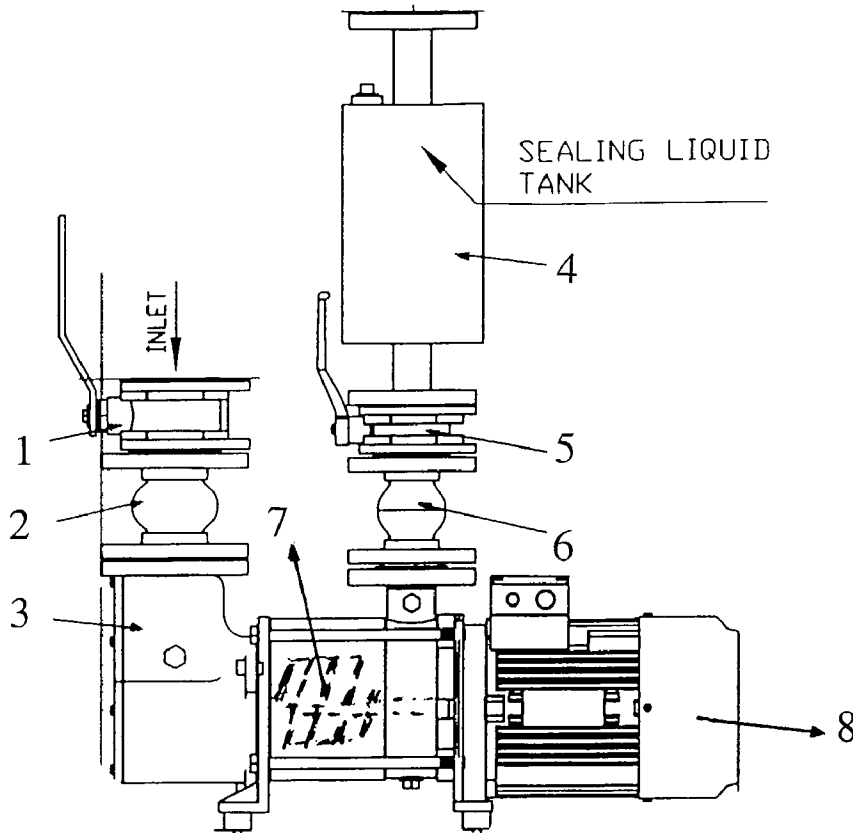




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 (54) Title: LIQUID SEAL PUMP OF THE HELICAL SCREW TYPE



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Liquid seal pump of the helical screw type including a pump housing (3) with an inlet (2), outlet (6) and within the housing provided helical screw rotor (7) driven by means of a motor (8). The outlet (6) of the pump (3) is provided with a sealing liquid tank (4) for the supply of liquid to the pump and thereby maintaining the liquid seal under idle running of the pump.

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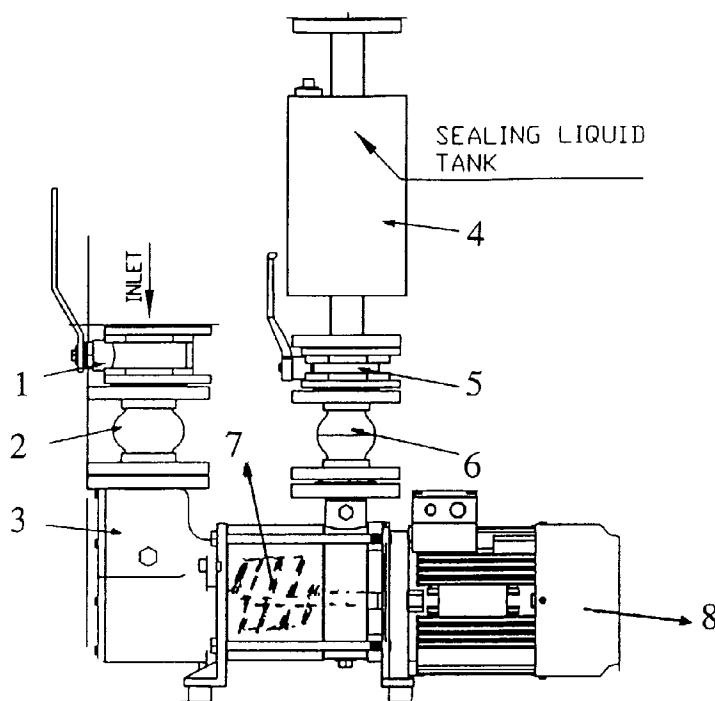
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(54) Title: LIQUID SEAL PUMP OF THE HELICAL SCREW TYPE



(57) Abstract: Liquid seal pump of the helical screw type including a pump housing (3) with an inlet (2), outlet (6) and within the housing provided helical screw rotor (7) driven by means of a motor (8). The outlet (6) of the pump (3) is provided with a sealing liquid tank (4) for the supply of liquid to the pump and thereby maintaining the liquid seal under idle running of the pump.



WO 02/097275 A1

Liquid seal pump of the helical screw type.

The present invention relates to a liquid seal pump of the helical screw type including a pump housing with an inlet, an outlet and within the housing provided helical screw rotor driven by means of a motor.

Pumps of the above-mentioned type are widely used in vacuum sewage systems being directly connected with the sewage collecting pipe from the toilets and showers etc.

The pump is based on the principle of creation of a liquid seal between the rotor and pump housing when the pump is running to obtain the required suction delivery head. With the known type of pumps, under idle running of the pump, a separate supply of liquid to the pump seal is provided through a supply pipe line connected directly to the pump housing, usually prior to the rotor. The liquid may be fresh water from a fresh water supply or black water from a sewage collecting tank. There are, however, several disadvantages of using a separate supply of water to maintain the liquid seal. Using fresh water is as such expensive in most parts of the world. Further, by using a continuous supply of fresh water, more liquid is generated and needs to be getting rid of. In particular in vacuum sewage systems where the storage capacity is limited, for instance on board ships, such extra liquid from the seal deprive storage capacity.

By using black water for the liquid seal, i. e. by pumping black water from the storage tank, no extra liquid is added. On the other hand, using black water has through extensive use shown that the supply pipe line very often becomes clogged due to particles in the black water, which in turn has led to fatal pump damage.

With the present solution is provided a liquid seal pump where the above disadvantages are avoided.

According to an aspect of the present invention there is provided a liquid seal pump of the helical screw type, the liquid seal pump comprising:

a pump housing with an inlet, an outlet; and

a helical screw rotor provided within the housing, the helical screw rotor being driven by means of a motor wherein the outlet of the pump housing is provided with a sealing liquid tank for the supply of liquid to the pump and thereby maintaining the liquid seal under the idle running of the pump.

The invention will be further described in the following by way of examples only and with reference to the drawings where:

Fig. 1 shows a side view of the pump according to the invention.

Fig. 2 shows a schematic view of a vacuum sewage system where two pumps according to the invention are provided.

The pump according to the invention is as stated above and as shown in Fig. 1 a liquid seal pump of the screw type including a housing 3 with an inlet 2 and outlet 6, and a helical screw 7 provided within the housing 3 which is driven by means of preferably an electrical motor 8. Between the screw and the rotor is gap which, when the pump is running, is filled with liquid circumferentially creating a seal between the inlet and outlet ends (upstream and downstream ends) of the pump. This seal has given the name to the pump, namely "liquid seal pump", and enables a pressure difference between the two ends of the pump.

Valves 1 and 5 are provided at the inlet, respectively outlet ends of the pump to enable shutting off of the pump in connection with maintenance and emergency, or when disconnecting it from the pipes to which it normally is connected (se Fig. 2).

At the outlet end of the pump is connected a sealing liquid tank 4 supplying liquid to the pump under its idle running. Under normal running when the pump sucks and pumps liquids and air (fluids), the seal liquid tank will be partly or wholly filled up with liquid. When in turn the pump runs idle, the liquid in the tank flows back to the pump, maintaining the liquid seal. Tests have proven that the pump may run for hours without any further supply of liquid form other liquid sources, and temperatures in the pump housing and bearings are kept very low. Further, tests have shown that the volume of the seal liquid tank should be at least twice the volume of the pump housing and the diameter of the outlet in millimetre should substantially

correspond to the capacity of in cubic meters per minute. Still further, tests have shown that the volume of the tank 4 should be at least 0,3 litre per cubic metre fluid capacity of the pump at atmospheric pressure.

The pump may be formed as being a part of, or integrated part of, the outlet pipe of the pump, and the vertical part of the outlet pipe or tank should be at 0,5 metres, adapted to the above volume and capacity measures.

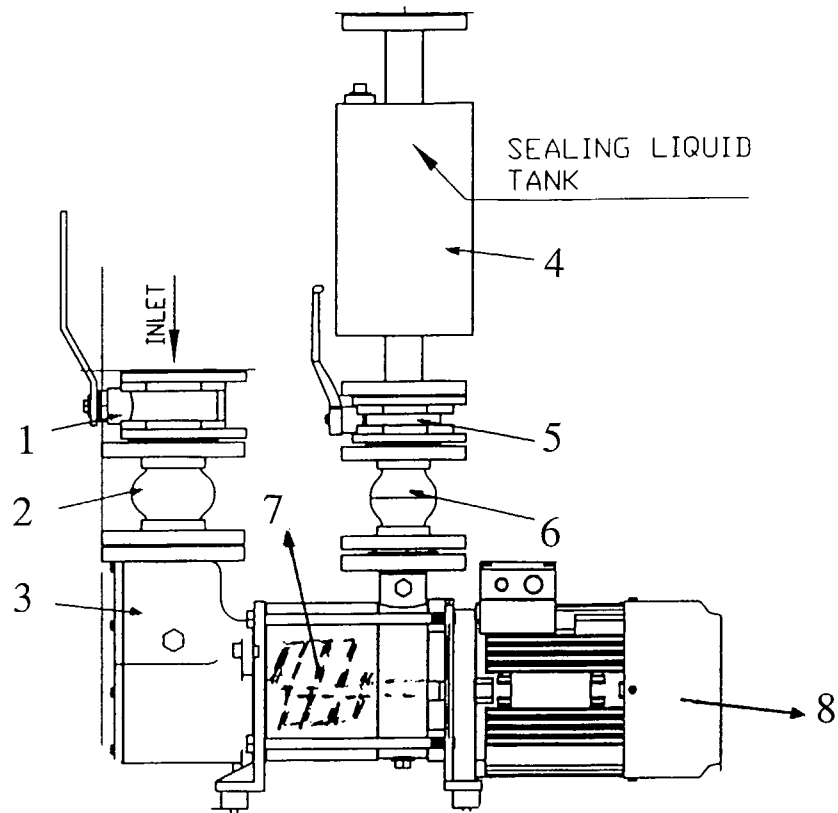
Fig. 2 shows schematically a vacuum sewage system where two pumps 3 according to the invention with seal liquid tanks 4 are provided. Sewage is drawn via pipes 9, 10 from toilets etc. and is pumped to a sewage collecting or treatment tank 13 via pipes 11, 12 respectively. In particular, the present invention is designed to be used in vacuum drainage systems where the pump(s) may run idle for several hours.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A liquid seal pump of the helical screw type, the liquid seal pump comprising: a pump housing with an inlet, an outlet and a helical screw rotor provided within the housing, the helical screw rotor being driven by means of a motor, wherein the outlet of the pump housing is provided with a sealing liquid tank for the supply of liquid to the pump and thereby maintaining the liquid seal under the idle running of the pump.
2. The liquid seal pump according to claim 1, wherein a volume of the sealing liquid tank is at least twice the volume of an inner space of the pump housing.
3. The liquid seal pump according to claim 1, wherein a volume of the sealing liquid tank is at least 0,3 litres per litre fluid capacity of the pump at atmospheric pressure.
4. The liquid seal pump according to claim 1, wherein a diameter of the outlet of the pump in millimetres corresponds substantially to a capacity of the pump in cubic meters.
5. The liquid seal pump according to any one of claims 1 to 4, wherein a vertical height of the sealing liquid tank is at least 0,5 metres.
6. The liquid seal pump according to any one of claims 1 to 5, wherein the sealing liquid tank forms part of, or an integrated part of, an outlet pipe of the pump.
7. The liquid seal pump according to any one of claims 1 to 6, wherein the liquid seal pump is for use in vacuum drainage systems and with long time idle running of the pump.

1/2

Fig. 1



2/2

Fig. 2

