Feb. 24, 1942. C. J. PERRY 2,274,304

PISTON

Filed Sept. 5, 1939 3 Sheets-Sheet 1

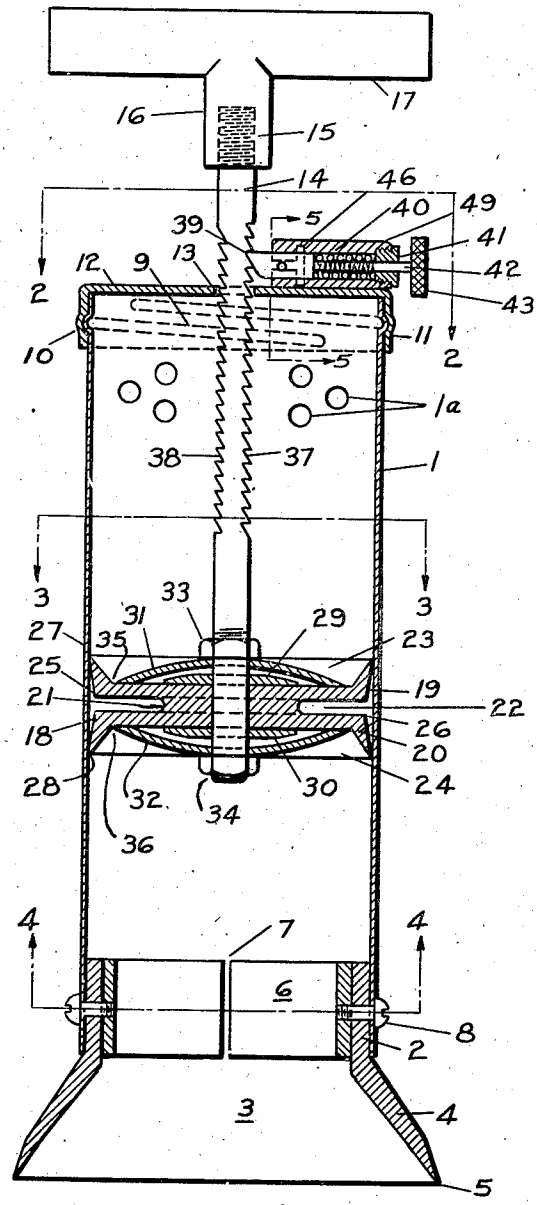

Fig. 1.

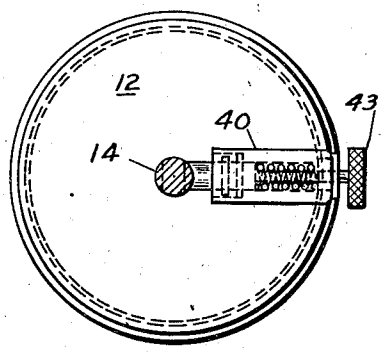

Fig. 2.

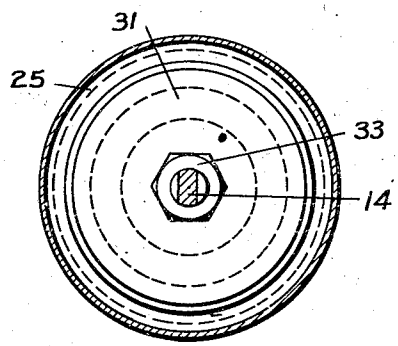

Fig. 3.

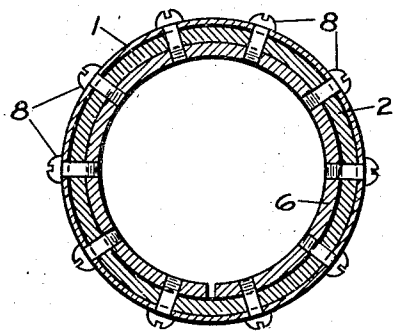

Fig. 4.

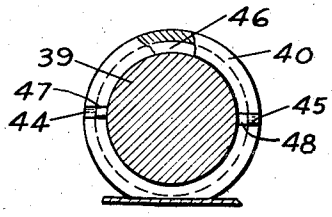

Fig. 5.

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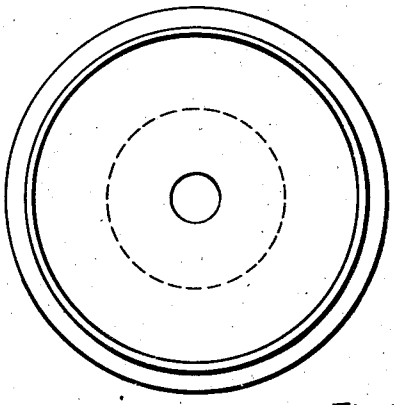

Fig. 7.

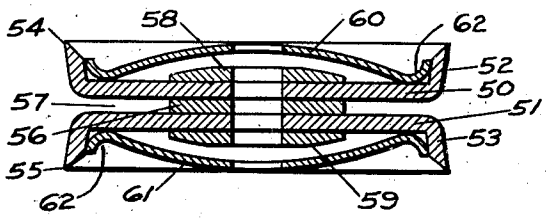

Fig. 6.

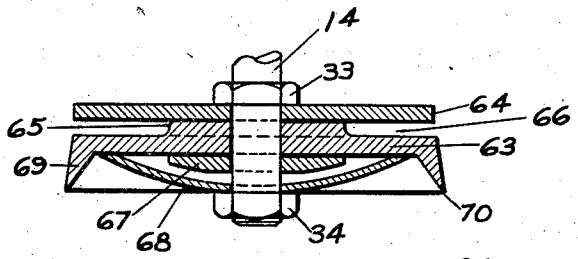

Fig. 8.

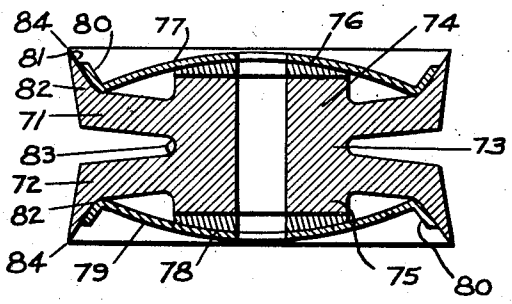

Fig. 9.

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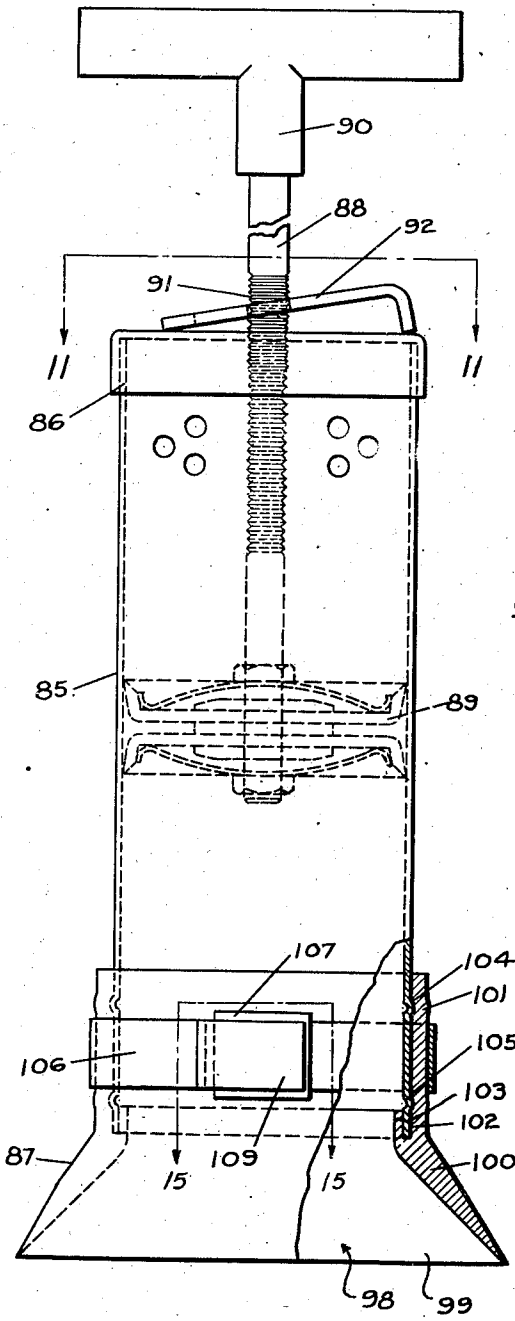

Fig. 10.

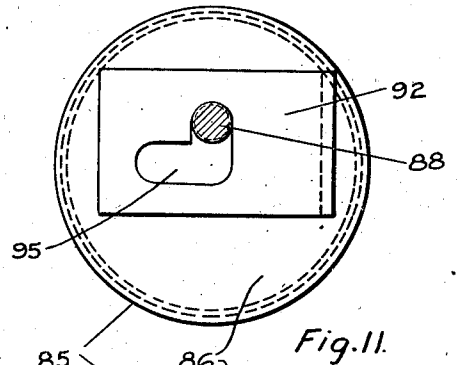

Fig. 11.

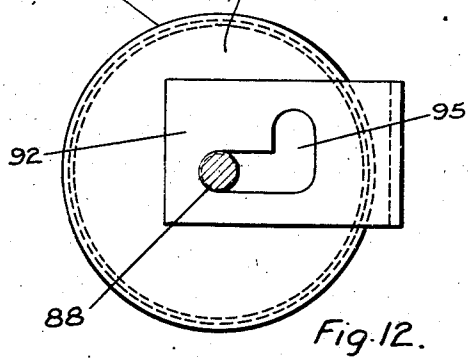

Fig. 12.

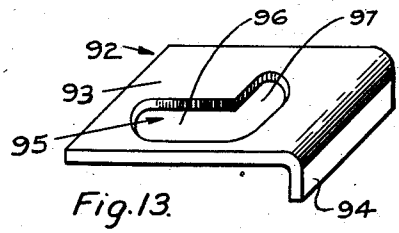

Fig. 13.

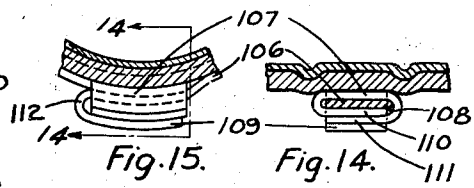

Fig. 15. Fig. 14.

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UNITED STATES PATENT OFFICE

2,274,304

PISTON

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Application September 5, 1939, Serial No. 293,424

6 Claims. (Cl. 309—4)

This invention relates to improvements in means for creating a vacuum and/or pressure within confined spaces. The means consist principally of a cylinder provided with a novel piston which has an extension for manual operation thereof. One end of the cylinder is provided with a resilient cup so as to make an air tight seal with the surface to which it is to be temporarily attached. The piston is free to be readily reciprocated by hand so as to cause agitation of fluids and solids, such as the cloggings in a drain pipe, in order to loosen them. When the solids are loosened, a high positive pressure or vacuum, may be exerted to remove them. This is done by forcing the piston forwardly in the cylinder or rearwardly respectively. Such a device is commonly called a plumber's force and suction pump, but such a term for applicant's device is purposely avoided.

Applicant's invention is not limited, however, to the use of clearing drains and the like, but has a general utilitarian use and may be used for attachment to various surfaces which are to be removed, and which generally are very difficult to remove by ordinary manual means. Such a surface may be the lens and its peripheral shell of an automobile head lamp. For such a use, automatic means are provided to hold the vacuum in the cylinder so that the hands of the operator are free for turning the cylinder and hence the surface to which it is attached. There are various kinds of removable cylinder ends and the like which are hard to remove or practically impossible to remove unless some particular tool is at hand, but with applicant's suction tool, they can be removed with ease.

An object of the invention is to present a device which is simple in construction, can be economically manufactured, and which is very effective for creating pressures and/or vacuums or in causing agitation of fluids and solids in clogged pipes and the like.

Another object is to provide a suction device capable of holding tightly to a surface which is to be shifted or removed by either a direct pull or by torsion.

Still another object is to provide novel constructed pistons, for vacuum and/or pressure cylinders, which are resilient and designed to snugly slide along the bore of the cylinder in a perfectly fluid tight fit.

And still another object is to provide a vacuum and/or pressure device which automatically holds the pressure or vacuum condition as long as the connector or coupler of the device is firmly attached to a surface.

Other objects, advantages and features of my invention will appear from the accompanying drawings, the subjoined detailed description, the preamble of these specifications and the appended claims.

Applicant is about to illustrate and describe one or more forms of his invention in order to teach one how to make, use and vend the same, but it is to be understood that the drawings and description thereof are not to limit the invention in any sense whatsoever, except as limited by the appended claims.

In the drawings:

Fig. 1 shows the invention in longitudinal section.

Fig. 2 shows the invention taken substantially along the line 2—2 of Fig. 1.

Fig. 3 shows a section taken substantially along the line 3—3 of Fig. 1.

Fig. 4 is a section taken substantially along the line 4—4 of Fig. 1, looking in the direction indicated by the arrows.

Fig. 5 is a section taken along the line 5—5 of Fig. 1.

Fig. 6 shows a cross section of a modified form of a part of the invention.

Fig. 7 shows a plan view of Fig. 6.

Fig. 8 shows a cross section of another modified form of a part of the invention.

Fig. 9 shows a cross section of still another modified form of a part of the invention.

Fig. 10 shows another form of the invention, partly in elevation, and partly in section thereof.

Fig. 11 shows a part of the invention taken along the line 11—11 of Fig. 10.

Fig. 12 is a view similar to Fig. 11 but showing a part thereof in a different position.

Fig. 13 shows a part of the invention in perspective view.

Fig. 14 shows a part of the invention taken substantially along the line 14—14 of Fig. 15.

Fig. 15 shows a view, partly in section, taken substantially along line 15—15 of Fig. 10.

Numeral 1 in the drawings represents a cylinder of metal or any other material suitable for the purpose, which is shown as having an opened bottom which is adapted to snugly accommodate a circular wall section 2 of a resilient cup 3. This cup has a flared wall section 4 which terminates in a lower edge 5 which is intended to make contact with any surface, not shown, to make a gas tight seal therewith. Although various resilient materials may be useful as the substance

of such a cup, rubber or some of its derivatives, or compositions containing rubber, may best be suited for the purposes intended.

Within the wall 3 of the cup is a metallic circular band 6 which is cut as at 7 to allow adjustment thereof in order to snugly engage the wall 2 and press firmly against the internal wall of the cylinder 1. A plurality of screws 8 are provided which pass through holes in the cylinder wall and are threadedly engaged with the band 6 as shown.

The upper end of the cylinder is provided with thread-like beads 9 to be engaged by recesses, similar to the beads, in the flange 11 and of the cover 12. This cover is designed to substantially close the top of the cylinder. The cover has a central hole 13 which is of such size as to permit the easy movement of a piston rod 14 therethrough. In order to prevent air friction, a plurality of vent holes 1a are provided in the upper side walls of the cylinder 1.

The top of the piston rod is threaded as indicated by 15 to accommodate the threaded bore of the boss 16 which is fixed to a rod-like handle 17. The end of the rod internally of the cylinder 1 is provided with a piston 18. The piston comprises cups 19 and 20 which are joined together by a spacer portion 21 which is materially less in diameter than the cups so as to provide an annular space 22. The cups are arranged back to back, in the manner shown, so as to have their open sides 23 and 24 facing in opposite directions. Each cup is configurated so as to form circular edges 25 and 26 respectively which have diameters slightly less than the diameter of the cylinder, and acute angled edges 27 and 28 respectively which have diameters substantially equal to the internal diameters of the cylinder.

The cups 19 and 20 and their spacer 21 are preferably one integral piece of resilient material such as rubber, leather or any well known compound of resilient material. Each cup 19 and 20 have hard washers 29 and 30 respectively as well as convexed washers or shells 31 and 32 respectively. The outer edges of the shells contact the resilient cups as shown. The cups 19 and 20, spacer 21 and washers 29 to 32 inclusive have bores to permit the lower end of the piston rod 14 to pass therethrough. The lower end of the piston rod is threaded and provided with nuts 33 and 34, arranged as shown, so that when nuts 33 and 34 are screwed toward one another, the convexed washers 31 and 32 will be brought closer together so that the ends 35 thereof will compress the outer ends of the cups 19 and 20 and thus cause expansion of the outer edges 27 and 28 of the cups so as to bring these edges into gas tight seal with the internal surfaces of the cylinder 1. By this arrangement, withdrawal or upward movement of the piston 18 will cause a suction in the lower part of the cylinder, or the downward movement of the piston will cause pressure in the lower part of the cylinder, such suction or pressure being communicated to any surface or device connected with the cup 3.

In order to hold the piston in any downward or upward position, the rod 14 is provided on one side thereof with a tooth rack 37 and on the other side thereof with a tooth rack 38. These racks are arranged in the manner shown so that when the rack 37 is engaged by the dog 39, downward motion of the rod is arrested whereas when the rack 38 is engaged by the dog 39, upward motion of the rod is arrested. This holding feature enables the device to maintain suction or pressure in the lower portion of the cylinder with at least one hand free for other purposes.

The dog 39 is provided with a cylinder 40 closed at one end thereof by plug 41. The plug has a bore through which slides a rod 42, one end of which is fixed to the center of dog 39 and the other end to a knurled finger knob 43. The cylinder is provided with side slots 44 and 45 which extend into a recessed circular groove 46. Fixed to each side of the dog are short pins 47 and 48 which extend into the slots 44 and 45 respectively, see Fig. 5. Within the bore of the cylinder 40 is a coiled compress spring 49 which constantly urges the dog toward the piston rod 14.

When it is desired to hold the piston near the handle end of the cylinder 1, the dog 39 is positioned with respect to the rack 37 as shown in Fig. 1 of the drawings. But when it is desired to hold the piston at the lower end of the cylinder, the dog is turned upside down by pulling on the knob 43 so as to free the pins 47 and 48 from their respective slots so that they can be turned in the groove 46 and the pin 47 placed in slot 45 and pin 48 placed in slot 44. In order to bring the rack 38 into engagement with the dog, the piston and rod is rotated by turning the handle 17, the handle being turned in a direction not to unthread it from the rod 14.

Fig. 6 shows a modified form of piston to be substituted for the one shown in Fig. 1 of the drawings. This piston comprises two resilient cups 50 and 51 which have angled flanges 52 and 53 respectively. These flanges have bore engaging edges 54 and 55 respectively which maintain gas-tight sliding connection with the bore walls of the cylinder. The cups are spaced apart by a washer 56 to form the space 57. Each cup 50 and 51 is provided with a plain washer 58 and 59 and a convexed washer or curved plates 60 and 61 respectively, as shown. The convex washers have their edges curled as at 62. The cups and washers are provided with holes at their centers to receive the piston rod. When the convexed washers are drawn together, they will cause the edges 54 and 55 to make closer contact with the walls of the cylinder as set forth in the description of Fig. 1.

Fig. 8 shows another form of piston having a resilient cup 63 and a large rigid washer or plate 64. Integral with the cup is a spacer boss 65 to maintain an air space 66 between the washer and cup. Within the cup is a substantially flat washer 67 and a convexed washer 68. The cup has an annular flange 69 which terminates into an annular edge 70 adapted to engage the bore of the cylinder 1. The cup disc and washers have holes to receive the threaded piston rod 14. The usual nuts 33 and 34 are shown for holding the piston to the rod. By drawing the nuts closer together, the edge 70 will be brought into more intimate contact with the internal walls of the cylinder 1.

Fig. 9 illustrates still another form of piston which can be substituted for piston 18 shown in Fig. 1. This piston has cups 71 and 72 joined together by a spacer 73, each cup having a boss portion 74 and 75 respectively. The cups and their respective bosses, and their common spacer, are made as an integral piece from any desirable resilient material. The cup 71 is provided with a small washer 76 and a large convexed washer or curved plate 77; the cup 72 is provided with similar washers 78 and 79. Each convexed washer has a turned rim portion 80 to engage a beveled surface 81 of the flanges 82 of their re-

spective cups. The space between the cups, from their portions 83, diverges outwardly so that there is ample room to allow the bottoms of the flanges 82 of each cup to move for plenty of adjustment of the edges 84 against the internal walls of cylinder 1.

In the form of the invention shown in Figs. 10 to 15 inclusive, the reference character 85 indicates the cylinder which has a closure cap 86 at the upper end and a resilient sealer element 87 at its lower open end. The cap has a central hole through which passes the piston rod 88, the hole being large enough to allow the rod to freely reciprocate therethrough. Within the cylinder is a piston 89 attached to the rod; this piston may be any piston suitable for the purpose, but for the sake of efficient operation, the piston shown in Fig. 6 is indicated.

The piston rod 88 extends above the cap and has its top end provided with a T-shaped handle 90. Threads 91 are shown along the rod to provide friction for a holding plate 92. Although the invention is fully operative with a smooth rod 88, it is preferred to roughen the rod to some extent in order to more securely hold the rod and hence its piston where desired.

The plate means 92 is preferably configurated as shown most clearly in Fig. 13 of the drawings. The plate consists of a flat area 93 with a downwardly turned flange 94. The flat area has an angled slot 95 arranged as shown and large enough to receive the rod 88. There should be only enough free play between the rod and slot sides to allow the plate to take the position shown in Fig. 10 so that it will wedge the rod therein and prevent its movement. The slot has two legs as indicated by 96 and 97. When it is desired to hold the rod in a certain position, the plate 92 is shifted so as to force the rod into the slot leg 97 as clearly shown in Fig. 11. When the rod is in the slot leg 96, the flange is parallel with the sides of the cylinder, see Fig. 12, so that the rod can freely reciprocate through the slot end 96.

The sealer 87 is preferably rubber and has a flared annular opening 98 formed by resilient inclined walls 99 which have a triangular cross-section 100. Integral with the wall 99 is an upstanding annular flange 101 which snugly fits the outer side of the cylinder wall 85. An annular groove 102 is provided and also a short upstanding annular wall 103. The groove snugly engages the lower annular end of the cylinder 85. Annular beads 104 and 105 are provided to increase the gripping action between the cylinder wall and the upstanding flange 101.

In order to securely hold the sealer to the cylinder end, a band or belt of metal 106 is employed. This band is longer than the perimeter of the flange 101 and is provided at one end with an integral end fold 107 having a space 108 adapted to receive the other end 109 of the band in the manner shown in Fig. 15. Where the fold ends 110 and 111 overlap they are soldered or welded. By slipping the end 109 through the fold and pulling it tight around the flange 101, it will securely hold the sealer onto the cylinder ends so that the flange will not slip over the beads 104 and 105. The band is locked by turning it sharply as indicated at 112 and folding it back on itself, see Fig. 15.

Having thus described my invention, what is claimed as new and desired to be secured by Letters Patent is:

1. In a piston for pumps and the like including spaced apart members having peripheral inclined edges adapted to engage the internal walls of a cylinder, curved plate means with a peripheral flange attached to the piston for forcing the edges outwardly, said flange engaging the inclined edges of the members.

2. In a piston for pumps and the like including resilient members having peripheral flanges which terminate into peripheral edges, means separating the members to form relatively large annular spaces between them, curved means adjustable against the members to force the edges thereof outwardly.

3. The piston recited in claim 2 wherein the members and the first recited means are an integral piece.

4. In a piston for pumps and the like including cup-like members joined together at their centers by a short spacer element forming a deep annular recess between the members, peripheral inclined flanges on said members having peripheral edges, curved plates having peripheral flanges resting against the inclined portion of said flanges and adapted to shift the edges outwardly.

5. In a piston for pumps and the like including cup-like members joined together, a spacer between the members forming a deep annular recess, said members having their outer portions divergent with respect to one another, peripheral edges on said members directed in opposite directions, thin plate means having flanges positioned on opposite sides of the piston and adapted to force the edges in an outwardly diametrical direction when the means are drawn toward each other.

6. In a piston having a cup-like member and a plate spaced apart by a central element, a curved plate having its periphery resting against portions of the member, said curved plate being adjustable to force the member and the first recited plate together in order to force the periphery of the member in an outward direction.

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