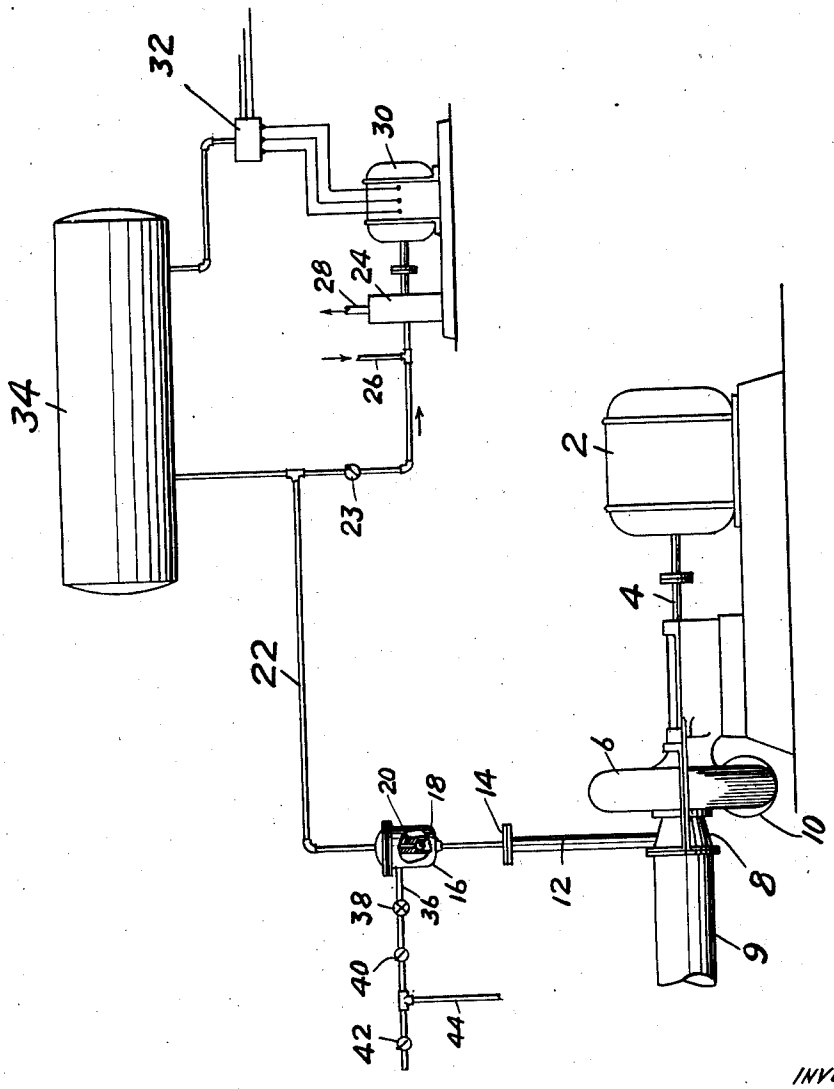
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PRIMING SYSTEM FOR CENTRIFUGAL PUMPS

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PRIMING SYSTEM FOR CENTRIFUGAL PUMPS

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6 Claims. (Cl. 103—113)

This invention relates to a priming system for centrifugal pumps, the system being particularly adapted for the priming of pumps handling sewage or other liquids containing solid or semisolid constituents.

In cases where there is no supply of water available to prime a centrifugal pump by gravity flow or where it is undesirable or impossible to prime the pump by the use of an auxiliary water pump, it has been customary to provide the pump with a centrifugal air pump in the same casing to evacuate the main pump and so render it self-priming. While this system is quite unsatisfactory in general use by reason of the absorption of considerable power by the constantly running air pump, it cannot be applied at all in connection with a centrifugal pump handling sewage since the air pump would be plugged almost immediately by the solid materials in the sealing liquid withdrawn from the sewage being pumped.

In my application Serial No. 457,309, filed of even date herewith and designated case 1, there is illustrated a priming system of general application which avoids the difficulties and objections attending the usual priming systems heretofore used. The broad object of the present invention is the modification of the general system for specific application to the pumping of sewage or similar liquids.

More specific objects of the invention relate to the provision of such elements and their arrangements whereby proper action of the priming system is insured, and will be clear from the following description read in conjunction with the accompanying drawing, which illustrates diagrammatically a preferred embodiment of the invention.

The broad features of the invention which are of general application are claimed in my said copending application.

Referring to the drawing, there is illustrated at 2 a prime mover, which may be a turbine, motor, engine or the like, which, through shafting 4, drives the rotor of the centrifugal pump 6 which may be of any suitable type, the pump being illustrated as having an intake bell 8 receiving liquid to be pumped from a pipe 9, and a discharge 10 from the usual volute.

Opening into the suction bell 8 at the top thereof is a large pipe 12 communicating with one side of a strainer or filter 14, the other side of which is connected with an air valve, conventionally illustrated at 16 as containing a ball 18, of suitable material, which floats, upon rise of liquid in the valve casing, against a seat at the bottom of the exit passage 20 which communicates through a pipe line 22 with the intake of a centrifugal air pump 24. Sealing water for the air pump enters at 26 and air and water are discharged at 28. If desired the discharge may be directed into a tank which discharges into 26 so that a circulation of sealing water is obtained. A check valve 23 is interposed in line 22 between valve 16 and the vacuum pump.

The air pump is driven by a motor 30 the circuit of which is controlled by a vacuum switch 32 connected either directly to line 22 or to a vacuum tank 34 which communicates with line 22 between check 23 and valve 16. The vacuum switch is of the well known type which effects a closure of the circuit when the pressure in line 22 reaches a predetermined maximum and which opens the circuit when the pressure drops to a predetermined minimum. For example, the switch may be arranged to close the circuit at 18 inches of vacuum and open it at 24 inches. Consequently the line 22 and tank 34 would be constantly under a vacuum of 18 to 24 inches. The electric circuit to switch 32 may be closed simultaneously with the starting of the prime mover 2.

Opening into the valve casing 16 is a flushout line 36 which receives clean water from a supply such as a city water connection. This line includes a stop valve 38, which is ordinarily closed during operation, and a double check valve arrangement 40 and 42, a drip 44 being provided between the check valves. The arrangement is such that clear water may be introduced to flush out the system either when in operation or when idle to clean out the valve 16 and strainer 14 as well as the centrifugal pump. The check valves prevent flow of sewage into the clean water supply, the drip 44 effectively taking care of leakage past the valve 40.

Assuming the pump to be dry, the ball 18 would be resting on its stop away from the seat and atmospheric pressure would exist in the system. Consequently switch 32 would be closed. By the exhaustion of the pump casing 6 (the discharge of the pump being initially closed by a suitable valve), the liquid from the supply is caused to rise in the pump casing until priming is effected. As the liquid rises in pipe 12 and valve casing 16, the ball 18 is floated against seat 20, thereby closing off communication between the pump 6 and the vacuum pump. The vacuum pump will continue to operate until the line 22 and tank 34 are exhausted to the minimum pressure whereupon switch 32 will stop the motor 30.

Pumping now proceeds upon opening of the

discharge line. If air accumulates in the pump casing it will escape through pipe 12 and strainer 14 and will be passed by valve 16, which, however, prevents the passage of liquid. By the use of a tank 34 of suitable size, the pressure will not rise sufficiently to start motor 30 except at extended intervals. Whenever the motor 30 does start, the exhaustion of the tank to minimum pressure takes place very rapidly so that it may operate only once or twice an hour for periods of less than a minute. In such cases there is very little consumption of energy in driving the vacuum pump, and no overheating of the sealing water takes place so that a circulatory system of clear water may be provided.

In some cases it may be desirable to eliminate valve 16 by substituting a standpipe of suitable height which will permit the rise of water to a height producing a vacuum sufficient to open switch 32.

The purpose of strainer 14 is to prevent solid matter from entering valve 16, since it might prevent the proper seating of ball 18.

It will be obvious that the air pump may be replaced by other vacuum-producing devices such as water or steam ejectors or the like. The operation of such devices may be readily controlled by the vacuum in tank 34. It will also be obvious that, within the scope of the invention, the pump 24 may be rendered inoperative, for example, by vacuum-controlled means opening the intake to the atmosphere, whereupon it would be idly driven by either a motor such as 30, or by the prime mover of the pump 6.

What I claim and desire to protect by Letters Patent is:

1. In a system for handling semi-solids in suspension, a centrifugal pump, a vacuum producing device, connections between the vacuum producing device and the suction of the centrifugal pump through which the former may evacuate and thereby prime the latter, means for stopping the operation of the vacuum producing device upon the attainment of a predetermined vacuum in the connections, said connections including a strainer for preventing the passage of solid material to the vacuum producing device, and means for continuously introducing cleaning water to the connections on the side of the strainer towards the vacuum producing device.

2. In a system for handling semi-solids in suspension, a centrifugal pump, a vacuum producing device, connections between the vacuum-producing device and the suction of the centrifugal pump through which the former may evacuate and thereby prime the latter, said connections including a valve adapted to pass air but prevent the passage of liquid, and means for continuously introducing cleaning water to the connections at the pump side of the valve.

3. In a system for handling semi-solids in suspension, a centrifugal pump, a vacuum producing device, connections between the vacuum producing device and the suction of the centrifugal pump through which the former may evacuate and thereby prime the latter, said connections including a valve adapted to pass air but prevent the passage of liquid, means for continuously introducing cleaning water to the valve, and means for stopping the operation of the vacuum producing device upon the attainment of a predetermined vacuum in the connections between the vacuum producing device and said valve.

4. In a system for handling semi-solids in suspension, a centrifugal pump, a vacuum producing device and connections between the vacuum producing device and the suction of the centrifugal pump through which the former may evacuate and thereby prime the latter, said connections including a valve adapted to pass air but prevent the passage of liquid, a strainer for preventing the passage of solid material from the centrifugal pump to the valve, means for stopping the operation of the vacuum producing device upon the attainment of a predetermined vacuum in the connections between the vacuum producing device and said valve, and means for introducing cleaning water to the valve.

5. In a system for handling semi-solids in suspension, a centrifugal pump, a vacuum producing device, connections between the vacuum producing device and the suction of the centrifugal pump through which the former may evacuate and thereby prime the latter, said connections including a valve adapted to pass air but prevent the passage of liquid, a strainer in the connections between the valve and the pump, and means for continuously introducing cleaning water into the connections between the valve and strainer.

6. In a system for handling semi-solids in suspension, a centrifugal pump, a vacuum producing device, connections between the vacuum producing device and the suction of the centrifugal pump through which the former may evacuate and thereby prime the latter, said connections including means adapted to pass air but prevent the passage of liquid, a strainer in the connections between said means and the pump, and means for continuously introducing cleaning water into the connections between said means and the strainer.

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