

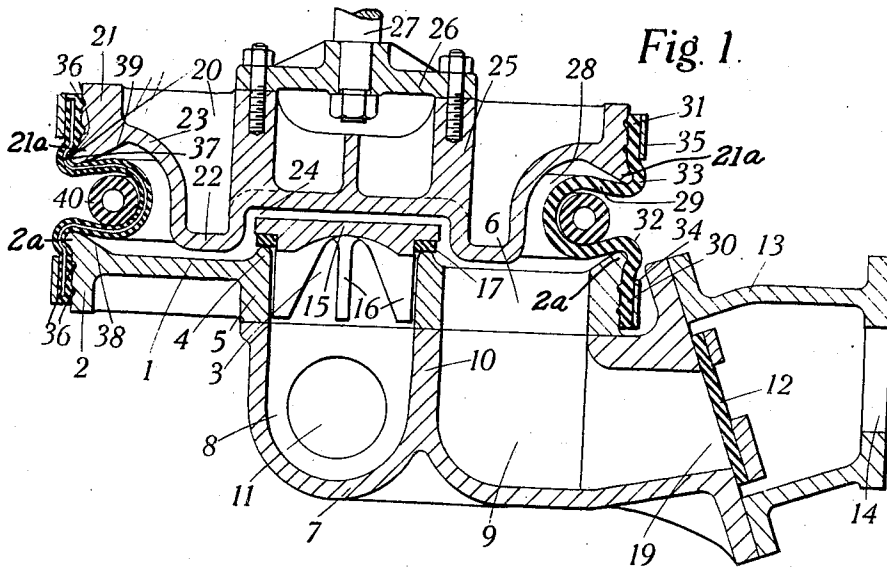
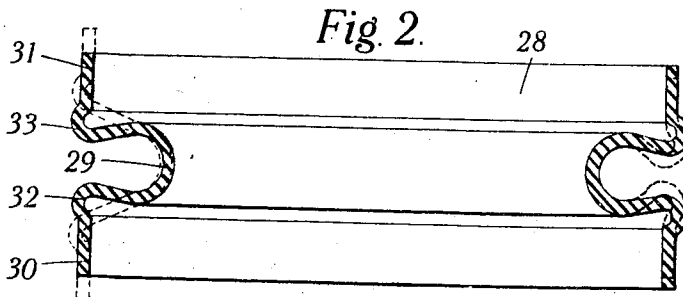
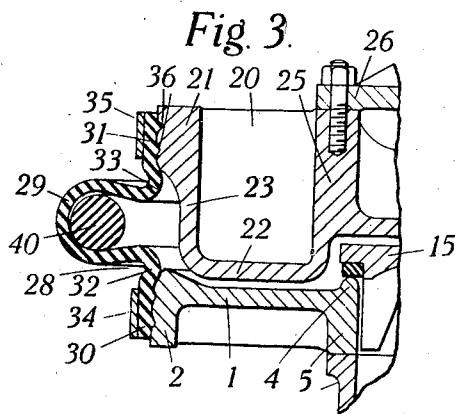
Nov. 14, 1939.

C. W. STANCLIFFE

2,180,128

RECIPROCATING PUMP

Filed July 7, 1937



INVENTOR
Cecil Wheatley Stancliffe
BY

Munn Anderson & Liddy
ATTORNEYS

UNITED STATES PATENT OFFICE

2,180,128

RECIPROCATING PUMP

Cecil Wheatley Stancliffe, London, England, assignor of one-half to Winget Limited, Rochester, Kent, England

Application July 7, 1937, Serial No. 152,306
In Great Britain June 15, 1937

5 Claims. (Cl. 103—148)

This invention relates to reciprocating pumps and specially, though not essentially, to contractors' pumps such as are used for pumping water from excavations.

5 An object of the invention is to provide an improved form of reciprocating pump operating by the alternate increase and decrease of the volume of the pump body.

10 Another object of the invention is to provide an improved form of reciprocating pump in which the volume of the pump body is alternatively increased and decreased by separating and approaching the edges of an annular member of open channel section forming part of the wall of the pump body.

15 Yet another object of the invention is to provide improved means for permitting the alternate increase and decrease of the volume of the body of a reciprocating pump.

20 Yet another object of the invention is to provide an improved form of reciprocating pump operating by the alternate increase and decrease of the volume of the pump body in which relatively movable members of the pump body are connected by members of open channel section which during operation of the pump change in curvature over the greater part of the channel section thereby reducing the stresses in these members and increasing their life.

25 Various other objects and advantages of the invention will appear from the following description of particular embodiments of the invention in which reference is made to the accompanying drawing, the novel features being pointed out in the appended claims.

30 In the drawing:

35 Fig. 1 is a cross-sectional view of one form of the improved pump,

40 Fig. 2 is a section through one form of diaphragm in the unstretched position, the forms taken by the diaphragm in its extreme positions being indicated in dotted lines,

45 Fig. 3 is a cross-sectional view, with certain parts broken away, of a modified form of pump.

50 The pump shown in Fig. 1 has a bottom member comprising a circular plate 1 of dished form with a surrounding cylindrical flange 2 and a circumferential shoulder 2a. An inlet passage 3 is formed in the centre of the plate, this passage being of cylindrical form and defined by a rim 4 on the upper side of the plate 1 and by a projecting cylindrical portion 5 on the lower side of the plate.

55 An outlet passage 6 is provided by a cy-

lindrical hole formed in the plate to one side of the centre thereof.

The plate 1 is mounted on a casting 7 formed with chambers 8 and 9 separated by a partition 10.

The chamber 8 communicates directly with the passage 3 in the plate 1 and is provided with an inlet 11. The chamber 9 communicates at one end directly with the outlet passage 6 in the plate 1 and at the other end has an outlet 19 closed by a flap valve 12. The valve 12 is self-closing due to its weight but on the establishing of a pressure in the chamber 9, the valve 12 lifts to permit the discharge of fluid from the pump.

15 A casing 13 fixed to the casting 7 surrounds the valve 12 and has an outlet 14, which may be connected to pipes or the like to deliver the discharge from the pump at the desired place.

20 The inlet passage 3 is closed by an automatic lift valve 15 comprising a cylindrical plate with extending legs 16 to guide the valve in its movement and with a washer 17 of rubber or similar material seating, in the closed position of the valve, on the rim 4.

25 The pump has an upper member 20 comprising a cylindrical flange 21, of the same external diameter as the rim 2 of the bottom member 1, and circular plate portion 22, the portions 21 and 22 being joined by a wall portion 23 which as shown is concave in cross-section. The flange 21 has a circumferential shoulder 21a, said shoulder being in confronting relationship to the circumferential shoulder 2a.

30 The plate portion 22 is formed with a central recess 24 so that the lower member and the upper member of the pump can be brought close together with minimum clearance between their plate portions 1 and 22, the valve 15 being then received in the recess 24.

35 The upper member 20 of the pump has a central boss 25 projecting on its upper side and a spider 26 rigidly attached to a connecting rod 27 is fixed to the boss 25. The rod 27 is reciprocated by any suitable means, which may be of any conventional form and is not therefore illustrated.

40 The upper and lower members of the pump are connected together by an annular member 28, of resilient material such as rubber, hereinafter termed a diaphragm.

45 The diaphragm 28 comprises an annular open channel portion 29 and flange portions 30 and 31. The diaphragm may be moulded of rubber, reinforced with canvas or similar backing in a manner similar to that in which the outer cover of a pneumatic tire is made. The diaphragm is in fact preferably similar in material and in the

55

method by which it is made to such an outer cover and resembles it in cross-section.

A suitable form of diaphragm 28 is shown in Fig. 2 in which the full lines represent the cross-section of the diaphragm in its unstretched position, that is in the form in which it is made. The channel portion 29 of the diaphragm is in cross-section an arc of a circle extending somewhat over 180° and is connected to the flange portions 30 and 31 by bead portions 32 and 33 running smoothly into the channel portion. Said bead portions overlie the confronting shoulders 2a, 21a, the latter being both rounded and outstanding from the surfaces of the flanges 2, 21, to provide extended bending zones for the diaphragm.

The diaphragm 28 is fixed to the bottom member of the pump by a circular clip 34 surrounding the flange 30 of the diaphragm and clamping it against the flange 2 of the base member. In a similar way, a circular clip 35 clamps the flange 31 of the diaphragm 28 to the flange 21 of the upper member 20.

In order to improve the adhesion of the diaphragm to the bottom and upper members, the flanges 30 and 31 are formed with circumferential ridges 36 which engage in corresponding recesses in the flanges 2 and 21 respectively.

The diaphragm 28 may be reinforced by metal spring members 37 shaped to correspond to the section of the diaphragm and embedded in the diaphragm at spaced intervals. In this case the stresses in the diaphragm as it is distorted are borne mainly by the members 37 and the rubber or other material in which the members are embedded serves mainly to prevent leakage of the fluid being pumped.

The diaphragm 28 is arranged with the opening of its channel portion directed outwardly, the channel portion being received in the recess formed by the concave wall portion 23 of the upper member and the plate 1 of the bottom member. The edges of these members, as shown in Fig. 1 slope inwardly at 38 and 39 so that the movement of the walls of the diaphragm is not obstructed.

A ring 40 of rubber or similar material is inserted in the open channel of the diaphragm and serves to prevent the collapse of the diaphragm due to pressure of fluid in the pump. This ring 40 is of such internal diameter that the diaphragm 28 can be stretched by the upward movement of the upper member 20 without exerting radial pressure on the ring. The cross-section of the ring 40 is such that when the channel section of the diaphragm 28 is closed or contracted, its inner surface conforms substantially to the surface of the ring.

The ring 40 may be a thick walled tube as in Fig. 1 or may be solid as in Fig. 3, or other suitable inserts may be used.

When the pump is placed with the inlet 11 under the level of the water to be pumped, reciprocation of the rod 27 causes the upper member 20 to be lifted and thereby increases the volume of the space between the upper and lower members of the pump. The suction thus produced draws the water into the pump through the inlet 11 lifting the valve 15 and causing the water to enter the body of the pump. On the return stroke of the rod 27, the upper member 20 approaches the lower member and water is expelled through the valve 12.

During the reciprocation of the upper member 20 the edges of the channel section of the dia-

phragm are alternately separated and brought closer together, the diaphragm 28 changing in form as shown in Fig. 2. At the top of the stroke, when the upper member is furthest from the lower member, the diaphragm takes the form shown in dotted lines at the left hand side of Fig. 2 and at the bottom of the stroke it takes the form shown in dotted lines at the right hand side of Fig. 2. It will be seen that the action is mainly of the nature of an alternate increase and reduction of a somewhat gradual curvature distributed over the greater part of the wall of the diaphragm. The stresses set up in the diaphragm are thus well distributed throughout the material and are largely reduced thereby increasing the effective life of the diaphragm.

A modified form of the pump is shown in Fig. 3. In this case, the diaphragm 28 is arranged with the opening of its channel section directed inwardly so that the diaphragm 28 surrounds the pump body. A ring 40 is loosely mounted in the channel section and is of such external diameter that substantially no radial pressure is exerted on the ring when the diaphragm is stretched by the upward movement of the upper member 20. The wall 23 of the upper member connecting the flange 21 to the plate portion 22 need not in this case be concave. In all other respects, this form of engine may be similar to that described above with reference to Fig. 1.

In some cases, more than one diaphragm may be used in series, arranged either internally of the pump body as in Fig. 1 or externally as in Fig. 3. Such duplication of the resilient members permits of increasing the effective stroke of the pump and prevents undue strain in the material of the diaphragms.

In such cases, the diaphragms are supported against collapse by rings or similar members arranged between successive diaphragms. Flanges on adjacent diaphragms may be clipped to these supporting rings or the diaphragm may be moulded with two or more open-ended channels, the supporting rings being provided between the channels.

The outlet of the pump may be arranged to deliver the liquid into a pipe or conduit extending above the pump so that the pump may function as a lift pump.

It will be understood that the invention is not restricted to the details of the specific forms described above but that it includes such modifications therein as come within the broad ideas underlying the invention.

I claim:

1. In a reciprocating pump, an annular rubber member of open channel section, and a plurality of resilient metal members connected intimately with the rubber member and following the contour thereof in the axial direction of said member.

2. In a reciprocating pump, an annular rubber member of open channel section, having embedded therein at intervals, around its circumference, a plurality of resilient metallic supports of shapes corresponding to the cross-section of the rubber member.

3. In a reciprocating pump, an annular flexible member of open channel section, having embedded therein at intervals around its circumference a plurality of resilient metallic supports of shapes corresponding to the cross-section of the flexible members and a ring-shaped supporting member mounted loosely in and substantially

filling the open channel of the flexible member while said member is substantially contracted.

4. In a reciprocating pump, a cylindrical diaphragm having a medial open channel portion, terminal cylindrical flanges to which the said channel portion is joined, bead portions at the juncture of the channel portion to the flanges, and a resilient ring lying loosely in said open channel portion while said diaphragm is substantially contracted.

5. In a reciprocating pump comprising a bottom member having a cylindrical flange and a

circumferentially outstanding, rounded shoulder, a top member having a cylindrical flange and a circumferentially outstanding, rounded shoulder, said shoulders being in confronting relationship, a cylindrical diaphragm having a portion of open channel section, terminal flanges on said channel portion being fitted upon the respective cylindrical flanges and having bead portions overlying the outstanding shoulders, and means securing the terminal flanges to the cylindrical flanges.

CECIL WHEATLEY STANCLIFFE.