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Waterloo, Iowa
Continuation of application Ser. No.
604,771, July 2, 1966, now abandoned.

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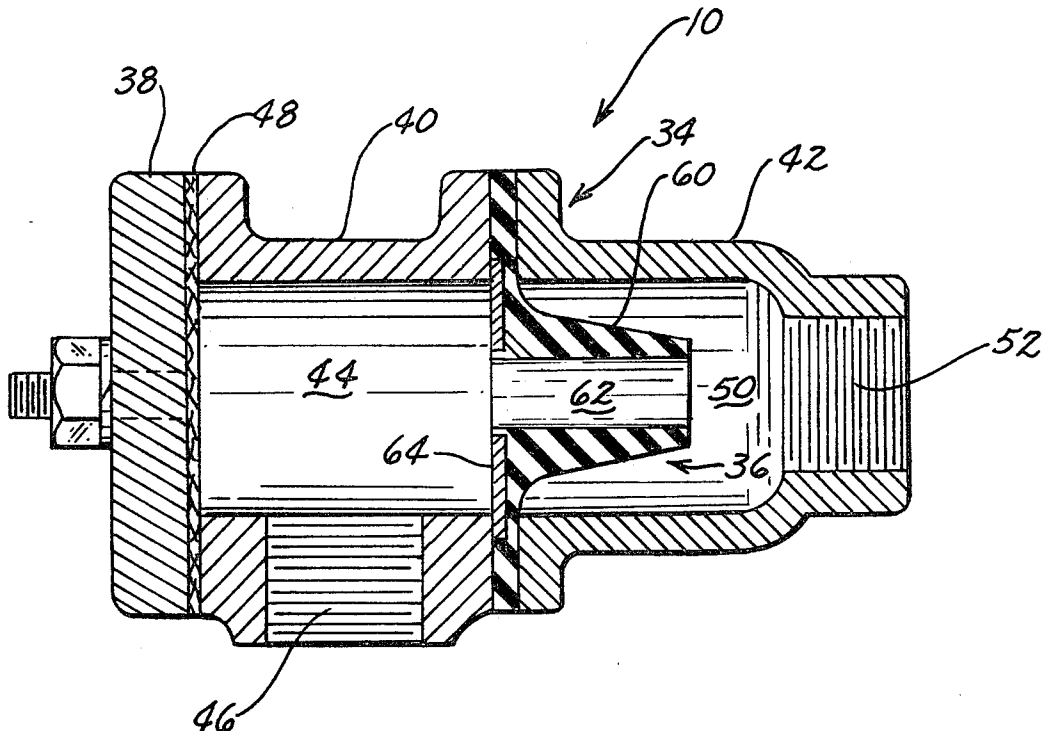
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[54] **VALVE MEANS**
1 Claim, 7 Drawing Figs.

[52] **U.S. Cl.**..... **137/517,**
137/525.1, 415/11
 [51] **Int. Cl.**..... **F16k 15/00**
 [50] **Field of Search**..... **137/515-**
—515.7, 517, 525.1; 103/113, 203; 138/45;
415/11

ABSTRACT: An air bleed valve for a pump including a housing having an intake opening in communication with the pump and a discharge opening. A conduit extends between the intake and discharge openings and has a normally open valve means provided therein which is adapted to close the conduit upon a predetermined pressure differential existing in the discharge and intake openings.



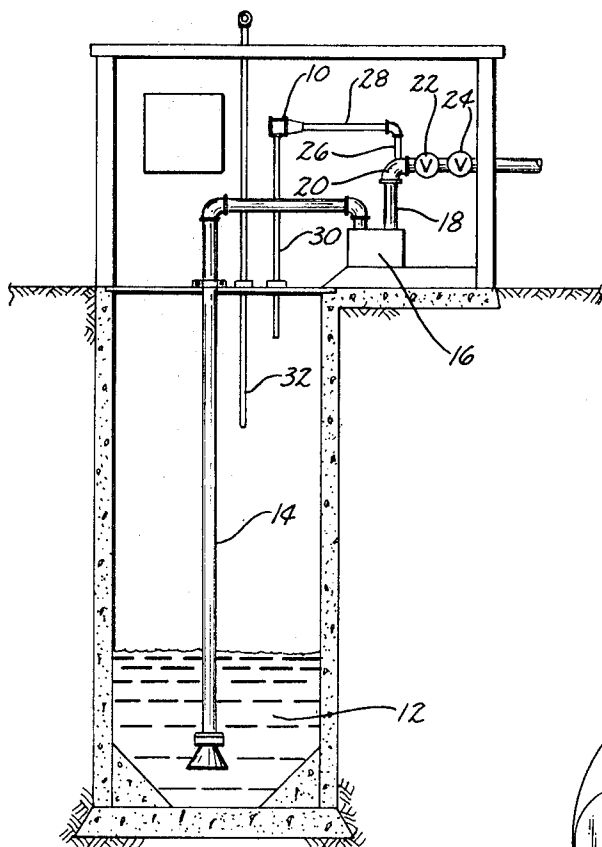


Fig. 1

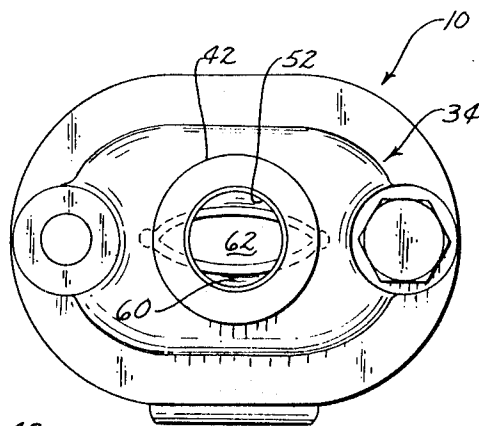


Fig. 3

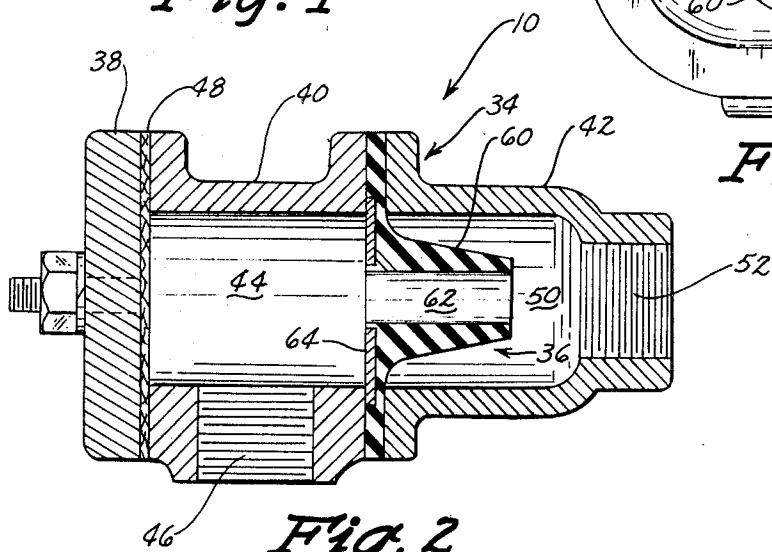
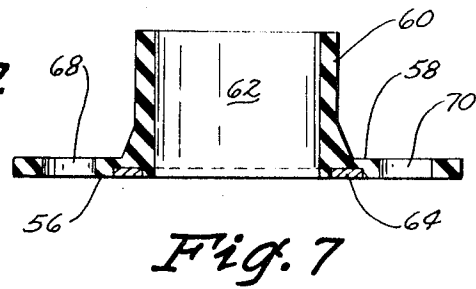
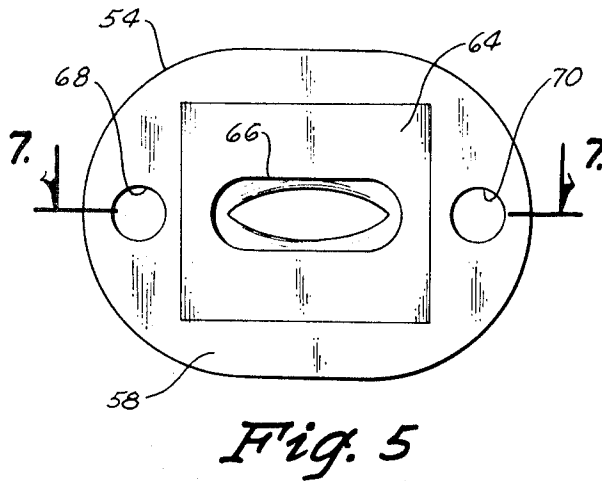
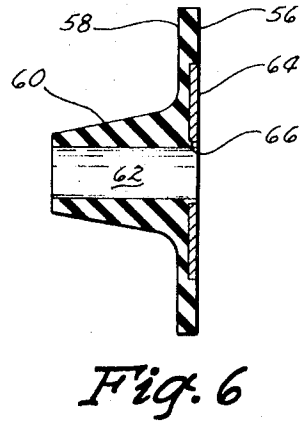
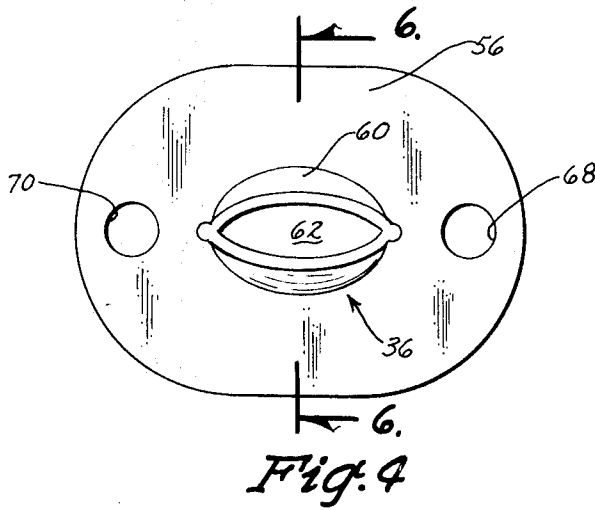


Fig. 2

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VALVE MEANS

This is a continuation of application Ser. No. 604,771, filed Dec. 27, 1966, and now abandoned.

Self-priming centrifugal pumps require vent lines in pump installations which do not have an open discharge which means that the pump must begin pumping against pressure. A centrifugal pump will develop very little pressure when air is present in the pump case, hence the need for a vent line to eliminate the entrapped air to permit the pump to operate. The air becomes entrapped within the pump case during the priming cycle and may also enter the system through leaks or the like. Until this invention, it has been necessary to have the vent line open at all times to eliminate the entrapped air from the pump case to permit pump operation. Thus, a portion of the liquid being pumped was continuously recycled which reduces the efficiency of the installation due to the power required to recycle the liquid. Additionally, the continuous flow also increases the probability of the vent line becoming clogged when solids are entrained in the liquid, as in sewage.

Therefore, it is a principal object of this invention to provide an air bleed valve means for use with a pump or the like. A further object of this invention is to provide an air bleed valve means for use with a pump which will not become clogged.

A further object of this invention is to provide a valve means which is normally open but which becomes closed when subjected to a predetermined pressure differential on opposite sides thereof.

A further object of this invention is to provide an air bleed valve means having an air bleed valve therein which may be constructed of a predetermined hardness or length to control the opening thereof.

A further object of this invention is to provide an air bleed valve means having a reinforced base portion and a flexible throat portion extending therefrom.

A further object of this invention is to provide an air bleed valve means which is self-cleaning.

A further object of this invention is to provide an air bleed valve means for use with a pump, the bleed valve being open when the pump is not operating.

A further object of this invention is to provide an air bleed valve means which will close when the priming cycle of the pump is complete.

A further object of this invention is to provide an air bleed valve means which is economical of manufacture, durable in use and refined in appearance.

These and other objects will be apparent to those skilled in the art.

This invention consists in the construction, arrangements, and combination of the various parts of the device, whereby the objects contemplated are attained as hereinafter more fully set forth, specifically pointed out in the claims, and illustrated in the accompanying drawings in which:

FIG. 1 is a schematic view of a pump installation utilizing the air bleed valve means;

FIG. 2 is a sectional view of the air bleed valve assembly;

FIG. 3 is a front elevational view of the air bleed valve assembly;

FIG. 4 is a front view of the air bleed valve;

FIG. 5 is a rear view of the air bleed valve;

FIG. 6 is a sectional view of the air bleed valve seen on line 6-6 of FIG. 4; and

FIG. 7 is a sectional view of the air bleed valve as would be seen on line 7-7 of FIG. 5.

A typical sump installation is shown in FIG. 1 and it is into an installation of this type that the air bleed valve assembly 10 of this invention is installed. In FIG. 1, the numeral 12 generally designates a wet well into which a suction line 14 extends. Suction line 14 extends upwardly from the well 12 and is connected to a pump 16 of conventional construction having a discharge line 18 extending upwardly therefrom. An elbow 20 is secured to the upper end of line 18 which is connected to a conven-

tional discharge check valve means 22 and a conventional gate valve 24.

An air bleed line 26 extends from elbow 20 and is in communication with the interior of elbow 20 and pump 16. Line 26 includes a horizontal portion 28 and a vertical portion 30. The air bleed valve assembly 10 is imposed in line 26 at the juncture of portions 28 and 30. As seen in FIG. 1, vertical portion 30 extends downwardly into well 12 and that a vent line 32 extends upwardly from well 12. FIG. 1 merely illustrates structure which is associated with this invention and for that reason does not show such structure as control box, liquid level control, fans, etc.

The air bleed valve assembly 10 is shown in detail in FIGS. 2 and 3 and includes a housing means 34 and a valve 36 mounted therein. Housing means 34 includes a rear cap member 38, an intermediate housing element 40 and a front housing element 42. As seen in FIG. 2, housing element 40 has an interior compartment 44 and an internally threaded pipe fitting 46 at its lower end. A seal 48 is positioned between the forward surface of cap member 38 and the rearward surface of intermediate housing element 40. Housing element 42 includes an interior compartment 50 and has an internally threaded pipe fitting 52 at its forward end.

Valve 36 is flexible and is preferably constructed of a neoprene material and includes a base portion 54 having rearward and forward surfaces 56 and 58 respectively and also includes a throat portion 60 extending forwardly therefrom. As seen in FIGS. 4-7, valve 56 is provided with an opening 62 extending therethrough which has a major horizontal axis and a minor vertical axis. When viewed from the rearward end of the valve, the configuration of opening 62 is seen to be convexo-convex. The rearward surface of base portion 54 is notched so as to receive a metal backing plate 64 which is rectangular in shape and which has a central opening 66 formed therein. Base portion 54 is provided with a pair of openings 68 and 70 extending therethrough which are adapted to register with openings formed in cap member 38 and housing elements 40 and 42 when the assembly is assembled as in FIG. 2. It is seen in FIG. 2 that the peripheral edges of base portion 54 as well as a portion of backing plate 64 are mounted between the forward surface of housing element 40 and the rearward surface of housing element 42. A pair of suitable capscrews would be extended through the registering openings just described to maintain the components in the assembled condition of FIG. 2. As seen in FIG. 2, throat portion 60 of valve 36 is positioned within compartment 50 and is normally open so that compartments 50 and 44 are in communication with each other through valve 36. As previously stated, valve 36 is flexible which permits throat portion 60 to close opening 62 when a predetermined pressure differential is built up between compartments 50 and 44. The closing of valve 36 can be controlled by varying the hardness of the material thereof or by varying the length of throat portion 60. For example, as the throat length is reduced or the hardness increased, the pressure differential required for closure is increased. Backing plate 64 is incorporated into the valve to prevent inversion of the flexible throat portion 60.

In operation, pipe fitting 52 would be threadably secured to the horizontal portion 28 of vent line 26 and pipe fitting 46 would be threadably secured to the vertical portion 30 of the vent line 26. Valve 36 is normally open when the pump 16 is not in operation and the flexible throat portion 60 would assume the position seen in the drawings. Inasmuch as the valve is normally open, any air that is present in the pump or which becomes present in the pump during the priming cycle may escape therefrom through horizontal portion 28 of vent line 26, through opening 62 in valve 36 and through vertical portion 30 of vent line 26. It can be seen that vertical portion 30 is open to the atmosphere. When the pump is started and begins to prime, the air present therein is expelled through the air bleed valve 36 and due to the presence of air, the pump will not develop sufficient pressure to close the valve 36. When the priming of the pump is complete, the pump discharge pressure

will increase abruptly thereby causing the throat portion 60 of bleed valve 36 to close and the discharge check valve 22 will open. When the pumping cycle is completed, the pump 16 stops and the discharge check valve 22 closes, and, due to the decrease in the pressure differential on opposite sides of the valve 36, the bleed valve 36 opens. The amount of pressure differential required to open valve 36 is dependent upon the construction of the throat portion, for example, an increase in the hardness of the throat portion material or a decrease in the length of the throat portion will require a greater pressure differential to close the valve 36. The backing plate 64 adds rigidity to the valve and prevents inversion of the throat portion 60.

The valve 36 is self-cleaning due to the fact that at each time the pump starts, whether air is present or not, a spurt of liquid is released therefrom which removes any solids entrapped in the valve in the previous cycle.

Thus it can be seen that a unique air bleed valve means has been provided for use with a pump or the like which eliminates the need for a constant recycling of liquid through the vent line. The elimination liquid through the vent line increases the efficiency of the installation due to the fact that power is not required for constant recycling. The efficiency of the installation is also increased due to the fact that the probability of clogging of the vent line is practically eliminated through the use of the valve means described herein.

Thus it can be seen that the device accomplishes at least all of its stated objectives.

Some changes may be made in the construction and arrangement of my VALVE MEANS without departing from the real spirit and purpose of my invention, and it is my intention to cover by my claims, and modified forms of structure or use of mechanical equivalents which may be reasonably included within their cope.

I claim:

1. An air bleed valve for a pump,
- a housing means comprising first and second housing elements attachably secured together, said first housing element having first and second end portions and a first com-

partment area formed therebetween, said first end portion of said first housing element defining an intake opening adapted to be connected to a pump, said second housing element having a discharge opening formed therein in communication with the atmosphere,

a valve means in said housing comprised of resilient material, said valve means comprising a base portion having a peripheral edge portion positioned between said second end of said first housing element and one of the ends of said second housing element, and a hollow throat portion in said first compartment area extending towards said intake opening, said throat portion being elliptically shaped in cross section along its substantial length and terminating adjacent said intake opening in an elliptically shaped normally open intake opening having arcuate upper and lower lip portions,

said valve means providing the sole means of communication between the intake and discharge openings of said first and second housing elements whereby said throat portion will be deformed to cause said lip portions to close on each other to close the intake opening of said valve means whenever the pressure in said first compartment area attains a predetermined value greater than the pressure in said second compartment area, and

a backing plate mounted adjacent said base portion of said valve means to prevent said throat portion from assuming an inverted position with respect to its normal position of extending towards the intake opening in said first housing element said backing plate having a peripheral edge portion positioned between said second end of said first housing element and said one end of said second housing element, and

means securing said first and second housing elements together so that said peripheral edge portion of said valve means and said peripheral edge portion of said backing plate are rigidly secured between said second end of said first housing element and said one end of said second housing element.