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S-105 23 Stockholm(SE)(54) **A fluid pump.**

(57) A fluid pump in which an elastic tube (31) provided with helically extending reinforcing threads (42) acts as pump. The pumping is accomplished by moving one end (32) of tube - (31) by means of pressure changes in another elastic tube - (21) connected with tube (31). The two tubes are coaxial.

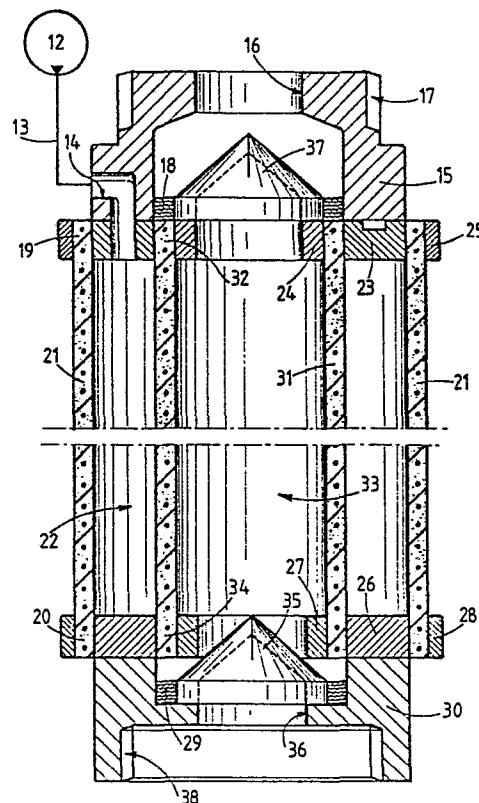


FIG. 1

EP 0 195 758 A2

A fluid pump

The present invention relates to a fluid pump which advantageously can be used for pumping a variety of fluids, e.g. concrete, berries and other food substances.

In order to obtain a cheap and reliable pump it has been suggested to use a tubular element of an elastic material in which helically extending reinforcing threads are embedded. The pump is provided with two check valves as inlet and outlet valves. Pumping is achieved by changing the length of the tubular element. In order to do so one of the ends of the tubular element is moved relative to the other end, which should be fixed because of a high weight resting on the bottom of a well or be clamped to the wall of a well. Both these methods of fixing the pump are disadvantageous. The use of high weight means, of course, means that the pump is heavy to handle since the weight has to be substantial. It has turned out, in most cases, to be impossible to clamp the pump to the wall of a well.

The present invention, which is defined in the appended claims, proposes a fluid pump which is cheap and reliable and which is light and does not need to be fixed in space. The pump can, therefore, be hung in the conduit through which the fluid is delivered. The pump can easily be designed such that it can pump berries or other fragile material without destroying it. The pump can advantageously be used for pumping concrete because it is easy to clean the pump. A number of pumps can easily be connected in series in a conduit to accomplish pumping to substantial heights without the use of high drive pressures.

The invention is exemplified below with reference to the accompanying drawings in which fig 1 shows a section through a pump according to the invention. Fig 2 shows a section through a part of a tubular element used in the invention. Fig 3 shows a section through a valve element used in the pump. Fig 4 shows the valve element from above. Fig 5 shows four pumps connected in series.

The fluid pump shown in fig 1 comprises a tubular member 31 and tube member 21. Tubular member 31 has a first end 32 and a second end 34. Tube member 21 has a first end 19 and a second end 20. The first ends are connected to one another by means of clamping. Rings 23,24,25 are used for the clamping. The second ends are similarly clamped to one another by means of rings 26,27,28. Tubular member 31 and tube member 21 may be tensioned relative to one another before they are clamped together in order to optimize the pump for a given counter-pressure. Tubular member 31 is provided with a pump chamber 33, an inlet valve 35 through which fluid is entered into the pump chamber and an outlet valve 37 through which fluid is delivered from the pump chamber. Valve element 35 is mounted in an end piece 30 by means of an elastic ring 29. End piece 30 is provided with an inlet opening 36 and a thread 38 for connection to a conduit or another pump. End piece 30 is connected with ring 26. The pump is provided with another end piece 15 which is connected with ring 23. Valve element 37 is held in end piece 15 by an elastic ring 18. End piece 15 is provided with an outlet opening 16 and a thread 17 for connection to a conduit or another pump. A space 22 is provided inside tube member 21. This space is via a channel 14 and a conduit 13 connected to a fluid pressure source 12 of variable pressure.

Tube member 21, the same is valid for tubular member 31, comprises a tube 41 in which reinforcing threads 42 are embedded. Threads 42 extend helically along the tube at a pitch angle α . The threads extend in both directions. In the

pump shown in fig 1 tube member 21 has a pitch angle of 20° and tubular member 31 a pitch angle of 60° . The values are thus on either side of the value $\arccot(\sqrt{2})$, approx 35.3° . This means that when space 22 is pressurized tube member 21 is lengthened and the volume of space 22 increased. As a result tubular member 31 is lengthened. The volume of pump chamber 33 is then as a result of the pitch angle decreased so that fluid is pushed out from the pump chamber. Pumping is accomplished by successively pressurizing and depressurizing space 22. In the fig 1 example the pump chamber is in the centre with space 22 extending about tubular member 31, although these volumes could be arranged in the opposite way.

The valves, exemplified by outlet valve 37, comprise a metal ring 51 to which a rubber cone 52 has been vulcanized. The rubber cone has been provided with cuts 53 in form of a cross. The valves act as check valves.

In the example shown in fig 5 four pumps 61,62,63,64 are connected in series. The arrangement of several pumps, the number being virtually unlimited, in series makes it possible to raise a fluid to a desired height without using unduly high pressures. Many fluids, e.g. certain types of concrete, must not be exerted to high pressures if the quality of the product is to be maintained. Space 22 of pumps 61 and 63 are via a conduit 65 connected to valve 67. Space 22 of pumps 62 and 64 are via a conduit 66 connected to valve 67. Valve 67 is via a conduit 69 connected to a fluid pressure source 68. One of conduits 65 and 66 is pressurized while the other is depressurized depending on the position of valve 67. Valve 67 is shown as manually operated. However, it is understood that the operation can be automated.

Claims

1. A fluid pump comprising a tubular member (31) provided with a pump chamber (33), an inlet valve (35) through which fluid is entered into the pump chamber, an outlet valve (37) through which fluid is delivered from the pump chamber, said tubular member being made of an elastic material (41) in which reinforcing threads (42) are embedded, said threads extending helically along the tubular member, and actuating means (21) for moving a first end (32) of the tubular member relative to a second end (34) of the tubular member to accomplish pumping,

characterized in that said actuating means comprises a tube member (21) being coaxial with said tubular member - (31), said tube member being made of an elastic material - (41) in which reinforcing threads (42) are embedded, said threads extending helically along the tube member, each end of said tube member being connected to an end of the tubular member, and that a space (22) inside the tube member is connected to a fluid pressure source (12) of variable pressure.

2. A fluid pump according to claim 1,

characterized in that the pitch angles of the reinforcing threads (42) of said tube (21) and tubular (31) members have values on either side of $\arccot(\sqrt{2})$.

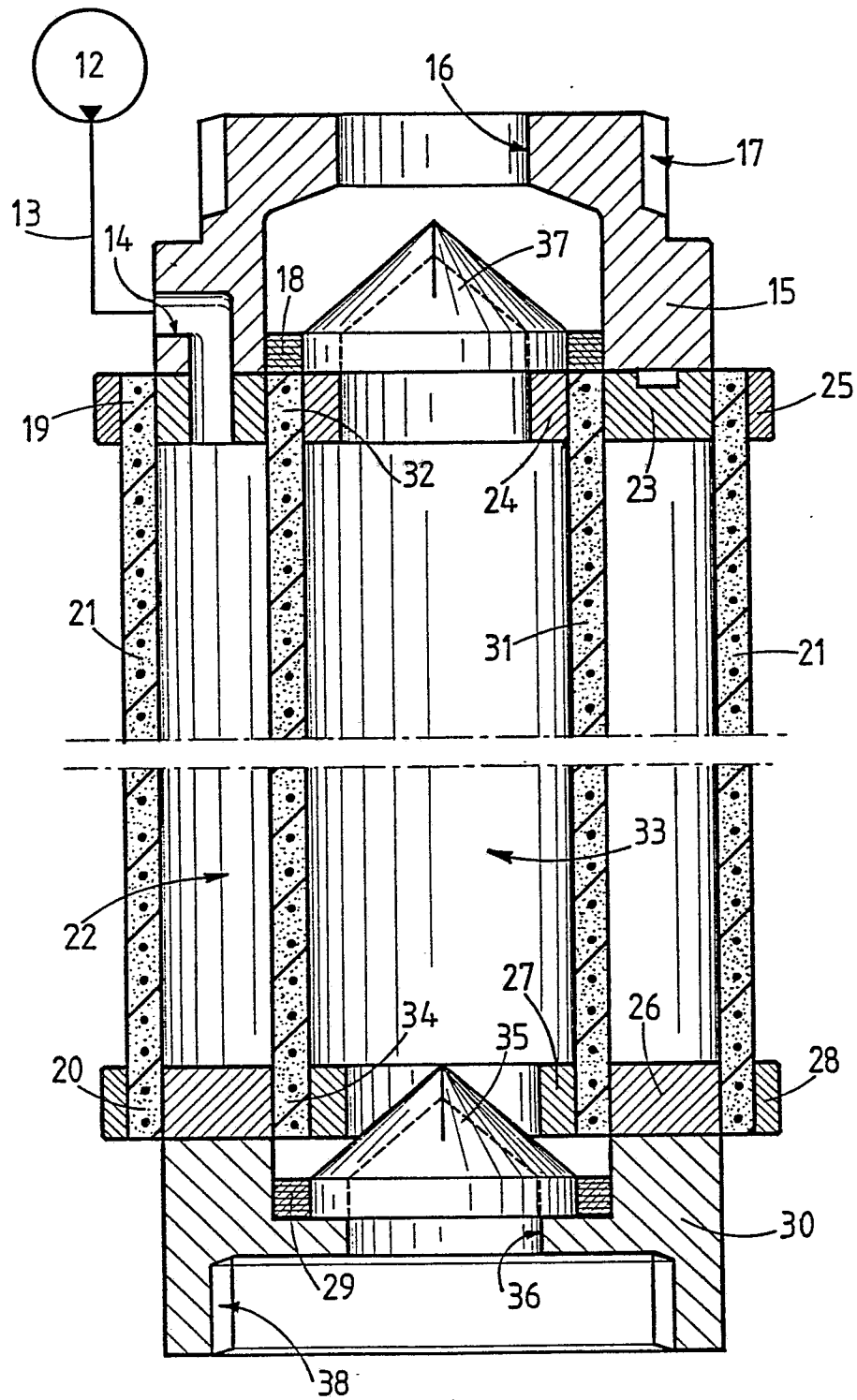


FIG. 1

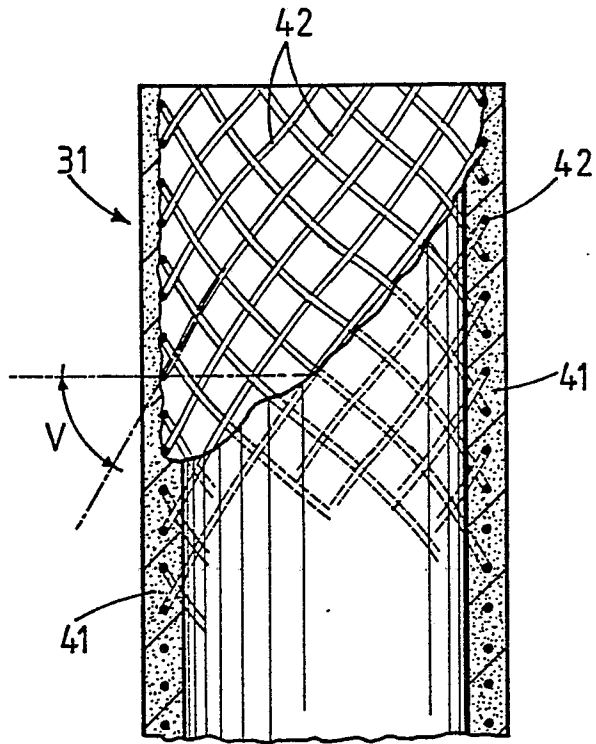


FIG. 2

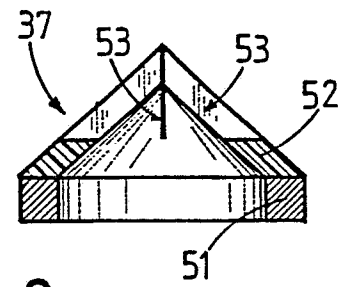


FIG. 3

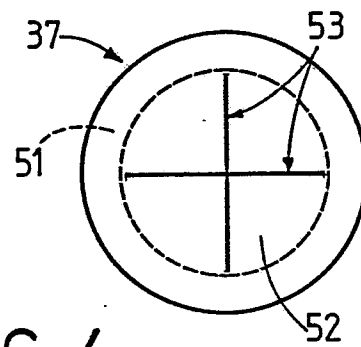


FIG. 4

FIG. 5

