(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 172 795**
**A2**

# (12) EUROPEAN PATENT APPLICATION

(21) Application number: **85850233.9**

(22) Date of filing: **10.07.85**

(51) Int. Cl.⁴: **F04B 9/10** , F04B 43/10

(30) Priority: **01.08.84 CH 3712/84**

(43) Date of publication of application:
**26.02.86 Bulletin 86/09**

(84) Designated Contracting States:
**AT BE CH DE FR GB IT LI NL**

(71) Applicant: **Institut Cerac S.A.**
**Chemin des Larges Pièces**
**CH-1024 Ecublens(CH)**

(72) Inventor: **Lagne, Ulf Jöran**
**16 Algövägen**
**S-133 00 Saltsjöbaden(SE)**

(74) Representative: **Grundfelt, Gunnar et al**
**c/o Atlas Copco Management Consulting AB Patent Department**
**S-105 23 Stockholm(SE)**

## (54) A fluid pump.

(57) A fluid pump having an elastic tubular member (21) as pumping element. The tube is provided with helically extending reinforcing threads (42). Pressurization of the interior of the tube results in a change of volume of the tube. This volume change accomplishes the pumping.

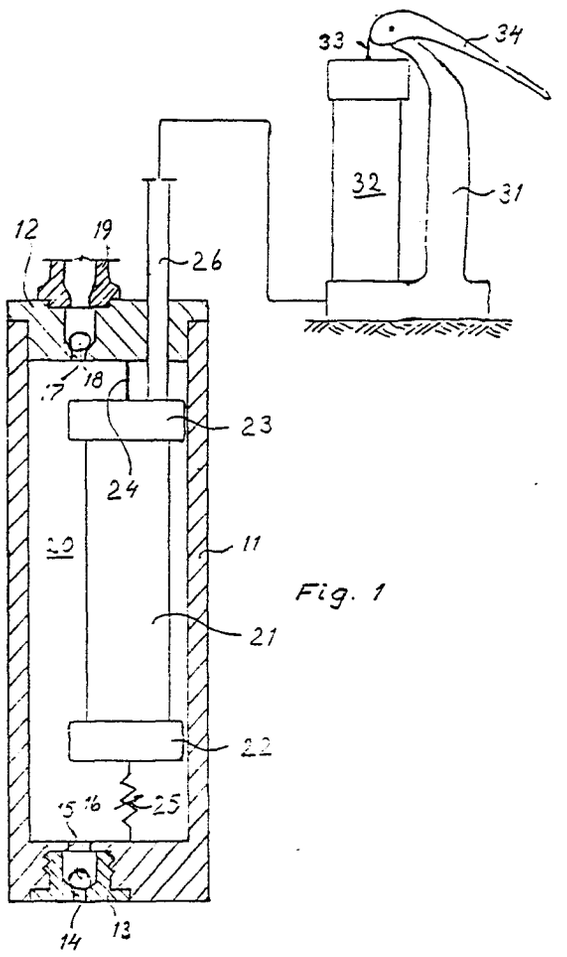


Fig. 1

EP 0 172 795 A2

# A fluid pump

The present invention relates to a fluid pump which advantageously can be used for pumping a variety of fluids.

Simple and cheap prior art pumps comprise a cylinder in which a piston is movable to accomplish the pumping. Such pumps have the drawback of requiring a high quality internal surface in the cylinder. Furthermore, a seal is needed between the piston and the cylinder. Such a seal causes friction and wear. Regular maintenance is therefore required. To move the piston in the cylinder a rod, capable of taking loads in both directions, is needed. This is a substantial drawback if the pump is to be used in a deep well. The drawback with the piston and cylinder arrangement becomes even more evident if a fluid containing abrasive material, e.g. cement, is to be pumped.

The present invention, which is defined in the appended claims, aims at doing away with the above mentioned drawbacks by replacing the piston with a tubular pump element of an elastic material having helically extending threads embedded. The elastic material could advantageously be rubber. The reinforcing threads should be resistant against deformation and be positioned with a separation that gives a good elasticity to the tubular pump element.

The invention is exemplified below with reference to the accompanying drawings in which fig 1 shows a section through a fluid pump according to the invention. Fig 2 shows a part section through a pump element used in the invention. Fig 3 shows a modified embodiment of the invention.

The fluid pressure pump shown in the drawings comprises a housing 11 covered by a cover 12. An inlet valve 16 is arranged in a channel 14,15 in the bottom of the housing. The valve element is mounted by means of a screw 13. Fluid to be pumped is entered into pump chamber 20 through the inlet valve and is then delivered through outlet valve 18 to a conduit 19 which leads to a delivery point. Valve element 18 is arranged in channel 17 in the cover 12 and held in place by conduit 19 which is screwed into cover 12. A pump element comprising a tubular member 21 and end pieces 22,23 is mounted in pump chamber 20. End piece 23 is fixed, e.g. by a wire 24, to cover 12. End piece 22 is elastically connected to housing 11 by means of an adjustable spring 25. The interior of the tubular member 21 is by means of a conduit 26 connected to a fluid pressure source 32, which is made in the same way as the pump element 21. The fluid pressure source 32 is connected to a stand 31 having a lever 34 which in a suitable way, e.g. by means of a wire 33, makes it possible to change the length of the fluid pressure source. This results in a change in the fluid pressure, as described below. This change in pressure results in a change of volume of the pump element 21. This change in volume, caused by moving lever 34 up and down, accomplishes the pumping.

The tubular member 21, the same is valid for tubular member 32, comprises a tube 41 in which reinforcing threads 42 are embedded. Threads 42 extend helically along the tube at a pitch angle v. The threads extend in both directions. If the angle v is greater than arccot(sqrt(2)), approx. 35.3° a decrease in the length of the tubular member caused by pressurization of the interior of the tubular member results in an increase of the volume of the tubular member. If on the other hand angle v is smaller than the above mentioned value a decrease in length results in a decrease in volume.

Adjustment of the force of spring 25 changes the pressure needed from fluid pressure source 32 to accomplish pumping. In this way it is possible to adjust the pump for pumping with different counterpressures in conduit 19.

In the embodiment of the invention shown in fig 3 parts having the same reference numerals as parts in the fig 1 embodiment function in the same way. In the fig 3 embodiment the tube 41 has been extended to be clamped to housing 11 and cover 12 by means of clamps 51 and 52 respectively. The length of the tube 41 has been chosen such that a predetermined tensile force prevails in the tube. In this way the tube replaces the spring 25 of fig 1 . However, the pump will then be adapted to a particular counterpressure. In order to be adapted to another counterpressure the length of the tube of that pump has to be changed. Tube 41 is provided with a dividing piece 53 clamped to the tube by means of a clamp 54. Channel 15 communicates with pump chamber 20 via channel 55, groove 56 and hole 57 through tube 41 and clamp 54. The space above dividing piece 53 is via conduit 26 connected to a fluid pressure source of variable pressure which effects the pumping.

## Claims

1. A fluid pump comprising a housing (11) provided with a pump chamber (20), an inlet valve (16) through which fluid is entered into the pump chamber, an outlet valve (18) through which fluid is delivered from the pump chamber and a pump element (21) to vary the volume of the pump chamber, **characterized** in that the pump element comprises a tubular member (21) which is made of an elastic material (41) in which reinforcing threads (42) are embedded, said threads extending helically along the tubular member, that one of the ends (23) of the tubular member is fixed relative to the housing and the other end (22) is elastically connected to the housing, and that the interior of the tubular member is connected to a fluid pressure source (32) of variable pressure.

2. A fluid pump according to claim 1 **characterized** in that the elastic connection is obtained by means of a spring (25) the spring force of which is adjustable.

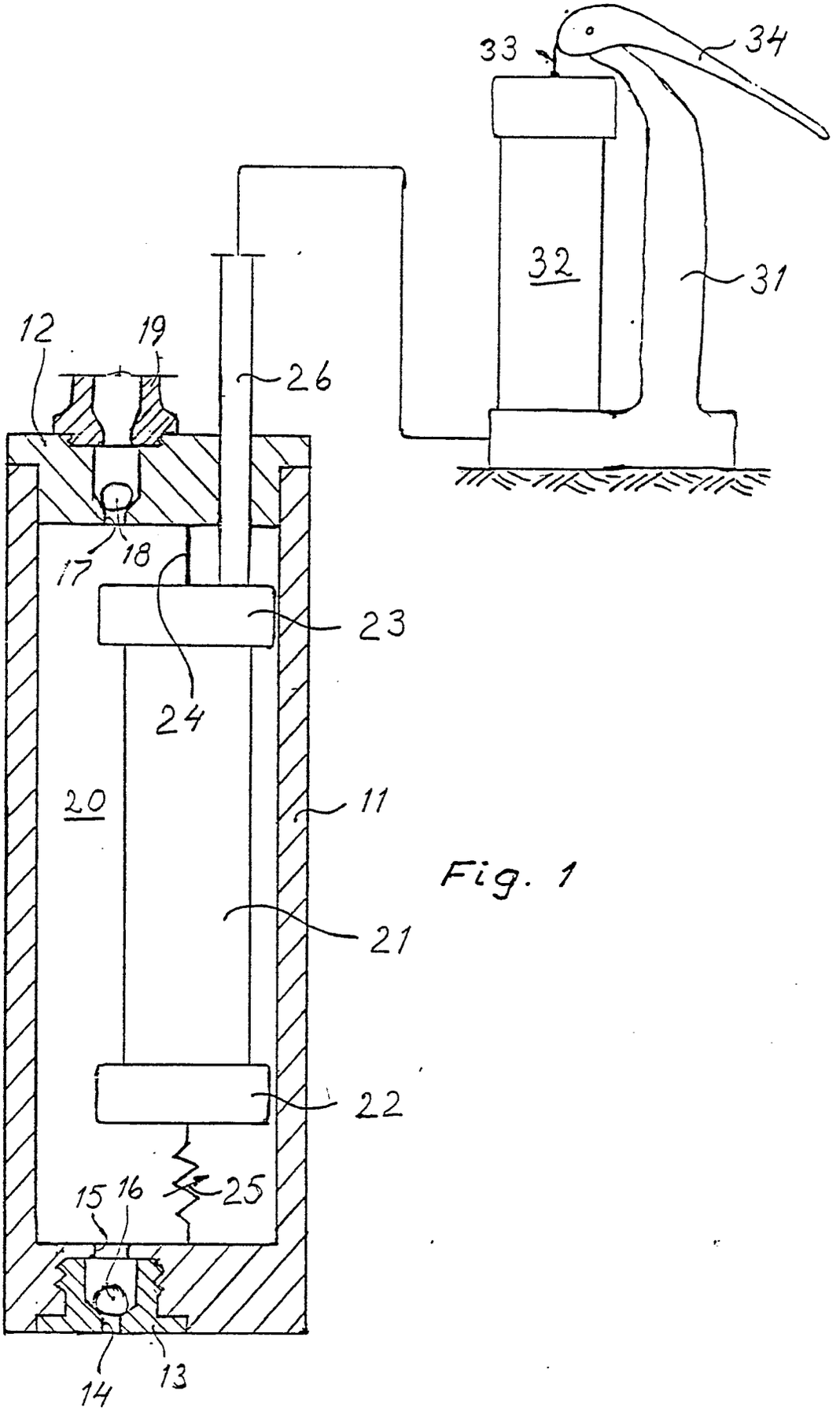


Fig. 1

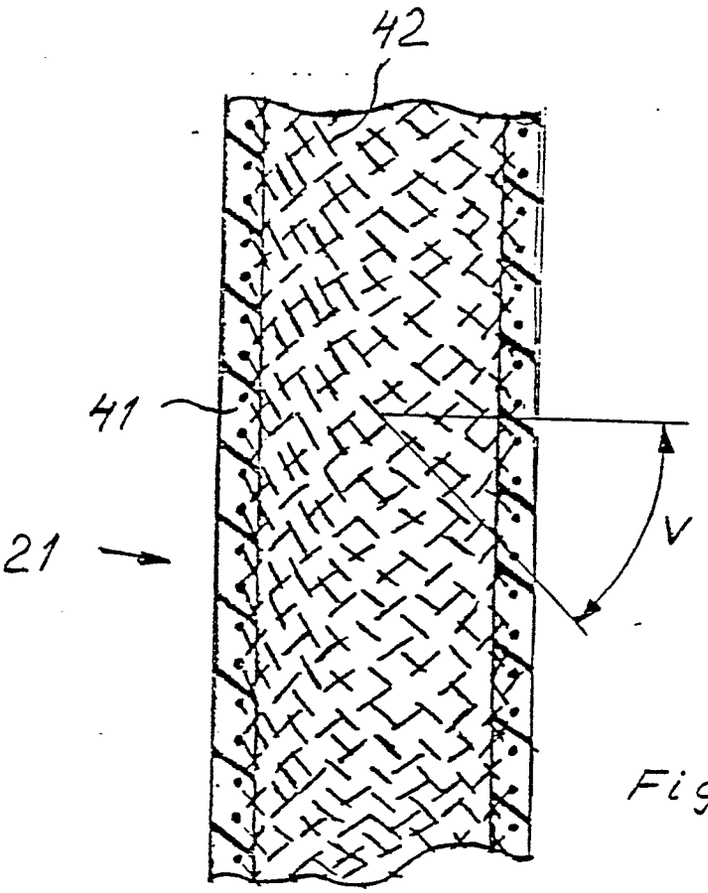


Fig.2

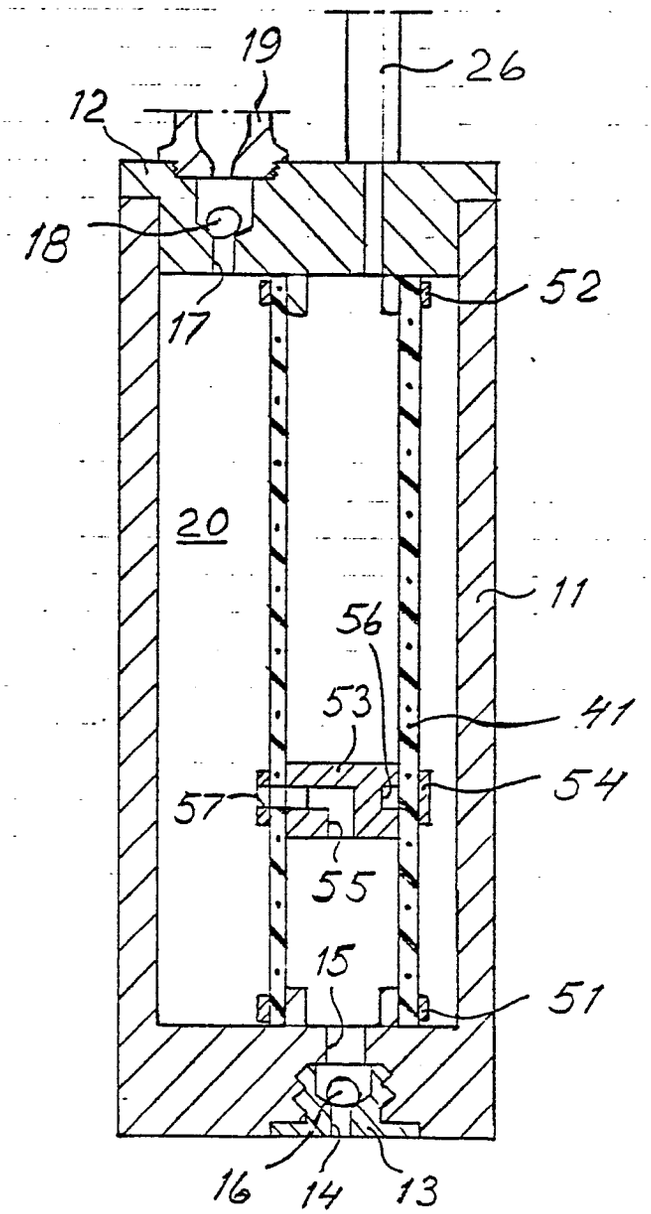


Fig. 3