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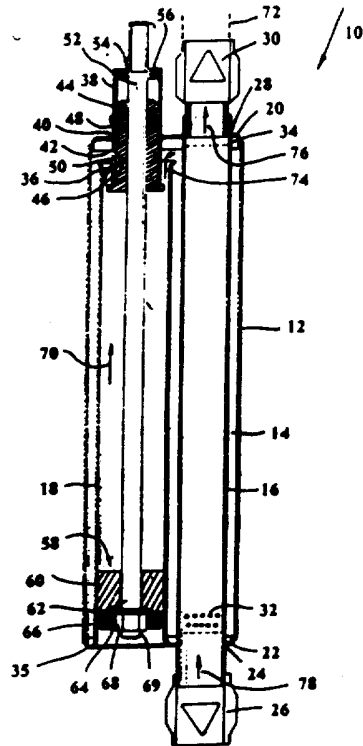
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(51) **International Patent Classification (Int. Cl.):** F04B 1/02
 (54) **Title:** PUMP

(57) **Abstract:** A pump unit includes a housing defining a chamber; a first cylinder provided in the housing and extending through both end covers of the housing; a first one-way valve provided at one end of the first cylinder; a second one-way valve provided at the other end of the first cylinder; at least one first aperture in the first cylinder leading into the chamber; a second cylinder provided in the housing; a piston rod extending through the second end cover of the housing into the second cylinder; a piston attached to the piston rod; at least one second aperture leading into the second cylinder from the chamber so that movement of the piston away from such second aperture(s) suction of liquid through the first one-way valve into the first cylinder, whilst the second one-way valve is closed, and movement of the piston in an opposite direction causes closure of the first one-way valve and opening of the second one-way valve for displacing liquid from the second cylinder through the second one-way valve to be discharged via a discharge pipe.



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(56) **Documents cited:** AP 31, EP-0215752-A2



APPLICANTS CONTINUED

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FIELD OF INVENTION

The present invention relates to pump units.

SUMMARY OF INVENTION

5 According to the invention, a pump unit, includes

a) an elongated cylindrical housing closed at both ends by a first end cover and a second end cover respectively;

10 b) a first cylinder provided in the housing and extending at opposite ends through both end covers of the outer housing;

c) a first one-way valve provided at one end of the first cylinder at or near the first end cover, which valve is adapted to open for allowing liquid to flow into the first cylinder when suction is applied to this valve;

15 d) a second one-way valve provided at the other end of the first cylinder at or near the second end cover, which valve is adapted to open to allow liquid to flow out of the cylinder when pressure is applied to this valve;

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e) at least one first aperture in the first cylinder leading into the chamber defined by the housing;

5 f) a second cylinder provided in the housing, of which having end directed to or at the first end cover of the housing is closed;

C g) a reciprocatingly arranged piston rod extending through the second end cover of the housing into the second cylinder;

10 h) a piston attached to the piston rod and being slidably mounted in the second cylinder;

i) at least one second aperture leading into the second cylinder from the chamber in the housing so that movement of the piston away from such second aperture(s) in the second cylinder towards the closed end of the second cylinder causes suction to be applied for sucking liquid through the first one-way valve into the first cylinder, thereafter into the chamber and then into the second cylinder through the second aperture(s), whilst the second one-way valve is closed, and movement of the piston in an opposite direction from the closed end of the second cylinder towards the second aperture(s) causing the first one-way valve to close and the second one-way valve to open so that liquid is displaced from the second cylinder through the second aperture(s) into the chamber

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and thence through the first aperture(s) into the first cylinder and through the second one-way valve to be discharged via a discharge pipe.

5 An air escape opening may be provided in the first cylinder at or near the closed end of the housing on the side of the second non-return valve.

10 The first one-way valve may be provided in the part of the first cylinder extending out of the housing through the first end cover, in use being the bottom part.

The second one-way valve may be provided in the other part of the first cylinder extending out of the housing through the second end cover, in use being the upper part.

15 A sleeve may be fitted to the second end cover of the housing, the sleeve supporting a sealing packing through which the rod passes reciprocatingly and sealingly.

The piston may be made of polyethylene material.

The discharge pipe may be a plastics pipe.

20 BRIEF DESCRIPTION OF DRAWINGS

The invention will now be described by way of example with reference to the accompanying schematic drawing.

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In the drawing there is shown a sectional side view of a pump unit in accordance with the invention.

DETAILED DESCRIPTION OF DRAWING

5 Referring to the drawing, the pump unit, generally indicated by reference numeral 10, includes an external housing 12 defining a chamber 14.

In the housing 12 a first cylinder 16 and a second cylinder 18 are located as will be described in more detail hereinafter.

10 The housing 12 is closed off at its upper end by means of a flanged disc 20 and at its lower end by means of a flanged disc 22.

15 The first cylinder 16 extends to below through a hole 24 in the lower disc 22. At the bottom end of the cylinder 16 a first one-way valve is provided 26. The cylinder 16 further extends upwardly through a hole 28 in the upper disc 20. At its upper end a second one-way valve 30 is provided.

20 The first cylinder 16 has a number of holes 32 on the inside of the housing 12 near the bottom disc 22.

At its upper end near the upper disc 20 the first cylinder 16 has at least one air escape hole 34. The hole 34 is as close as possible to the disc 20.

The second cylinder 18 is joined (e.g. welded) at its lower end at 35 to the lower disc 22. At its upper end the cylinder 18 is joined by means of a number of circumferentially distributed and spaced apart support arms 36 to a sleeve 38 extending upwardly through a hole 40 in the upper disc 20.

The sleeve 38 supports a sealing packing member 42. The sealing packing member 42 has two circumferential grooves 44, 46 in which respectively a screw 48 and an O-ring 50 are located.

A shaft 52 extends through a hole 54 in an end disc 56 provided at the upper end of the sleeve 38. It also passes sealingly reciprocatingly through the member 42 and to its lower end a piston 58 is fixed. The piston 58 comprises an internally threaded piston disc 60 screwed onto the bottom threaded part of the rod 52. A further U-shaped disc 64 is provided to support a sealing washer 66 against the piston disc 60. The components 60, 64, 66 are held in position by means of a nut 68 screwed onto the threaded end 69 of the shaft 52.

In use the unit 10 is placed into a bore hole or any other collected liquid to be pumped. The rod 52 is joined to a reciprocating mechanism, which may be a wind pump or a rod joined to a reciprocating engine driven unit.

In use the unit 10 is put into water or liquid to be pumped, and water will then rise through the valve 26 into the housing 12. When the rod 52 moves upwardly in the direction indicated by arrow 70, the water or other liquid contained in the housing 12 is pumped out through the valve 30 joined to an outlet pipe indicated in dotted lines 72, which outlet pipe may be a plastics pipe. This operation is as follows:

The piston 60 moves upwardly and forces the liquid contained in the cylinder 18 through the openings between the upper end of the cylinder 18 and the supports 36 as indicated by arrow 74. Consequently the liquid is forced through the opening 34 and the openings 32 into the cylinder 16 and upwardly through the one-way valve 32 as indicated by arrow 76. The valve 30 opens when force is applied to it from below and allows liquid to flow through it into the pipe 72. Also any air, which may have collected in the upper end of the unit 10 will escape through the hole 34 into the upper end of the pipe 16 and be pumped out through the valve 30. During this operation the one-way valve 26 is closed and no water is sucked into the unit 10.

When the rod 52 and therewith the piston 60 move downwardly in the direction opposite to that indicated by arrow 70, liquid is sucked into the cylinder 18 in that the valve 30 closes and the one-way valve 26 opens.

Liquid now is sucked through the one-way valve 26 in the direction indicated by arrow 78 and passes through the holes 32 into the chamber 14 defined by the housing 12 and is also sucked into the cylinder 18 through the upper open end thereof between the supports 36 in a direction opposite to that indicated by arrow 74. When the piston 58 reaches the bottom position, the rod 52 is again moved upwardly as indicated by arrow 70, and therewith the procedure is repeated and the one-way valve 26 closes while the valve 30 opens and liquid is pumped out through the outlet pipe 72.

The unit 10 preferably is made of stainless steel material except for the following items:

1. Packing member 42: polyethylene
2. Piston disc 60: polyethylene
3. Washer 66: polyurethane
4. One way valves 26, 30: brass and rubber seal

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g) a reciprocatingly arranged piston rod extending through the second end cover of the housing into the second cylinder;

5 h) a piston attached to the piston rod and being slidably mounted in the second cylinder;

i) at least one second aperture leading into the second cylinder from the chamber in the housing so that movement of the piston away from such second aperture(s) in the second cylinder towards the closed end of the second cylinder causes suction to be applied for sucking liquid through the first one-way valve into the first cylinder, thereafter into the chamber and then into the second cylinder through the second aperture(s), whilst the second one-way valve is closed, and movement of the piston in an opposite direction from the closed end of the second cylinder towards the second aperture(s) causing the first one-way valve to close and the second one-way valve to open so that liquid is displaced from the second cylinder through the second aperture(s) into the chamber and thence through the first aperture(s) into the first cylinder and through the second one-way valve to be discharged via a discharge pipe.

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2. A unit as claimed in claim 1, in which an air escape opening is provided in the first cylinder at or near the

closed end of the housing on the side of the second non-return valve.

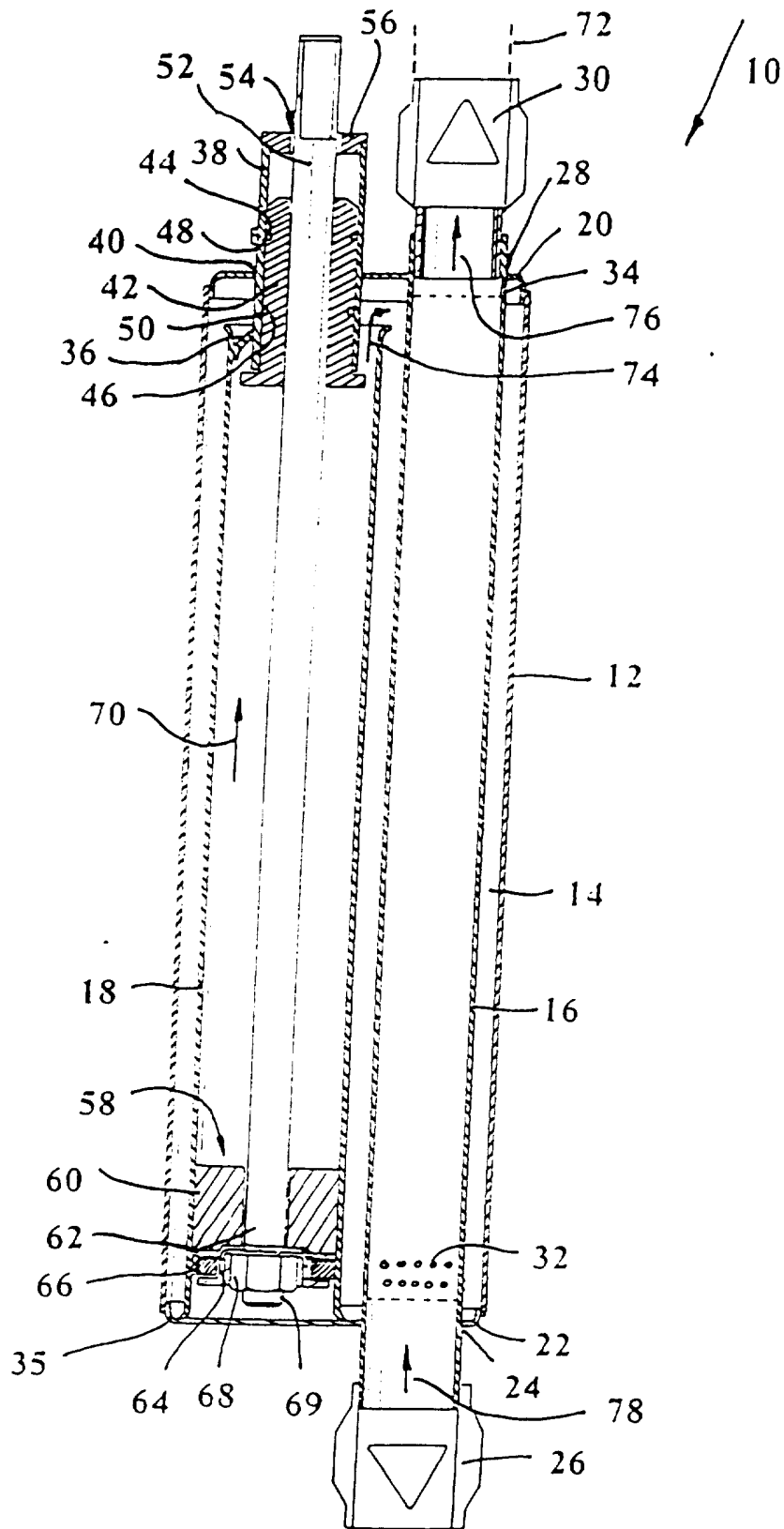
3. A unit as claimed in claim 1 or in claim 2, in which the first one-way valve is provided in the part of the first cylinder extending out of the housing through the first end cover, in use being the bottom part.

4. A unit as claimed in claim 3, in which the second one-way valve is provided in the other part of the first cylinder extending out of the housing through the second end cover, in use being the upper part.

5. A unit as claimed in any one of the preceding claims, in which a sleeve is fitted to the second end cover of the housing, the sleeve supporting a sealing packing through which the rod passes reciprocatingly and sealingly.

6. A unit as claimed in any one of the preceding claims, in which the piston is made of polyethylene material.

7. A unit as claimed in any one of the preceding claims, in which the discharge pipe is a plastics pipe.



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