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(54) A device for providing automatic circulation in a waste water pump.

(57) The invention concerns a device for providing 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 flap (18) which is controlled by the pump pressure.

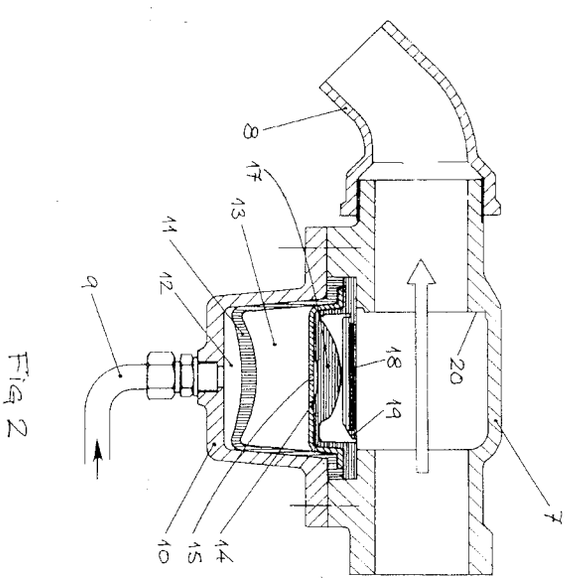

Fig 2

EP 0 594 548 A1

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.

The purpose of this invention is to obtain a device which in a simple and reliable way controls the valve and which is less sensitive to clogging. 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 cylindric part of the valve 6 and 8 its outlet. 9 stands for a pressure connection from the pump housing 4, 10 a membrane housing with a membrane 11 which parts two chambers 12 and 13. 14 stands for a partition wall having an opening 15, 16 an additional chamber, 17 a flexible wall, 18 a valve flap having a leading edge and 20 finally a valve seat.

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 wrenching possible sludge banks. After a certain time, the valve is closed and the pumping takes place in the normal way.

The valve 6 comprises a cylindric part 7 and an outlet 8. A pressure pipe 9 from the pump housing 4 is connected to the cylindric part 7 via a membrane housing 10 having a first chamber 12. The pressure therein acts upon a membrane 11 which in its turn influences on the pressure in another chamber 13 containing a dampening medium such as oil. The chamber 13 is further limited by a wall 14 provided with a narrow opening 15 creating a connection with a second oil chamber 16. The latter has a flexible wall 17 arranged to be able to act upon a valve flap 18 for a temporary closing of the valve 6.

Fig 2 shows the valve in an open position which means that circulation is taking place in the pump station. The valve flap 18 then takes a position entirely beside the flow. This is the situation at pump start.

The pressure in the pump housing 4 will then, via the connection 9, propagate into the chamber 12 and act upon the membrane 11. The oil in the chamber 13 will then be pressed through the opening 15 in the rigid wall 14 into the other chamber 16 causing the flexible wall 17 to move upwards in the drawing. The wall 17 is formed with a bead which acts upon the valve flap 18 against it spring force, outwards into the flow through the valve 6. As soon as the edge 19 of the flap 18 has moved so far out into the flow, that a part of the latter begins to enter behind, above the flap, the latter will swing out entirely and obtain a sealing contact with the seat 20, thus interrupting the flow through the valve 5. Fig 3 shows the device in a position where the flow starts entering behind the flap, while Fig 4 shows the valve in an entirely shut position.

The movement of the flap 18 in closing direction is entirely obtained by help of the pressure from the pump outlet and against the force from a not shown spring which acts to keep the flap in the position shown in Fig 2.

When the flap has reached the position shown in Fig 4, the valve 6 is closed and will remain so as long as the pump operates. When the pump stops, the flap is brought back to the position shown in Fig 2 and the valve is open at next pump start.

The pressure in the pump outlet thus acts upon the flap 18 via the chamber 12, the membrane 11 the chamber 13 the opening 15 and the chamber 16. The time before which the flap is being closed may be decided by dimensioning the opening 15. The smaller opening, the longer time before enough oil has flown into the chamber 16 to obtain a sufficient force onto the flap 18. The suitable opening time may vary depending on the type of pump station and is preferably possible to adjust from outside.

In the description the closing element is described as a flap valve. However, also other movable ele-

ments are possible within the scope of the invention.

Claims

1 A device for providing automatic 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 9, characterized in that it comprises a membrane housing (10) connected to the cylinder formed part (7) of the valve (6) and containing a membrane (11) one side of which being acted upon by the pressure in the pump housing (4), while its other side constitutes a wall of a chamber (13) containing a dampening medium such as oil, that a spring loaded valve flap (18) is mounted within the cylinder formed part (7) of the valve and arranged to be able to close said valve and interrupt the circulation and that the valve flap (18) is arranged to be directly or indirectly and against the spring force, moved in a closing direction by the pressure in the chamber (13) controlled by the membrane (11).

2 A device according to claim 1, characterized in that the chamber (13), via an opening (15), is connected to another chamber (16) which has a flexible wall (17) arranged to be able to act upon the valve flap (18) in a closing direction.

3 A device according to claim 2, characterized in that the opening (15) is adjustable for controlling of the time when the pressure in the chamber (16) is strong enough to make the valve flap (18) swing out into the flow through the valve (6) and interrupt the circulation.

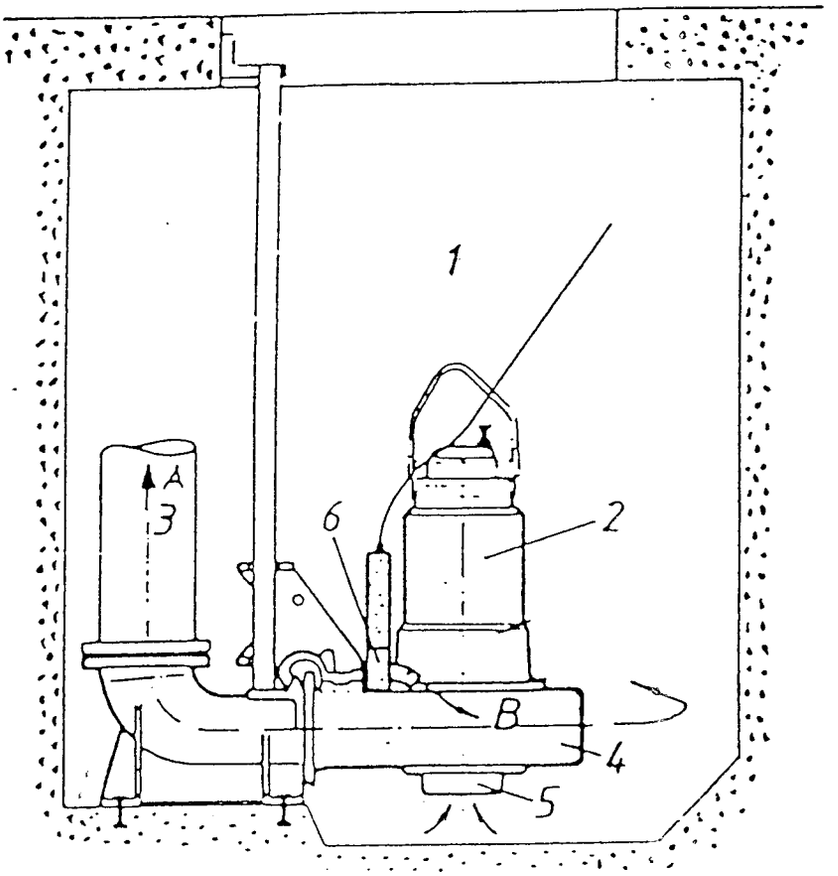

Fig_1

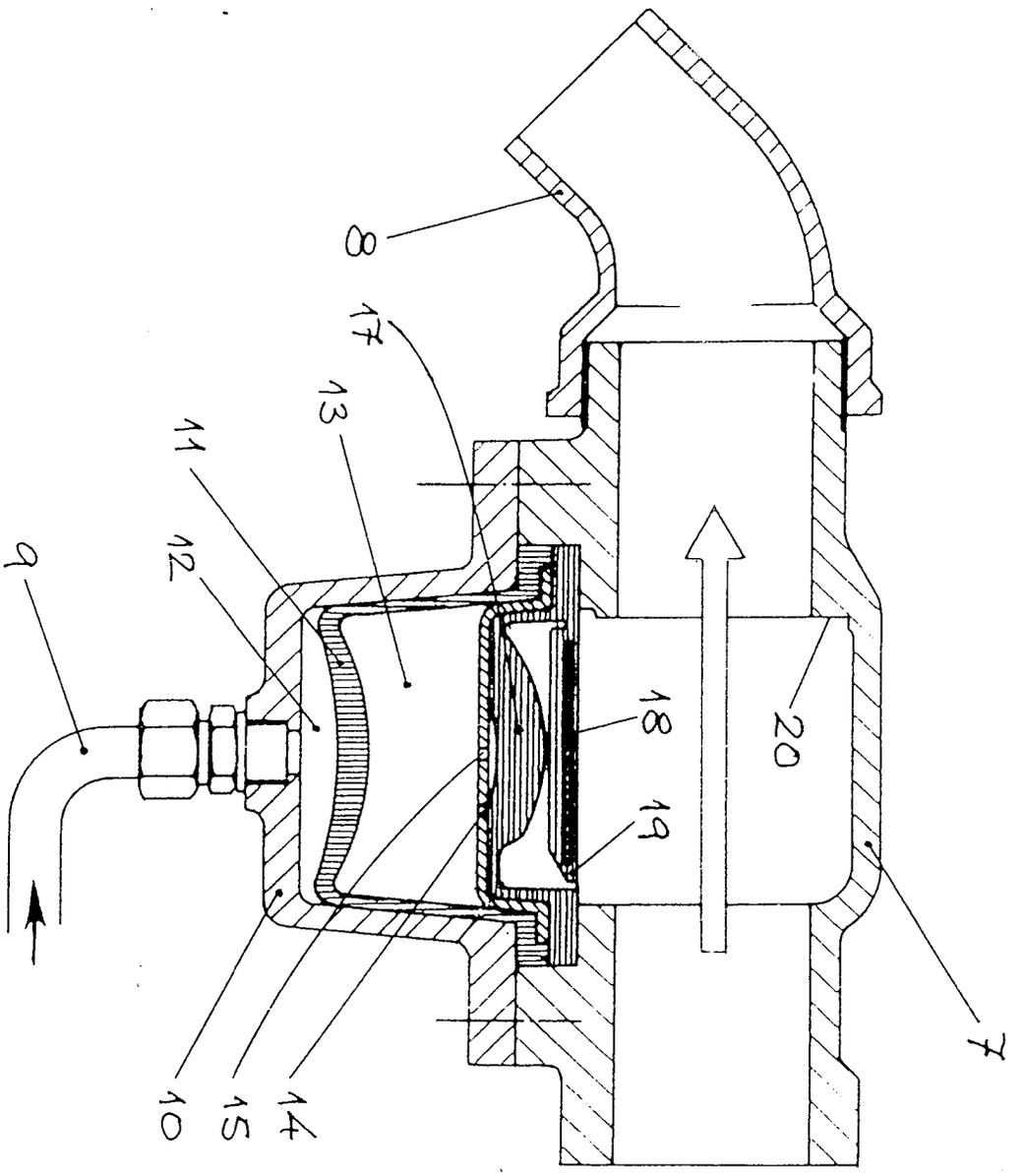

Fig 2

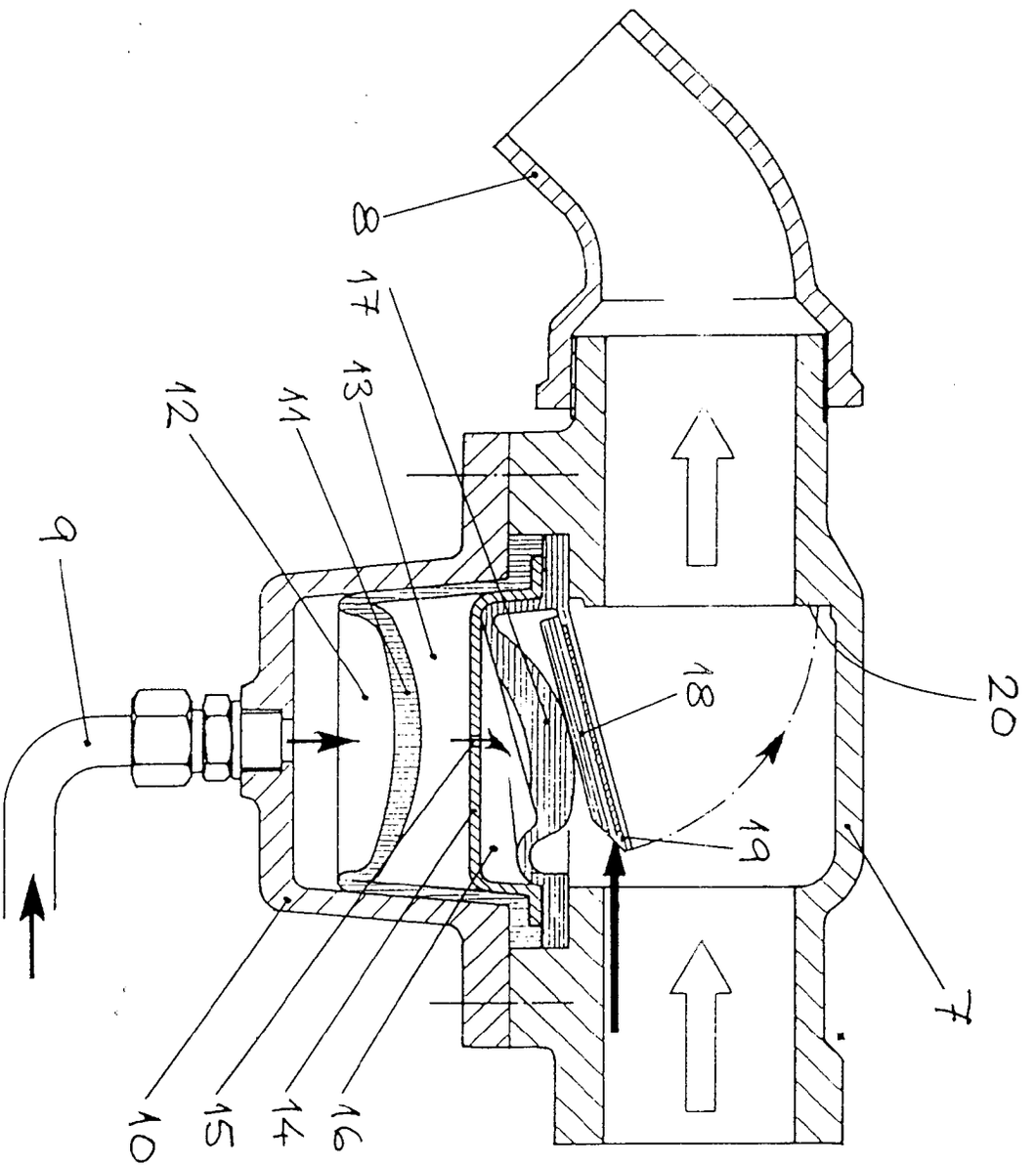

Fig 3

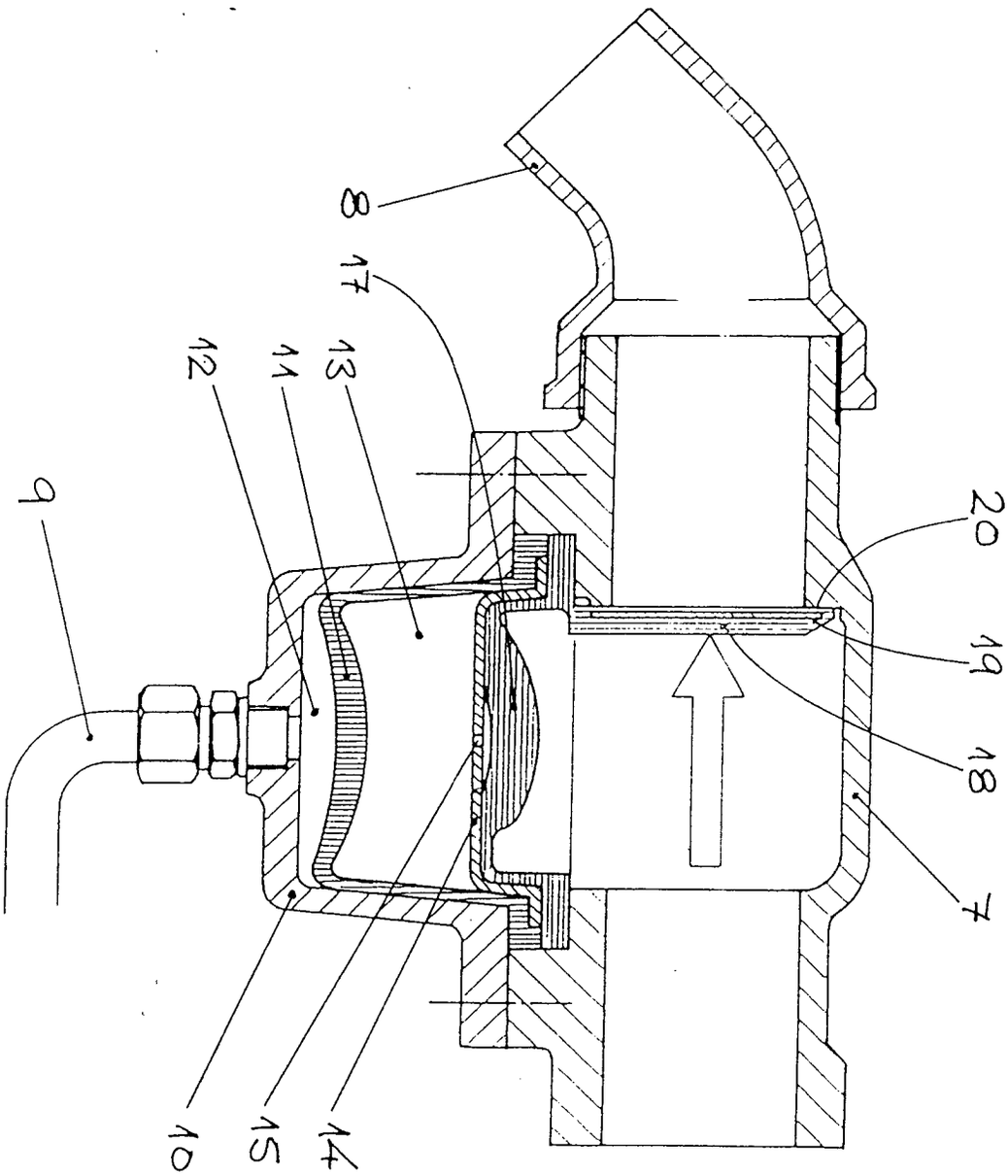

Fig 4

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 93850173.1

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A	EP-A1-0 058648 (FLYGT AB) *Whole document*	1-3	E03F 5/22 E04D 15/02
A	EP-A1-0 384 903 (FLYGT AB) *Whole document*	1-3	
A	EP-A1-0 472 509 (ITT FLYGT AB) *Whole document*	1-3	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

E03F
F16K
F04D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
STOCKHOLM	22-12-1993	GRENMARK T.

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
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T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
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