

March 20, 1962

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3,025,870

ANTI-SIPHONIC DEVICE

Filed Feb. 9, 1960

Fig. 1

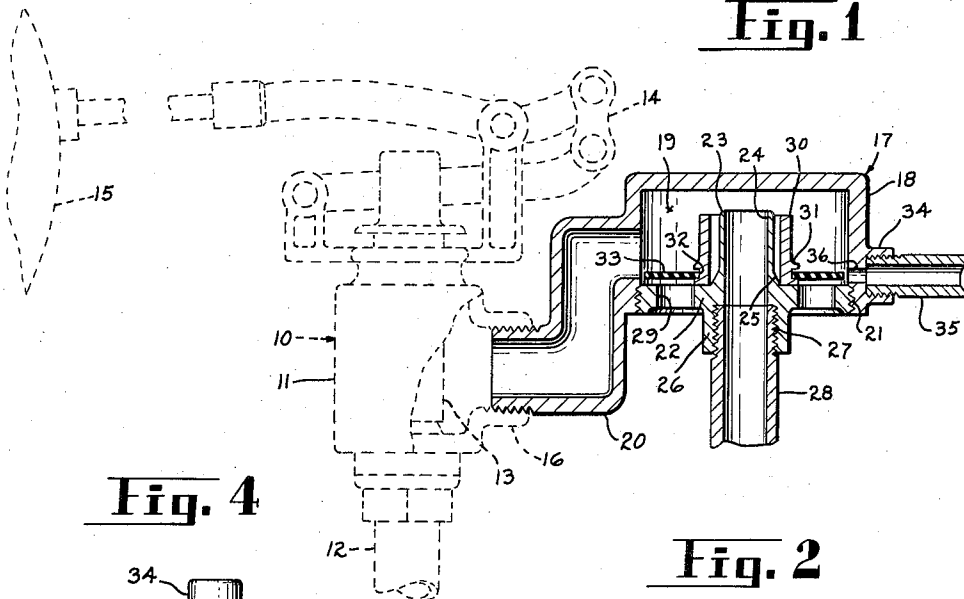


Fig. 4

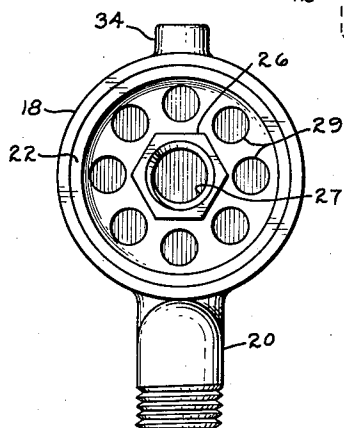


Fig. 2

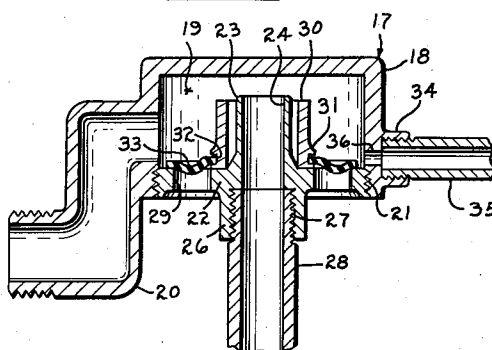
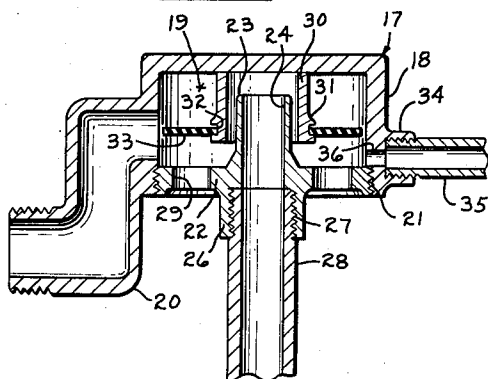


Fig. 3



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ANTI-SIPHONIC DEVICE

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Filed Feb. 9, 1960, Ser. No. 7,643

3 Claims. (Cl. 137-217)

This invention relates to an anti-siphon device for pre-
venting back-flow of a fluid through a fluid supply line
that fills a storage tank. For purposes of illustration, the
device will be described in conjunction with a ball-cock
valve, but it is to be understood that the invention is
clearly applicable to other installations.

The anti-siphon devices in present day use consist
mainly of two types: Those that have air intake ports at
the top of the valve and those that have air intake ports
at the bottom. The first-named group, with the intake
ports at the top, depend upon the incoming fluid to lift
a port-sealing member upwardly until it closes off said
ports. When a pressure reduction takes place, the port-
sealing member will drop by gravity and open said ports
to the atmosphere. One of the principal objections to
this type of device is that there is a delay between the
time fluid is admitted to the valve and the closing off of
the vent ports in the top of the valve. This results in
water splashing upwardly out of the vent ports and many
times out of the storage tank itself, thereby wetting the
walls and floor around said tank.

The second type of vacuum breaker noted above has
the vent ports located at the bottom of the device and
employs a port-sealing member that drops into position
by gravity and uses the reduced pressure above said seal-
ing member and the force of the incoming air to raise
said member, thereby admitting air to the system.

There are several drawbacks to prior devices of this
type:

First of all, the vent ports are always closed unless a
reduction of fluid pressure causes the port-sealing mem-
ber to be lifted off its seat. If no such fluid pressure
reduction takes place for a considerable length of time,
the sealing member may actually become stuck to its seat
and be unable to move when a pressure reduction does
occur, thereby rendering the device useless.

Secondly, the sealing member may be held in sealing
position by normal surface tension of the water, thereby
causing enough delay to permit some back-flow of fluid
into the supply line.

A third fault common to both of the above types con-
cerns the tolerance or clearance between moving parts.
It is, of course, necessary to locate the port-sealing mem-
bers so that they will be centered with respect to the air
vent ports to insure proper closing of said ports. This
normally requires fairly small clearance between moving
parts. Small particles of dirt or sand entering the anti-
siphon unit can work between the moving parts causing
said parts to stick, thus making the unit inoperative.

An object of the present invention is to provide an im-
proved anti-siphon device where the air inlet ports are
at the bottom but which will be reliable in operation.

Another object is to provide an improved means for
admitting air into the supply lines instantly when the
pressure in said lines is reduced below atmospheric pres-
sure.

A further object is to provide an improved anti-siphon
device which will avoid or eliminate the above-mentioned
drawbacks to prior anti-siphon devices, and at the same
time, be simple and economical to produce, with no com-
plex castings and with few parts.

Another object is to provide an anti-siphon device in
which the moving parts have a liberal clearance so that

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any small particles of dirt or sand that may enter the
unit will not cause sticking or jamming of said parts.

Other objects and advantages of this invention will be
apparent from the following description when taken in
conjunction with the accompanying drawings, in which:

FIG. 1 is a vertical cross-sectional view of an anti-
siphon unit embodying my invention as it appears in its
normally inactive position and attached to a ball-cock
valve that is shown in dotted outline;

FIG. 2 is a vertical cross-sectional view of the unit as
it appears when the tank to which it is attached is being
filled;

FIG. 3 is a vertical sectional view of the unit as it
appears when the pressure in the supply line has fallen
below atmospheric pressure; and,

FIG. 4 is a bottom view of the anti-siphon unit.

In the drawing, the numeral 10 designates generally a
ball-cock valve of the type commonly found in the con-
ventional toilet storage tank, consisting of a valve body
11 that is attached to a water supply line 12. A valve
13 is operated by the usual linkage 14 under the control
of a float 15. The valve body 11 has an internally
threaded outlet 16 to which my anti-siphon unit 17 may
be attached.

The anti-siphon unit 17 has a valve body 18 within
which is formed a cylindrical chamber 19 that is connected
to the outlet 16 of the ball-cock valve by the nipple 20.
This nipple, which may be formed integrally with the valve
body, is angled as shown so that the body of the anti-
siphon unit is above the threaded connection 16 on the
inlet valve, the center of which connection is normally
the high-water level of the tank. This insures location
of the anti-siphon unit above the water level without re-
quiring an unnecessarily high tank. The chamber 19 is
open at the bottom and has a short internally threaded
section 21 into which is fitted a closure plate 22 that has
a complementary thread on its peripheral surface.

A hollow cylindrical stem 23 that is provided with a
central bore 24 extends upwardly from the top surface
of the closure plate 22 and has at its juncture with the
top of said closure plate, an outwardly tapering or flared
portion 25 for reasons that will appear later. It should
be noted that when the closure plate 22 is assembled to
the body 18, the upper end of the stem 23 is spaced from
the top of the chamber 19.

A hexagonal boss 26 is provided on the lower surface
of the closure plate 22 in axial alignment with the hol-
low stem 23 and has a threaded recess 27 for receiving
the threaded end of a discharge tube 28. The bottom
of the threaded recess 27 connects with the bore 24 of
the stem 23, thereby providing a smooth straight central
passageway between the discharge tube and the cylindrical
chamber 19 of the anti-siphon unit. A series of vent
ports 29, circularly arranged about the stem 23, allow
communication between the atmosphere and chamber 19.

A sleeve 30 is loosely fitted around the stem 23 and
has at its lower end an enlarged portion 31 in which is
formed a groove 32 for carrying a flexible disc 33 which
may conveniently be made of rubber. The disc 33 is
somewhat smaller in diameter than the diameter of the
chamber 19 but slightly larger in diameter than the diam-
eter of the circle defined by the outer edges of the vent
ports 29 in the closure plate 22.

It is to be noted that the disc 33 is normally spaced
somewhat from the upper surface of the closure plate
22 due to the spacing of the groove 32 from the end of
sleeve 30 and the normal tendency of the disc 33 to re-
main in a flat state. The inside diameter of the sleeve 30
is such that when said sleeve is in its lowermost position,
it will co-operate with the tapered portion 25 of stem 23
to center the sleeve 30, and therefore, disc 33, with re-
spect to the vent ports 29 and chamber 19.

A small boss 34 is located on the side of the valve body 18 and threadedly receives the usual small toilet bowl refill tube 35 which is connected to the chamber 19 by a reduced opening 36.

When no water is passing through the anti-siphon unit 17, the flexible disc 33 is spaced slightly from the vent ports 29 so that the chamber 19 is open to atmospheric pressure as seen in FIG. 1. Should the ball-cock valve be opened at a time when the line pressure is reduced below atmospheric pressure, there could be no back-flow of water through the ball-cock because the anti-siphon unit is already vented to the atmosphere.

If the line pressure is only slightly below atmospheric pressure, the disc 33 need only flex somewhat to allow sufficient air to enter the lines and satisfy any vacuum formed therein. If differential between line pressure and atmospheric pressure is quite high, the combination of the pressure reduction above the disc 33 in the chamber 19 and the velocity of the incoming air striking the underside of the disc 33 will cause the entire disc 33 and sleeve 30 to be elevated as shown in FIG. 3. This will accomplish two things: first, the top of sleeve 30 will contact the top surface of chamber 19 thus reducing the area of said chamber that is open to discharge tube 28 and thereby reducing the possibility of drawing any water back through said discharge tube; secondly, the vent ports 29 will be opened wide to allow more air to enter the system.

Because the combined area of the vent ports 29 is greater than the area of the nipple 20, any amount of vacuum formed in the lines can be satisfied by said vent ports. After the vacuum has been satisfied, the sleeve 30 will drop to its lowermost position once again. When the lower end of the sleeve 30 comes down, the flared portion 25 of the stem 23 will center the sleeve with respect to ports 29 and chamber 19.

When the toilet storage tank is being filled, the anti-siphon unit will appear as shown in FIG. 2. The water from the ball-cock valve will flow through the nipple 20 and enter the chamber 19 where the water pressure will cause the flexible disc 33 to be deformed downwardly, thereby sealing the vent ports 20. The water will completely fill the chamber 19 and then exit through bore 24 of the stem 23 and into the discharge tube 28 from which it will enter the toilet storage tank. While the storage tank is being filled, a small amount of water will be discharged through the opening 36 and refill tube 35 to refill the toilet bowl in the usual manner.

Should there be a sudden failure of pressure while the storage tank is being filled, the disc 33 will, because of its resilient nature, immediately flex upwardly to assume the position shown in FIG. 1 and then, dependent upon the degree of pressure reduction, either flex slightly or raise upwardly as described above.

The spacing of the flexible disc 33 from the upper surface of the closure plate 22 obviates the possibility of surface tension or adhesion causing a delay in the upward movement of the disc 33 and the relatively large tolerances between the stem 33 and sleeve 30 eliminates the danger of small particles of dirt causing the mechanism to stick.

It can be seen that I have provided a simple efficient anti-siphon unit that is quick-acting and reliable in operation as well as economical to manufacture.

It is not desired to confine the invention to the exact form described and shown herein, but it is desired to include all such forms as come within the scope of the appended claims.

What I claim is:

1. An anti-siphon device comprising a valve body having a cylindrical chamber therein and a nipple connecting said chamber to a fluid supply unit, said chamber having an opening in its lower end, a closure plate fitted into said opening, said plate having a series of ports therethrough, a hollow discharge stem projecting upwardly from the top surface of said plate and into said chamber, a sleeve loosely fitted around and slidable on said stem, a flexible disc of somewhat smaller diameter than said chamber carried by said sleeve adjacent its lower end, said disc in its normally inactive position being spaced slightly above the ports of said closure plate, and means for centralizing said sleeve when it is in its lowermost position.

2. An anti-siphon device comprising a valve body having a chamber therein and a nipple connecting said chamber to a fluid supply unit, said chamber having an opening in its bottom, a closure plate fitted into said opening, said plate having a series of ports therethrough, a stem projecting upwardly from the top surface of said plate and into said chamber, said stem having a central bore, a sleeve loosely fitted around and slidable on said stem, a flexible disc somewhat smaller than said chamber carried by said sleeve adjacent its lower end, said disc in its normally inactive position being spaced slightly above the ports of said closure plate, said disc being adapted to flex downwardly under fluid pressure to seal said ports, said disc and sleeve being adapted to move progressively upwardly as a unit along said stem as the fluid pressure in the valve body decreases below atmospheric pressure until the upper end of the sleeve seats against the top wall of said chamber to reduce the area of said chamber open to said bore.

3. An anti-siphon device comprising a hollow valve body adapted to be connected to a water supply unit, said valve body being closed at the top and having a plurality of vent ports at the bottom, a discharge connection at the bottom of said valve body, a hollow stem extending upwardly into the valve body and communicating with said discharge connection, a vertically movable sleeve surrounding said stem, the walls of the sleeve being spaced substantially from the stem, a disc of flexible material carried by the sleeve which in unstressed condition extends over said vent ports in slightly spaced relation thereto, whereby pressure of water above said disc causes the disc to flex into sealing relation with said vent ports, and whereby a vacuum above the disc will cause the disc to rise away from the ports to allow air to enter the valve body.

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