bag for maintenance or replacement.

As the water is contained solely within the bag, it will not contact the tank itself, thereby eliminating the need for a corrosion resistant coating or lining on the interior surface of the tank.

Other objects and advantages will appear in the course of the following description.

DESCRIPTION OF THE DRAWINGS

The drawings illustrate the best mode presently contemplated of carrying out the invention;

FIG. 1 is a vertical section of the pressure tank of the invention;
FIG. 2 is a transverse section taken along line 2—2 of FIG. 1;
FIG. 3 is a fragmentary enlarged vertical section of the bag mounting structure before application of the clamping ring; and
FIG. 4 is a view similar to FIG. 3 after application of the clamping ring.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The drawings illustrate a liquid pressure tank 1 that has particular use in a water supply system. The tank 1 includes a generally cylindrical shell 2 having its open upper end enclosed by a dome-shaped head 3 and the lower end closed by a head 4. The heads 3 and 4 are provided with flanges which are welded to the inner surface of the shell 2.

Mounted within the tank 1 is an air and water impervious flexible bag or diaphragm 5, and the interior of the bag 5 defines a water chamber 6, while the space between the outer surface of the bag 5 and tank 1 provides an air chamber 7.

Air is supplied to the air chamber 7 through an air valve 8 which is secured within an opening 9 in the dome-shaped upper head 3. A cap 10 encloses the outer end of valve 8. In practice the air chamber 7 is normally precharged with compressed air so that it has a pressure in the range of 20 to 30 psi and after precharging, the valve 9 is closed so that the air chamber 7 is closed to the atmosphere. As water is introduced into the bag, the bag inflates and the air within the air chamber 7 will be compressed to a range of perhaps 40 to 50 psi. Precharging the air chamber 7 with compressed air enables a greater proportion of the volume of the bag to be utilized for providing the desired pressure in the water system.

To mount the bag 5 with respect to the head 4 of the tank, the head is provided with an opening 11 that is bordered by an annular, downwardly extending flange 12 which terminates in an angular outwardly bent leg 13. A ring 14 is welded to the outer surface of the flange 12 and is provided with an angular leg 15. Legs 13 and 15 diverge to define a generally V-shaped annular recess 16.

As best illustrated in FIGS. 3 and 4, the neck 17 of the bag 5 is provided with an enlarged bead or rim 18 having a generally circular cross section when in the uncompressed state. The bead 18 is secured within the V-shaped recess 15 by means of a plastic, disc-shaped adapter 19 that extends across the opening 11 in head 4. The lower edge of the bead 18 is received within an annular groove 20 formed in the upper surface of the adapter 19. The periphery of the adapter 19 is provided with a pair of inclined edges 21 and 22, and before clamping, as shown in FIG. 3, the upper inclined edge 21 is spaced slightly out of contact with the lower surface of the leg 15.

A clamping ring 23 is employed to clamp the adapter 19 to the leg 15 and the clamping action serves to compress the bead 18 and provide a fluid tight seal between the members. As best shown in FIGS. 2 and 4, the
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clamping ring 23 is of standard construction and it includes a circular band 24, and a pair of side walls 25 diverge outwardly from the band 24. The band 24 is tightened by a turn bolt 26, and in the clamping operation, one of the diverging side walls 25 bears against the outer inclined surface of leg 15, while the other side wall 25 bears against the inclined edge 22 of the adapter 19 to draw the members tightly together and compress the bead 18. In the compressed state, as shown in FIG. 4, the bead 18 bears firmly against the inner surfaces of the diverging legs 13 and 15, as well as being sealed within the groove 20.

To introduce water into the interior of the bag or water chamber 6, the adapter 19 is provided with a central bore 27 and a disc 28 is located at the upper end of the bore and is provided with a series of holes 29. A water line 30 is threaded within the lower end of the bore 27 and water is introduced and withdrawn from the bag 5 through the line 30. The series of small holes 29 in disc 28 prevents the bag 5 from being drawn downwardly into the bore 27 if the bag is completely collapsed, thereby preventing possible damage or rupture of the bag.

The use of the clamping ring 23 enables uniform pressure to be applied around the entire periphery of the bead 18 and thereby provides a more uniform and effective sealing action.

With the construction of the invention, the bag 5 can be readily removed from the tank by untightening the turn bolt 26, after disconnecting the water line 30, and removing the clamping ring 23. The adapter 19 can then be lowered and the bag 5 drawn outwardly through the opening 11.

As the water is contained entirely within the interior of the bag 5, the construction eliminates any problem of corrosion of the tank wall or contamination of the water with the products of corrosion.

Various modes of carrying out the invention are contemplated as being within the scope of the following claims particularly pointing out and distinctly claiming the subject matter which is regarded as the invention.

We claim:

1. A liquid pressure tank assembly, comprising a tank having an opening therein, an annular flange on the tank bordering said opening, said flange having a first annular leg and a second annular leg located radially outward of said first leg and diverging from said first leg to provide a generally V-shaped recess therebetween, an impervious bag mounted within the tank with the interior of the bag defining a liquid chamber and the space between the bag and the tank defining a gas chamber, an adapter disposed across the opening in the tank and including conduit means for introducing and withdrawing liquid from the interior of the bag, said bag having a neck terminating in an enlarged bead, said bead disposed within said recess in said flange, and a clamping ring engaged with the peripheral edge of the adapter and said tank flange and operable to seal the bead between the flange and the adapter.

2. The tank assembly of claim 1, wherein said clamping ring includes a circular band and a pair of side walls diverging outwardly from said band, said adapter having an inclined annular surface disposed adjacent the periphery of said adapter, one of said side walls of the clamping ring disposed in engagement with said inclined surface and the other of said side walls disposed in engagement with the outer surface of said second leg.

3. The tank assembly of claim 2, wherein said adapter is formed with a circular groove facing said V-shaped recess, said bead disposed in said groove.

4. The tank assembly of claim 1, wherein said conduit means comprises a series of small holes.

5. A liquid pressure tank assembly, comprising a tank having an opening therein, an annular flange extending outwardly from the tank and bordering the opening, said flange including a first angular leg and a second angular leg disposed radially outward of said first leg and diverging from said first leg to provide a generally V-shaped annular recess therebetween, an impervious bag disposed within the tank and having a neck disposed within the opening, an adapter disposed across the opening in the tank and having a series of holes therein through which water is introduced and withdrawn from the interior of the bag, said adapter having a generally circular groove therein facing said V-shaped recess and having a first inclined surface located adjacent the periphery of said adapter, said neck of the bag being provided with a circular bead, said bead disposed within the recess and within said groove, and a clamping ring having a pair of diverging side surfaces, one of said side surfaces disposed in engagement with the outer surface of the second leg and the other of said side surfaces disposed in engagement with the inclined surface of said adapter, whereby tightening of said clamping ring serves to seal said bead between the legs and the adapter to provide a fluid tight seal for the bag.

6. The tank assembly of claim 5, wherein said adapter is provided with a second inclined surface located adjacent the periphery of said adapter and disposed in engagement with the inner surface of said second leg when the clamping ring is tightened.

7. A liquid pressure tank assembly, comprising a tank having an opening therein, an annular flange on the tank bordering said opening, said flange having an outwardly facing annular recess, an impervious bag mounted within the interior of the tank with the interior of the bag defining a fluid chamber, said bag having a neck terminating in an enlarged bead, a connecting member disposed across the opening in the tank and including conduit means for introducing and withdrawing fluid from the interior of the bag, said bead disposed within the recess in said flange, and a clamping ring engaged with the peripheral edge of the connecting member and with said tank flange and operable to compress and seal the bead between the flange and the connecting member, said connecting member having a surface located radially outward of the bead on the bag and disposed in engagement with said flange when the clamping ring is tightened and the bead is compressed.

8. The tank assembly of claim 7, wherein the connecting member is formed with a circular groove facing the recess in the flange and the bead is disposed in said groove, said surface being located radially outward and adjacent said groove.

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