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S. ROSEN  
PRECISION PUMP

2,907,614

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2 Sheets-Sheet 1

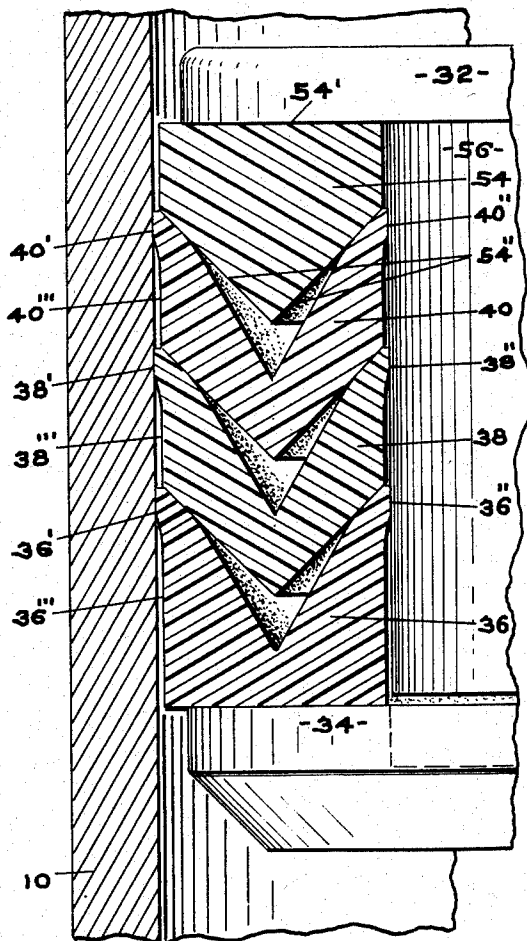


FIG. 6.

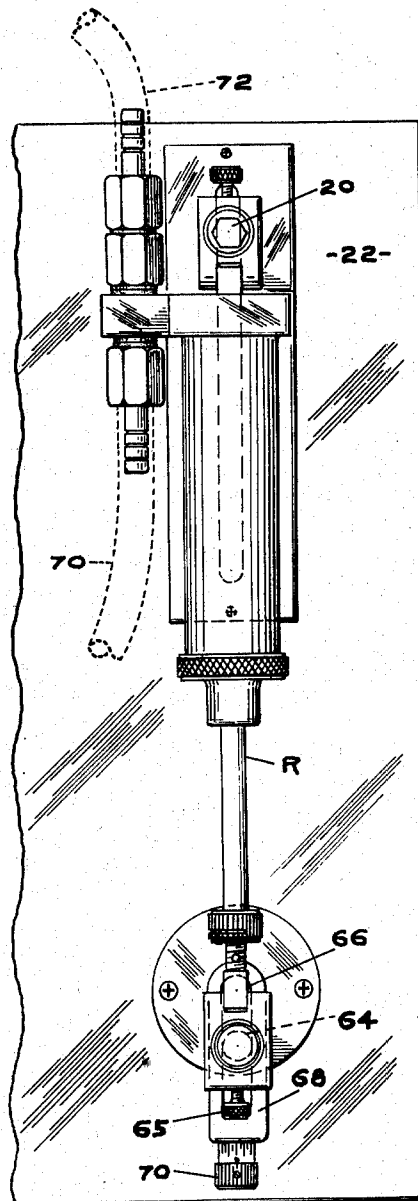


FIG. 1.

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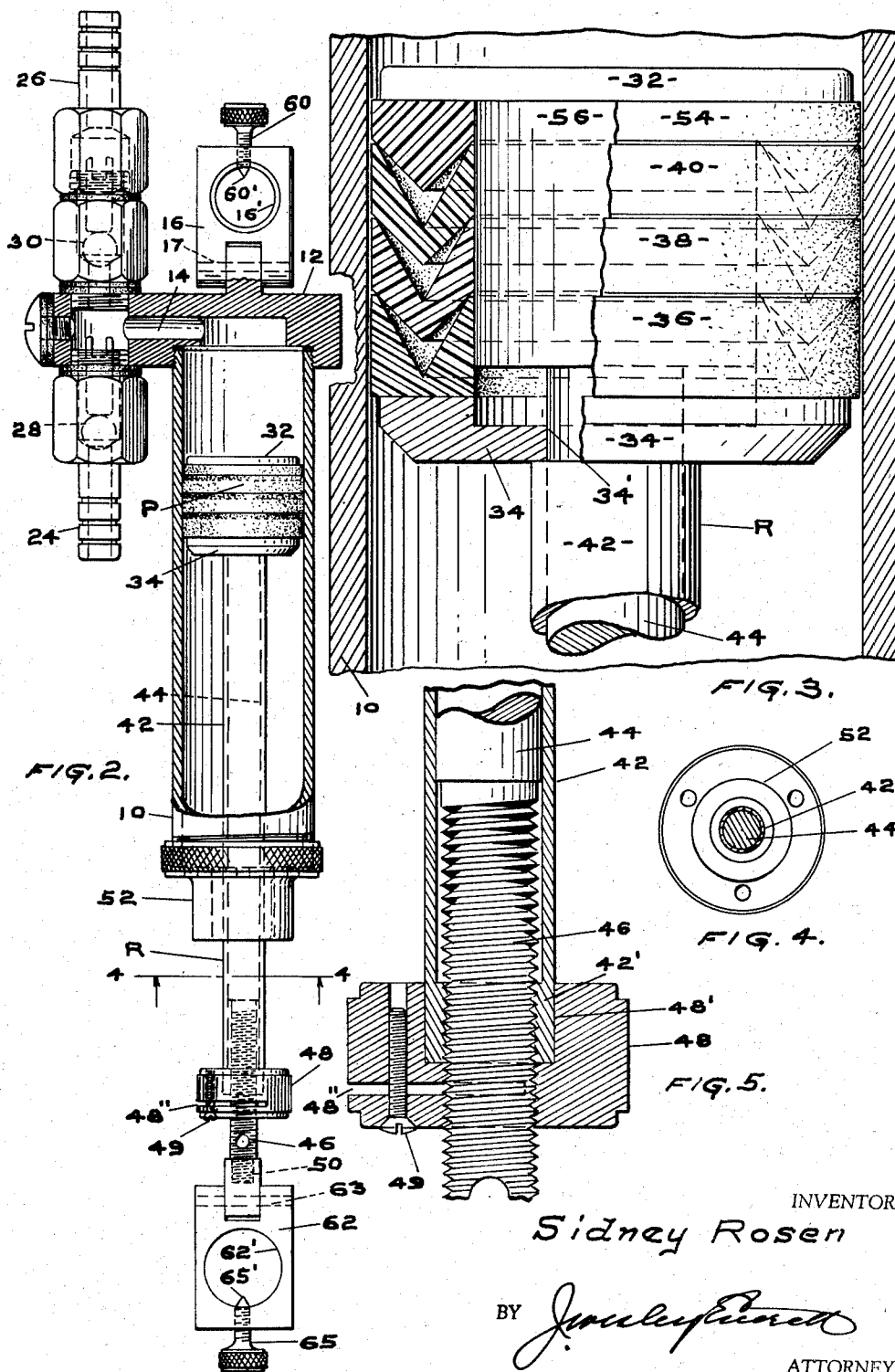
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1

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## PRECISION PUMP

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Application February 25, 1958, Serial No. 717,368

1 Claim. (Cl. 309—4)

The present invention relates to an improved reciprocating pump for pumping predetermined amounts of fluids and particularly to the piston and the piston packing rings. The pump is the type used on filling machine as shown in Patent No. 2,807,213 dated September 24, 1957.

One object of the invention is to provide a piston having a plurality of adjustable elastic piston packing rings.

Another object of the invention is to provide a means associated with a piston supporting rod with means outwardly from the piston for applying pressure to the piston packing rings for changing the diameter of the packing rings.

A further object of the invention is to provide a simple means for making the adjustment of the pressure on the packing rings from a point outside the pump cylinder.

A still further object of the invention is to provide a pump packing ring that will have a minimum of drag on the cylinder wall.

While several objects of invention have been pointed out, other objects, uses and advantages will become more apparent as the nature of the invention is more fully disclosed, consisting in its novel construction, combination and arrangement of its several parts as shown in the accompanying drawing and particularly referred to in the description to follow.

In the drawings:

Figure I is a view in elevation of the pump as it would be carried on a support therefor.

Figure II is an enlarged vertical view of the pump, partly in section and partly in elevation showing the interior of the pump cylinder and the relative position of the pump piston in respect thereto.

Figure III is a greatly enlarged portion of the pump cylinder and piston, partly in section and partly in elevation showing the arrangement of the piston packing when first assembled and without any pressure being applied to the live members.

Figure IV is a sectional view taken on line 4—4 of Figure II.

Figure V is a fragmentary sectional view of several of the elements of the means for adjusting the diameter of the piston packing rings.

Figure VI is a further enlarged sectional view, similar to that shown in Fig. III, illustrating the manner in which the packing rings engage the cylinder wall after pressure has been applied to the rings.

In referring to the drawings like reference numerals are used to point out like and similar parts throughout the several views.

The pump as shown in Fig. I is adapted to operate on the type of filling machine shown in Patent No. 2,807,213 dated September 24, 1957. The pump is provided with a cylinder 10 having one end closed by the member 12. The member 12 is provided with an opening 14 for admitting a fluid to the upper end of the cylinder 10. The member 12 is hingedly connected to a member 16 which

2

is pivotally supported upon a stationary arbor 20 carried on the supporting housing 22, and in which the mechanism is carried for operating the pump. Connected with the opening 14 is an intake pipe 24, and an outlet pipe 26.

5 The direction of the flow of the fluid being controlled by the valves 28 and 30.

Adapted to operate within the cylinder 10 is a piston P, and connected with the piston P is one end of a piston rod R. The piston itself is composed of several parts.

10 The upper end consisting of a plate 32, and the lower end consisting of the plate 34. These piston plates 32 and 34 are movable relative to each other to compress a plurality of elastic piston rings 36, 38, and 40. This movement of the two plates 32 and 34 is accomplished by pressing one end of a tube 42 against the bottom of the plate 34, and connected to the plate 32, is one end of a rod 44, which is adapted to extend outwardly through the tube 42, as shown best in Fig. 2. The plate 34 is provided with a hole which fits closely, but slidably over the rod 44, as drawn at 34'.

20 Adjacent the outer end of the tube 42 there is provided a threaded arm 46, which extends beyond the end of the tube 42, and on this threaded arm there is a threaded nut 48. This nut 48 is fixed to the outer end of the tube by a drive fit, or other suitable means. By rotating the nut 48 the rod 44 and the plate 32 is adjustable relative to the tube 42 and the plate 34 respectively. The nut 46 is slotted on one side, as shown at 48". Extending perpendicular of the slot 48" is a screw 49 for locking the nut to the rod 44. The lower end of the threaded arm 46 is fixed to a hinged member 50, which will be hereinafter referred to. The tube 42 and the rod 44 both make up the piston rod R. The piston rod R is guided in its reciprocating movement by a collar 52 threadably attached to the lower end of the cylinder. The collar 52 also prevents the piston P from being completely withdrawn from the cylinder. However, when it becomes necessary to remove the piston, the collar may be removed by unscrewing it from the cylinder.

As mentioned hereinbefore the elastic piston rings 36, 38 and 40 are adapted to lie between the two piston end plates 32 and 34. There is also an additional ring 54 which acts only to expand the upper edges of the V-shaped ring 40. This ring 54 has a surface 54' adapted to engage the upper plate 32 and a lower V-shaped surface 54" of approximately 45 degrees which is adapted to engage the V-shaped top surface of the ring 40, which has been described as having its upper side wall in the form of a V and at an angle of 60 degrees with the horizontal top surface of the ring. While the rings 36 and 54 are shown with a flat surface to engage the plates 32 and 34, they may be of any convenient form to engage the inner surfaces of the plates.

The packing rings being in the form of a hoop, there is provided a member 56, for filling the space of the piston inwardly from the inner edges of the rings. This member is normally fixed or made a part of the top plate 32. It will be noted that the length of this member 56 is slightly shorter than the distance created by the thickness of the packing rings, as shown best in Figs. III and VI. This is to allow for the plates 32 and 34 to be moved toward each other to compress the rings.

The pump is operated by having its closed end fixed as to location preferably on a box, or cabinet 22, by the arbor 20. The member 16 is provided with an opening 16', which slips over the arbor 20 and is held from being displaced therefrom by a screw 60 having a beveled point 60', which slidably fits into a groove cut about the arbor (not shown). This groove screw allows the member 16 to pivot on the arbor 20. The member 16 is connected to the member 12 by a pin 17, which hinges

the pump cylinder in a plane parallel with the elongated axis of the arbor.

Referring again to the operation of the piston, the member 50 is hingedly connected to the member 62 by a pin 63. The member 62 is similar in construction to the member 61 at the closed end of the cylinder and operates in substantially the same manner. The member 62 is carried on an adjustable pinion 64, which in turn is mounted eccentrically on a rotatable shaft 66, by way of an arm 68. The member 62 is held on the pinion 64 by a screw 65 having a beveled point 65'. Associated with this arm 68 are means for adjusting the pinion 64 relative to the axis of the shaft 66. The adjusting means is operated by the knurled screw head 70. By adjusting the position of the pinion 64 relative to the axis of the shaft 66, the stroke of the piston may be adjusted to different lengths and the pump may be adjusted to pump any predetermined amount of fluid for each stroke of the piston.

The intake pipe 24 is provided with a convenient inlet hose, or pipe 70 which is connected with a fluid supply and the outlet pipe 26 is connected with a convenient outlet hose, or pipe 72 through which the fluid is usually conveyed to smaller vessels, or to other vessels for filling, mixing, etc.

Referring again to the flexible piston rings, it will be noted that the upper edges 36', 38' and 40' of each of the rings 36, 38 and 40 are pressed outwardly in contact with the inner surface of the cylinder wall while the edges 36'', 38'' and 40'' are pressed against the stationary center member 56. With this arrangement the upper outer edges 36', 38' and 40' of the rings are very sensitive in their movement to increase, or decrease their diameters by the movement of the plates 32 and 34. While these rings, in Fig. VI, show their remaining surfaces out of contact with the cylinder wall, it is because the illustrations are on a very large scale. However, in actual practice the remaining surfaces 36''', 38''' and 40''' of the rings do have a wiping contact with the cylinder wall. While many types of elastic material may be used for the rings, the best material found to date is "Teflon," a trade name of E. I. du Pont, for one of their well known synthetic plastic materials.

The piston including the plates 32 and 34 and the piston packing rings 36, 38, 40 and 54 are assembled, as shown in Fig. III, with the packing ring not under pressure. The rod 44 is extended through the tubular member 42, and the nut 48 is run along the thread member 46 until the plates are moved toward each other until the plates are in contact with the rings. Further movement of the plates toward each other will begin to compress the rings forcing the piston packing rings to a point where their outer upper edges 36', 38' and 40' are moved outwardly in contact with the cylinder wall. The screw 49 is set to squeeze the two portions of the nut together to form a self-locking nut.

In operation when the piston is moved away from the closed end, fluid is drawn from the inlet pipes 28 and 70, through the opening 14 in the member 12, and into the cylinder 10. When the piston is moved in the opposite direction the fluid is forced out through the same opening 14, but through the exhaust pipes 26 and 72.

This type of piston packing ring is very efficient in its operation and is easily adjusted to fit the cylinder wall from outside the cylinder.

While the invention has been shown and described in a specific form, it is not intended as a limitation, as the scope of the invention is best defined in the appended claims:

I claim:

A pump assembly in which a piston is adapted to reciprocate within a cylinder for pumping fluids comprising, a cylinder, means at one end of the cylinder through which the fluid is received and discharged, the other end of the cylinder having an opening for slidably receiving a piston rod which extends partly within and without the cylinder, said piston rod comprising an inner rod member and an outer sleeve member, the inner rod member having fixed to its end within the cylinder the innermost end of a piston, the opposite end of the piston comprising a bushing having a central aperture slidably receivable over the inner piston rod member, each piston end being slightly less in diameter than the inner diameter of the cylinder, a shoulder fixed inwardly from the fixed innermost end of the piston and about the end of the inner piston rod adjacent the fixed end of the piston and of larger diameter than the piston rod for receiving a plurality of elastic compression rings in which at least the center rings are of V cross-sectional form with flat side surfaces, the rings being of such width as to fill the space between the shoulder and the inner surface of the wall of the piston, the bushing end of the piston having a recess in its surface adjacent the shoulder for receiving a portion of the shoulder adjacent thereto to allow the bushing to be moved inwardly over the shoulder for a predetermined distance against the compression rings without interference from the shoulder, the sleeve member of the piston rod telescoping the inner rod member from the slidable bushing end of the piston to a point without the piston adjacent the outer end of the inner rod member having its end within the cylinder abutting the surface of the bushing end of the piston about the aperture and opposite the compression rings, the outer end of the inner piston rod member beyond the opening in the cylinder being provided with an external thread and the outer end of the sleeve piston rod member beyond the opening in the cylinder being provided with an internal thread for threadably receiving the threaded end of the inner rod member for fixing the two piston rod members relative to each other and means for locking the two piston rod members in adjusted position, whereby by adjusting the sleeve member relatively to the inner member the sleeve member moves the bushing end of the piston relative to the fixed end of the piston for regulating the pressure on the compression rings and means on the outer end of the inner piston rod member for connecting the same to a crank mechanism.

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