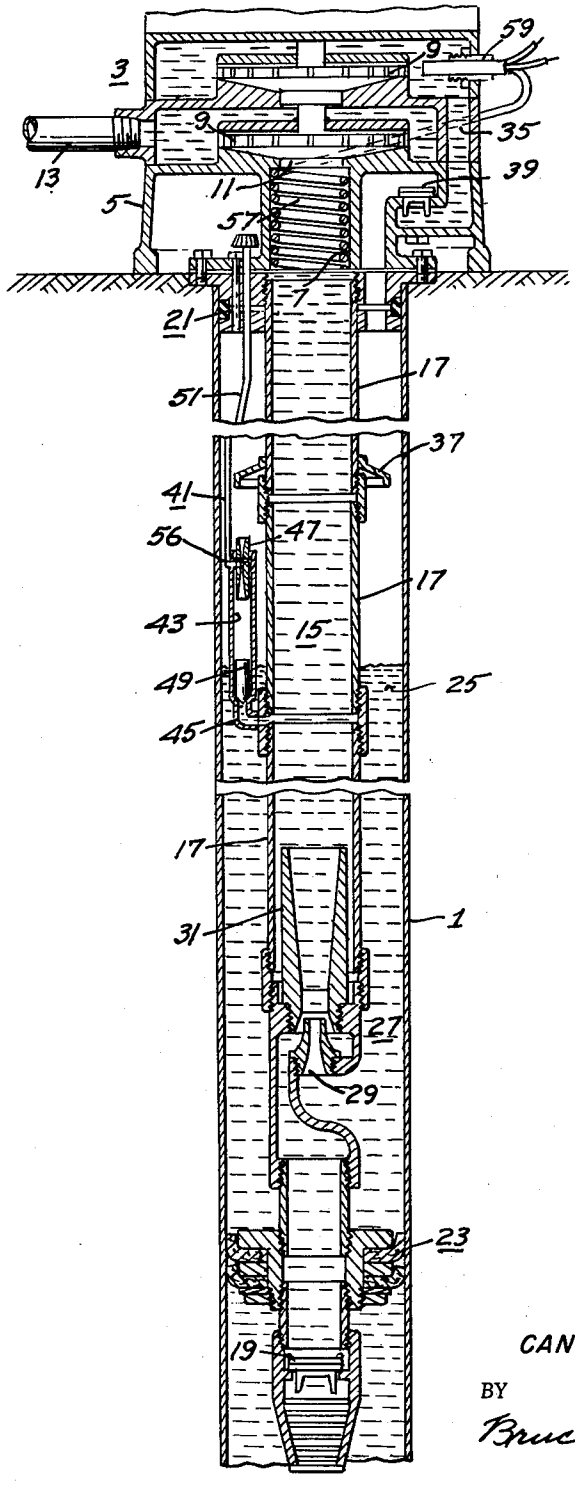
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IMPELLER PUMP PRESSURE SYSTEM AND PUMP UNIT ASSEMBLY THEREFOR

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IMPELLER PUMP PRESSURE SYSTEM AND PUMP UNIT ASSEMBLY THEREFOR

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Among the objects of my invention are:

(1) To provide a novel and improved impeller type deep well pump pressure system;

(2) To provide a novel and improved impeller type deep well pump pressure system which will satisfy the most rigid sanitation code requirements for many localities;

(3) To provide a novel and improved impeller type deep well pump pressure system in which the conventional pressure tank may be eliminated to advantage;

(4) To provide a novel and improved impeller type deep well pump pressure system which is protected against freezing;

(5) To provide a novel and improved impeller type pump unit assembly; and

(6) To provide a novel and improved impeller type pump unit assembly in which contained water is protected against freezing.

Additional objects of my invention will be brought out in the following description of a preferred embodiment of the same, taken in conjunction with the accompanying drawings wherein the FIGURE is a view in section through a system installation embodying the present invention.

Referring to the drawings for the details of my invention in its preferred form, the system in its installed form, comprises a well casing **1** which extends from substantially ground level down to a point below water level in the well.

Mounted over the well casing is a pump unit assembly **3** preferably of the impeller type having a base component **5** formed with an intake passageway **7**. In conjunction with the base component, the pump unit assembly includes a plurality of serially coupled impeller stages **9** having a flow connection **11** at one end with the intake passageway **7** and a service discharge connection **13** from one or more of said stages, only one such discharge connection being shown.

Disposed in the well casing **1** is a suction line **15** usually fabricated from a plurality of connected pipe sections **17**, and terminating at its lower end below water level in the well, in a foot valve **19** which may be of conventional design.

At its upper end, the suction line is coupled in a flow connection with the intake passageway **7** of the pump unit assembly, whereby water coming up through the suction line may flow to the first impeller of the series.

A seal **21** between the suction line **15** and casing **1** adjacent the upper end thereof, and a second seal **23** between the suction line and casing at a lower location, preferably adjacent the foot valve **19**, constitute means for forming a chamber **25** within the casing, with the suction line and the casing comprising walls of such chamber.

An injector assembly **27** is coupled into the suction line between the two seals and preferably in proximity to the lower seal. Such injector assembly includes a nozzle **29** supported in the walls of the suction line with its intake end exposed to the interior of the chamber **25**, and a Venturi **31** supported axially of the suction line, with its intake end in closely spaced relationship to the discharge end of the nozzle.

A pressure line flow connection **35** from one of the stages of higher pressure in the series, and preferably the last stage thereof, to the chamber **25** preferably by way of a passage formed in the pump casing and through the upper seal **21**, will impart to the chamber, the function of a conventional tank normally employed in a pressure system.

In the present instance, however, the injector assembly **27** is supplied with high pressure water directly from the pressure chamber in a series flow relationship, while in the conventional type pressure system, the discharge from the high pressure stage is divided between the pressure tank and the injector assembly.

A splash plate **37** encircling the suction line and affixed thereto toward the upper end thereof, serves to break up the inflowing water to the pressure chamber, to facilitate the release of entrapped air from such water.

A check valve **39** in the pressure line flow connection **35** to the pressure chamber **25**, will preclude loss of air cushion during quiescent periods of pump operation.

To assure a positive supply of air to maintain a proper air cushion within the pressure chamber, an air intake assembly **41** for determining air intake, is provided. This air intake assembly includes a liquid responsive control means which may take the form of an air intake control chamber **43** in the well casing chamber at approximately the desired liquid level therein, such air intake control chamber having a float controlled connection **45** from its lower end to the suction line **15**, while at its upper end, is installed an aspirator **47** coupling the control chamber **43** to the pressure chamber **25**.

Within the air intake control chamber is a float valve **49**, adapted in the absence of liquid in the control chamber, to seal off the flow connection **45** from the lower end of the control chamber to the suction line.

Associated with the air intake control chamber, is an air intake tube **51** extending from a point within the base of the pump unit assembly, where it is exposed to atmosphere, down to the air intake control chamber **43** where it terminates at the restricted passage through the aspirator **47**.

With water level in the pressure chamber above the aspirator and during a quiescent period of the pump, the control chamber **43** will be filled with water. Upon starting of the pump, such water will be withdrawn into the suction line at a greater rate than it can enter through the aspirator until the valve **49** seats. During this period, the flow of water through the aspirator sucks in air from the atmosphere, which separates out and accumulates in the control chamber. Upon stopping of the pump, the back flow of water from the suction line will drive the air from the control chamber through the aspirator into the pressure chamber, thus improving the air cushion.

On the other hand, should the water level in the pressure chamber be below the aspirator, a condition depicted in the drawing, no water can flow through the aspirator upon starting the pump, and consequently no air will be sucked into the control chamber from the atmosphere. Also, the valve will seat promptly to preclude flow of air from the air cushion beyond this point via the control chamber.

At no time does air enter the suction line from the control chamber **43**, as this could cause the pump to become air bound and cease pumping.

Therefore, when the liquid level in the pressure chamber is high, it is indicative of a condition requiring the addition of air to the air cushion, and air will be taken in upon operation of the system, while with the liquid level low, no air will be admitted.

A check valve **56** in the air intake passage to the aspirator, and preferably in the aspirator itself, will block escape of air from the chamber **25**.

To avoid problems of freezing in an installation of this type, I provide a heating unit **57**, preferably within the

passageway 7. Such heating unit may be in the form of a coil along the wall of the passageway 7, and is connectible by means of a thermostat 59 to a source of power (not shown), such thermostat being preferably located in the casing of the pump unit assembly or some other suitable point therein. When the surrounding temperature therefore drops to a value approaching freezing, the thermostat may be set to respond and connect the heating unit to the source of power to generate sufficient heat within the pump unit assembly to preclude freezing of any water confined therein, the generated heat being sufficient to exert an influence sufficiently below ground level to avoid freezing problems below ground level.

As in the conventional type pump pressure systems, the present system may include a high pressure service discharge from the chamber 25, and a pressure switch made responsive to pressure in the chamber 25 to determine operating periods of the pump unit assembly.

By widely spacing the seals so as to locate the upper one at substantially ground level and the lower one adjacent the foot valve, not only is a pressure chamber of maximum volume realized, but the maintenance of pressure therein greater than pressures normally expected to exist against the outer surface of the well casing, will preclude any possibility of leakage of foreign matter into the chamber to contaminate the water therein. Inasmuch as many States have sanitation codes imposing rigid requirements on well installations to avoid such contamination from the outside, the present invention adequately satisfies the most rigid of such requirements.

From the foregoing, it becomes apparent that the present invention fulfills the objects thereof, and while I have illustrated and described a preferred embodiment of the same, it is subject to modification and alteration without departing from the underlying principles involved. I accordingly do not desire to be limited in my protection to the specific details illustrated and described except as may be necessitated by the appended claims.

I claim:

1. A pump system assembly comprising a well casing; a pump unit assembly mounted over said well casing, said pump unit assembly including an intake passageway, a plurality of serially coupled impeller stages having flow connection at one end with said intake passageway; a suction line in said well casing and connecting with said pump assembly intake passageway, means forming a pressure chamber, with said casing and suction line comprising walls thereof, said means including a seal between said suction line and said casing at an upper location in said casing and a seal between said suction line and casing at a lower location in said casing; an injector assembly including a nozzle open to the interior of said pressure chamber, and a Venturi supported within said suction line with its intake end in closely spaced relationship to said nozzle; a pressure line flow connection from a stage of said series to said pressure chamber, said pressure line flow connection including a check valve to hold air under pressure in said pressure chamber; and an air intake assembly having one end exposed to atmosphere and coupled at its other end to said suction line at a location between said seals for controlling intake of air into said pressure chamber.

2. A pump system assembly comprising a well casing; a pump unit assembly mounted over said well casing, said pump unit assembly including an intake passageway, a plurality of serially coupled impeller stages having flow connection at one end with said intake passageway, a service discharge connection from an intermediate stage of said series; a suction line in said well casing and connecting with said pump assembly intake passageway; means forming a pressure chamber, with said casing and suction line comprising walls thereof, said means including a seal between said suction line and said casing at an upper location in said casing and a seal between said suction line and casing at a lower location in said casing; an injector assembly including a nozzle supported in the wall of said suction line and open to the interior of said pressure chamber, and a Venturi supported axially of said suction line with its intake end in closely spaced relationship to said nozzle; a pressure line flow connection from a higher pressure stage of said series to said pressure chamber, said pressure line flow connection including a check valve to hold air under pressure in said pressure chamber; and an air intake assembly for controlling intake of air into said pressure chamber, said air intake assembly comprising an air intake control chamber in said pressure chamber at approximately the desired liquid level therein, said air intake control chamber having a flow connection from its lower end to said suction line at a location between said seals, and an aspirator at its upper end opening to said pressure chamber, an air intake line from a point exposed to atmosphere and extending to said aspirator, and a float valve in said air intake control chamber adapted, in the absence of liquid in said control chamber, to seal off the flow connection from the lower end of said control chamber to said suction line.

3. A pump system assembly comprising a well casing; a pump unit assembly mounted over said well casing, said pump unit assembly including an intake passageway, a plurality of serially coupled impeller stages having flow connection at one end with said intake pasageway, a service discharge connection from an intermediate stage of said series; a suction line in said well casing and connecting with said pump assembly intake passageway; means forming a pressure chamber, with said casing and suction line comprising walls thereof, said means including a seal between said suction line and said casing at an upper location in said casing and a seal between said suction line and casing at a lower location in said casing; an injector assembly including a nozzle supported in the wall of said suction line and open to the interior of said pressure chamber, and a Venturi supported axially of said suction line with its intake end in closely spaced relationship to said nozzle; a pressure line flow connection from a higher pressure stage of said series to said pressure chamber, said pressure line flow connection including a check valve to hold air under pressure in said pressure chamber; an air intake assembly for controlling intake of air into said pressure chamber, said air intake assembly comprising an air intake control chamber in said pressure chamber at approximately the desired liquid level therein, said air intake control chamber having a flow connection from its lower end to said suction line at a location between said seals, and an aspirator at its upper end opening to said pressure chamber, an air intake line from a point exposed to atmosphere and extending to said aspirator, and a float valve in said air intake control chamber adapted, in the absence of liquid in said control chamber, to seal off the flow connection from the lower end of said control chamber to said suction line; heating means in said pump unit assembly intake passageway; and means responsive to a dropping of temperature in said pump unit assembly to a value approaching freezing, for connecting said heating means to a source of power, said means including a thermostat exposed to water temperature in said pressure line flow connection from said higher pressure stage.

4. A pump system assembly comprising a well casing; a pump unit assembly mounted over said well casing, said pump unit assembly including an intake passageway, a plurality of serially coupled impeller stages having flow connection at one end with said intake passageway; a suction line in said well casing and connecting with said pump assembly intake passageway, means forming a pressure chamber, with said casing and suction line comprising walls thereof, said means including a seal between said suction line and said casing at an upper location in said casing and a seal between said suction line and casing at a lower location in said casing; an injector assembly including a nozzle open to the interior of said pressure

chamber, and a Venturi supported within said suction line with its intake end in closely spaced relationship to said nozzle; a pressure line flow connection from a stage of said series to said pressure chamber, said pressure line flow connection including a check valve to hold air under pressure in said pressure chamber; and an air intake assembly having one end exposed to atmosphere and coupled at its other end to said suction line at a location between said seals for controlling intake of air into said pressure chamber, and a splash plate supported above the water level in said pressure chamber and in the path of water entering said pressure chamber via said pressure line flow connection for facilitating the release of air from such pressure line flow.

References Cited in the file of this patent

UNITED STATES PATENTS

1,475,389	Hyatt	Nov. 27, 1923
1,705,729	Herzlich	Mar. 19, 1929
1,745,231	Prusacki	Jan. 28, 1930
1,810,297	Schleyer	June 16, 1931
2,159,179	Riggenberg	May 23, 1939
2,196,453	Horwath	Apr. 9, 1940
2,212,010	Carpenter	Aug. 20, 1940
2,475,918	Ruth	July 12, 1949
2,623,466	Tinker	Dec. 30, 1952
2,787,220	Patterson	Apr. 2, 1957
2,807,214	Patterson	Sept. 24, 1957
2,810,352	Tumlison	Oct. 22, 1957

FOREIGN PATENTS

122,042	Great Britain	of 1919
737,141	Great Britain	Sept. 21, 1955

OTHER REFERENCES

Jacuzzi Pumps and Water Systems, catalog 149, copyright 1949 (page 92).