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(71) Applicant : **ITT FLYGT AB**
Box 1309
S-171 25 Solna (SE)

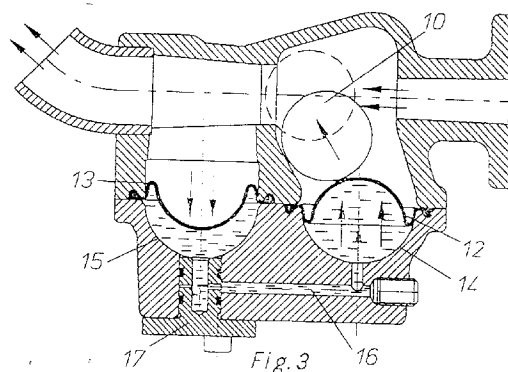
(72) Inventor : **Södergard, Bengt**
Kaplanvägen 76
S-194 41 Upplands Väsby (SE)

(74) Representative : **Larsson, Sten**
ITT FLYGT AB
Box 1309
S-171 25 Solna (SE)

(54) **A method and a device for automatic circulation in a waste water pump station.**

(57) The invention concerns a method and a device for obtaining automatic circulation in waste water pump stations.

On the pressure side the pump unit is provided with a valve (6) which during certain periods opens a connection between the pump and the pump station, thus obtaining a circulation in the latter. The valve (6) is opened and closed by a valve ball (10) which is controlled by the pump pressure.



The invention concerns a device for providing circulation in pump stations which are parts of a municipal sewage system.

As is described in the Swedish Patent Application 7908743-3 sludge banks occur in pump stations and other tanks in a sewage system as the circulation is not good enough. Sludge banks mean a lot of problems such as a bad smell, risk for explosions, corrosion problems etc.

According to the Patent Application mentioned, the problems have been solved by arranging a valve in the pump outlet, which is opened temporarily thus obtaining a circulation and flushing in the pump station. The sludge banks are dissolved and the fluid is homogenized.

The adjustment of the valve has up to now been controlled by electric means by help of a linear motor which acts upon a slide in the valve. A disadvantage with this solution, in addition to a relatively high cost, is that it easily becomes clogged as the pumped medium normally contains large amounts of solid bodies such as stones, rags and other objects. If a stone is stuck in the valve slide, the electric motor may break down.

Another disadvantage is that the motor of the valve is electrically driven which means specific installation problems where explosive gas may occur.

Another way to solve the problem to control the valve by help of the pump pressure is shown in Swedish Pat No 8900597-9. Here the under pressure created by the flow through the valve is utilized to move a valve element into a closed position after a certain time. This solution has however the disadvantage that the under pressure is not always sufficiently strong to be able to move the element into closed position.

The purpose of this invention is to obtain a device which in a simple and reliable way controls the valve, independent of the pressure situation in the surrounding area. This is obtained by help of the method and the device stated in the claims.

The invention is described more closely below with reference to the enclosed drawings.

Fig 1 shows a pump station with a pump unit and attached valve. Figs 2 to 4 show the principle design of the valve in different operating positions.

In the drawings 1 stands for a pump station with a submersible pump unit 2 connected to a pressure pipe 3. 4 stands for the pump housing having an inlet 5, while 6 stands for a mixing valve mounted on the pump housing 4. 7 stands for a valve housing and 8 its outlet with a bend 9. 10 stands for a valve ball and 11 its seat. 12 and 13 stand for diaphragms, 14 and 15 cups, 16 a conduit, 17 a control device and 18 a shoulder in the outlet.

The device operates in the following manner: Normally the valve 6 is closed and the pumped medium is transported from the pump housing 4 and into

the pressure pipe 3. The flow direction is shown by the Arrow A.

During certain times, for instance at pump start, the valve is open, which means that a certain amount of the pumped medium flows through the valve, arrow B, and obtains a strong agitation in the pump station wrecking possible sludge banks. After a certain time, the valve is closed and the pumping takes place in the normal way.

According to a preferred embodiment the valve 6 comprises a valve housing 7 with an outlet 8 ended by a bend 9. Within the valve housing 7 a valve cup 14 is provided which holds a diaphragm 12 with a valve ball 10. This is arranged to be able to close the passage through the valve housing 7 when it rests on a seat 11.

In Fig 2 the valve is shown in open position which means that circulation takes place within the pump station. The valve ball 10 then takes a position entirely beside the flow, not hindering it. The flow through the valve now creates pressure differences which may be used for controlling the valve function. Depending on among other things that the cross section in the outlet 8 is smaller than the cross section in the valve housing 7, the pressure in the former will be higher. The difference may also be increased by a shoulder 18 or a bend 9 in the outlet which further increases the pressure.

The mentioned pressure difference is utilized by arranging rooms in the valve housing 7 and the outlet 8 which are delimited by diaphragms 12 and 13 respectively, said rooms being connected by a conduit 16.

The pressure difference between the inner of the valve housing 7 and the outlet 8 when there is a flow through the valve, causes the diaphragm 13 to be pressed inwards which means that the medium, oil, within the rooms is pressed through the conduit 16 towards the room delimited by the diaphragm 12. The latter will then be pressed outwards, upwards in the drawing, and act upon the ball 10 in a closing direction, (Fig 3). When the ball has been moved a distance upwards, it will be influenced by the flow which brings it to a sealing alignment with the seat 11.

The time it takes for the oil to move from the room delimited by the diaphragm 13 to the room delimited by the diaphragm 12 is controlled in a suitable way by help of a restriction in the conduit 16.

In Fig 4 the valve is shown in a closed position which is the case after a predetermined time. Pump pressure will now prevail within the valve housing 7 as long as the pump operates. This means that the diaphragm 12 is pressed downwards to its original position and the oil is pressed back towards the diaphragm 13 which is not influenced by the pump pressure and thus resumes its original, bending design. When the pumping stops the pressure decreases and the valve ball 10 is moved by gravity to its original

position. The valve is then open waiting for next pump start.

In the description above a loose valve ball is used which seals against a seat in order to close the valve. Also other movable possibly turnable elements may be used as closing means and are within the scope of the invention.

In the description and especially in the drawings it is stated that the valve ball is actuated upon by a diaphragm 12 which has a corresponding number 13 in the outlet 8. The rooms being delimited by the diaphragms communicating via a conduit 16. It should be stressed that the drawings just show a preferred embodiment. The design of the diaphragms as well as that of the rooms may vary within the scope of the invention, to utilize the pressure difference between two different parts in the valve.

Claims

1 A method to control a valve for obtaining circulation in sewage water pump stations containing one or several pump units, preferably centrifugal pumps of the submersible type, one or several provided with mixing valves, which automatically, during a certain limited time period (periods) connect the pressure side of a pump with the pump station thus obtaining a circulation of the pumped medium and where the alternate return connection to the pump station is carried out by help of a valve comprising a valve housing connected to the pressure side of the pump and an outlet nozzle, the control of the valve being obtained by help of a movable valve element (10) which, in dependence of the pressure situation in the valve, in its one rest position seals against a seat (11) in the valve housing (7) thus closing the latter and which in its other rest position is contained within a diaphragm (12) arranged outside the flow through the valve, characterized in that the valve element (10) is acted upon to move from its first to its second rest position by gravity and from its second to its first rest position by the pressure difference between the outlet part (8) and the inner of the valve housing (7), caused by the flow through the valve.

2 A method according to claim 1, characterized in that the pressure difference between the outlet part (8) and the inner of the valve housing (7) is utilized to act upon diaphragms (12) and (13) which delimit communicating rooms.

3 A device for carrying out the method according to claim 1, characterized in that it comprises a valve housing (7) with an outlet part (8), the inner of the housing (7) as well as the inner of the outlet part (8) being provided with one diaphragm each (11) and (12) respectively, which delimit rooms (14) and (15) respectively communicating via a conduit (16) and that the diaphragm (12) is arranged to be able to move the

valve element (10) in a closing direction towards a seat (11) in the valve housing (7) thus interrupting the flow there through.

4 A device according to claim 3, characterized in that a controlling device (17) is arranged to control the flow through the conduit (16) which in its turn determines the closing time for the valve.

5 A device according to claim 3, characterized in that the outlet part (8) is provided with an interior shoulder (18) which adds to the pressure increase within the outlet part (8).

6 A device according to claim 3, characterized in that the outlet part (8) is terminated by a bend (9) which directs the flow from the valve and also adds to the pressure increase within the outlet part (9).

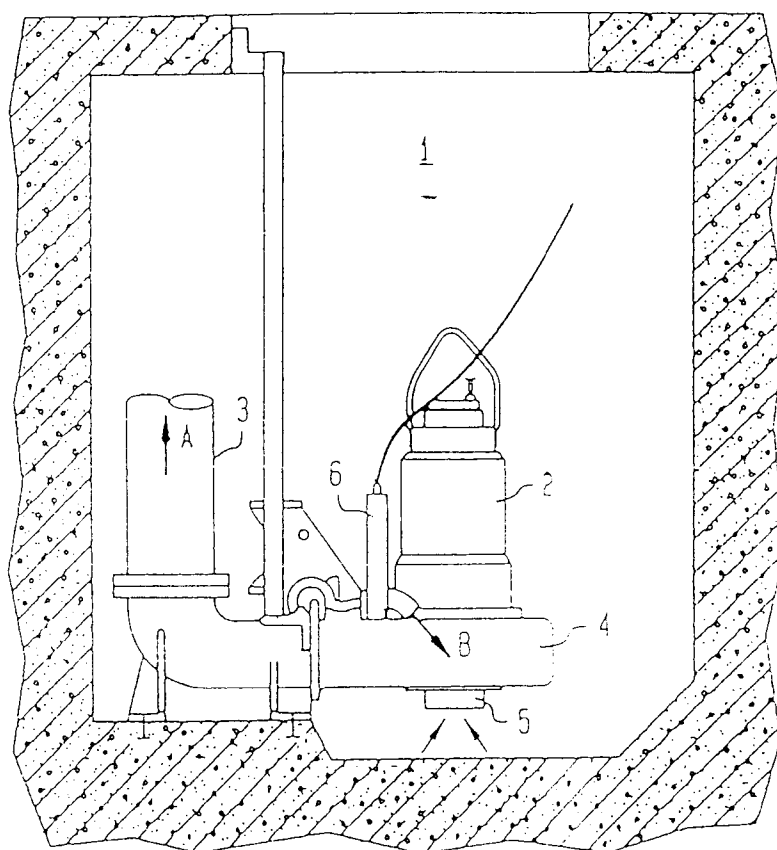
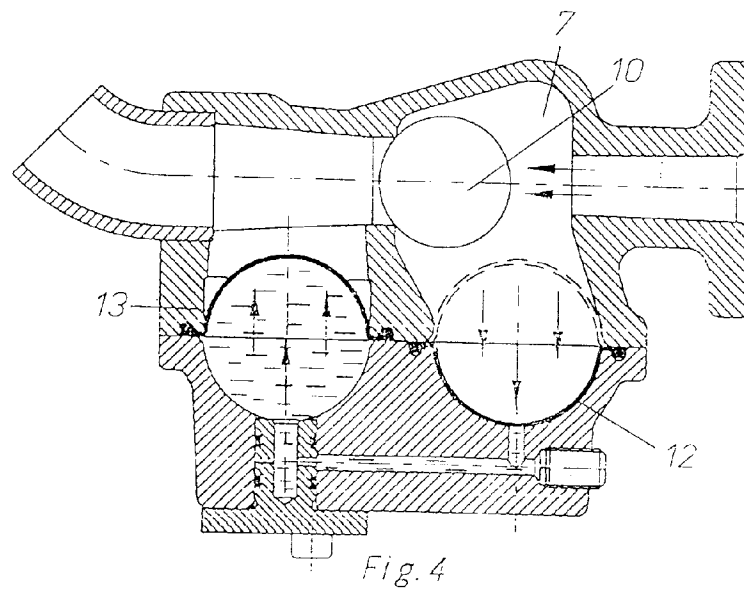
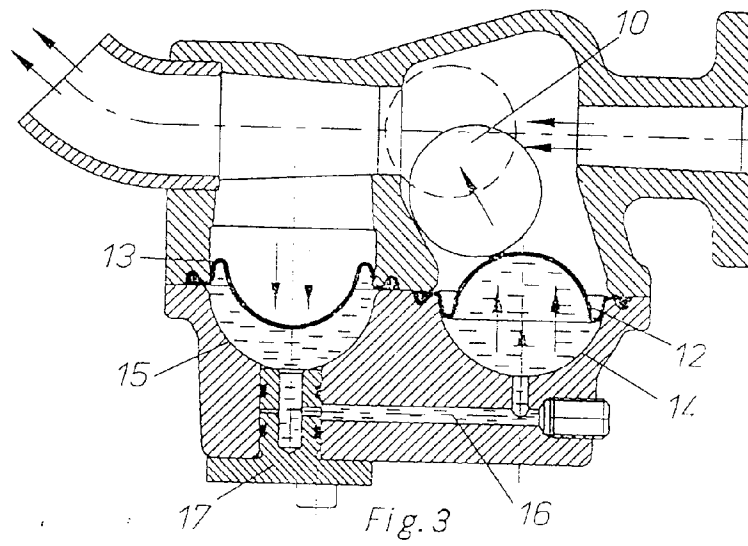
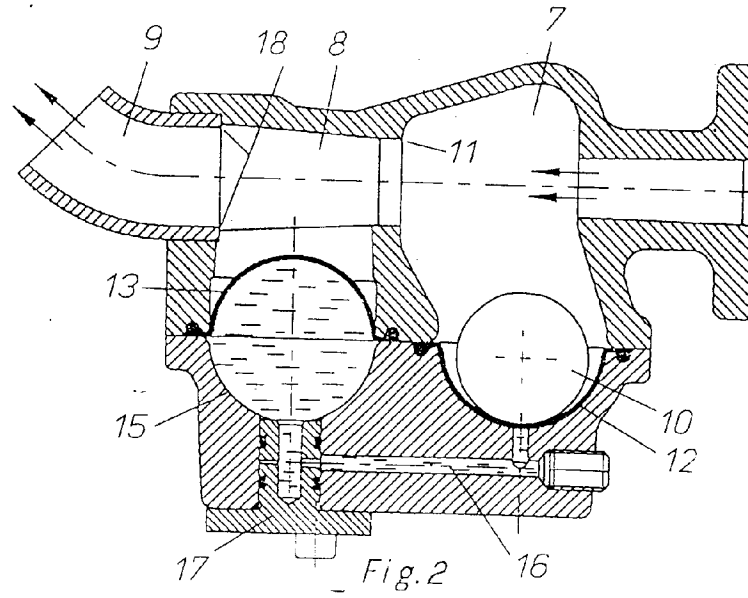


Fig 1





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 94 85 0059

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cls)
A	EP-A-0 472 509 (ITT FLYGT AB) * claims 1,6 *	1-6	E03F5/22
A	SE-B-463 218 (FLYGT AB) * claims 1,5 *	1-6	
			TECHNICAL FIELDS SEARCHED (Int.Cls)
			E03F F04D
The present search report has been drawn up for all claims			
Place of search STOCKHOLM		Date of completion of the search 14 July 1994	Examiner PRESTO HANS
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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