April 12, 1932. A. V. JENSEN 1,853,430

ROTARY PUMP

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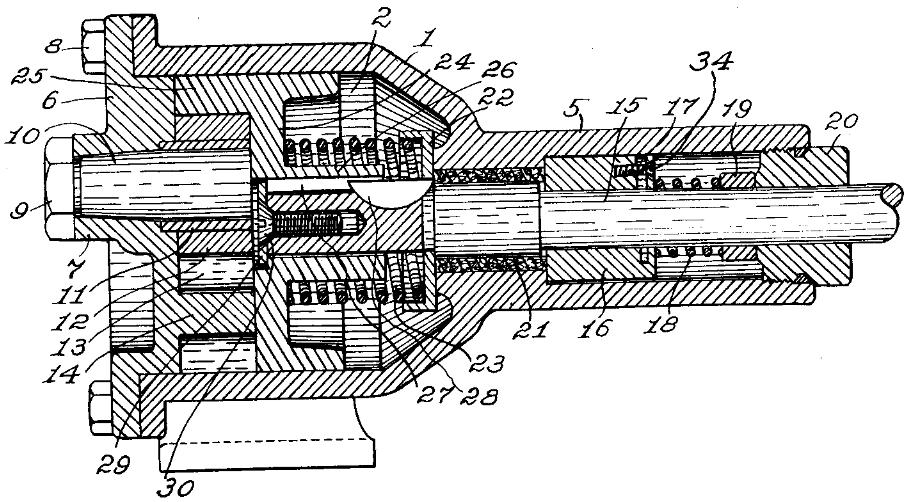
Fig. 1.



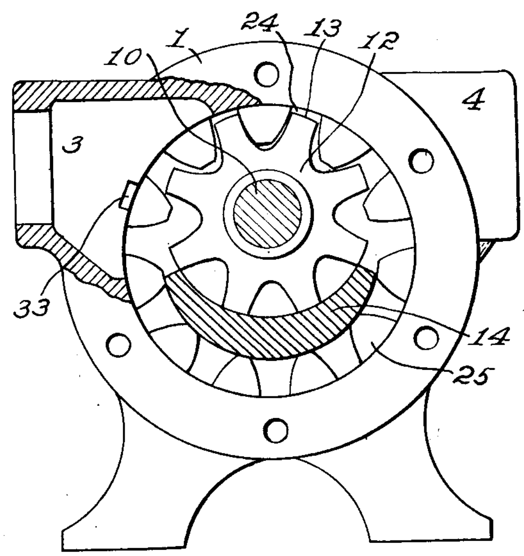


Fig. 4.

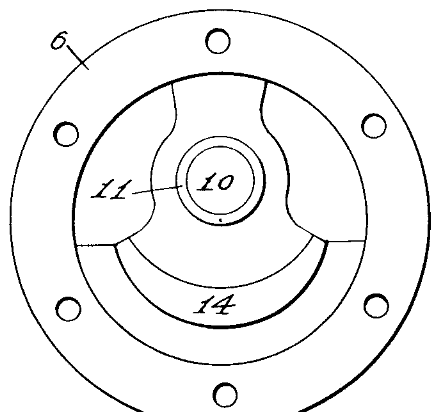


Fig. 5.

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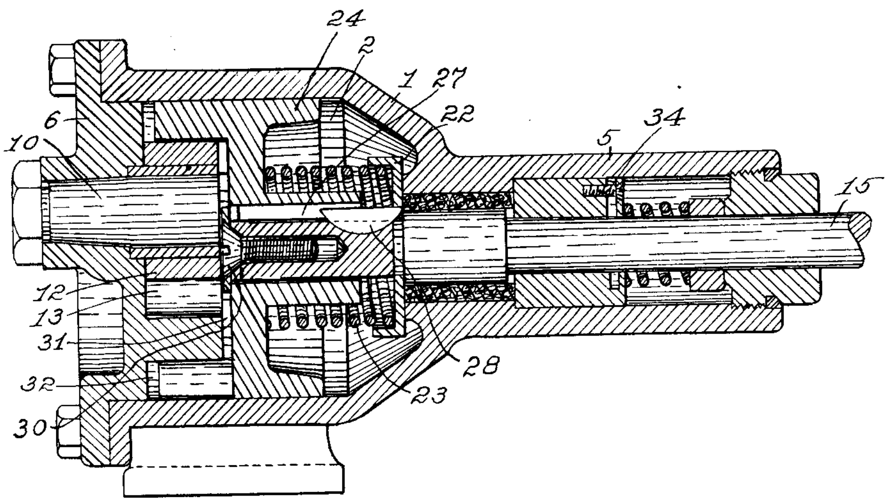
Fig. 2.



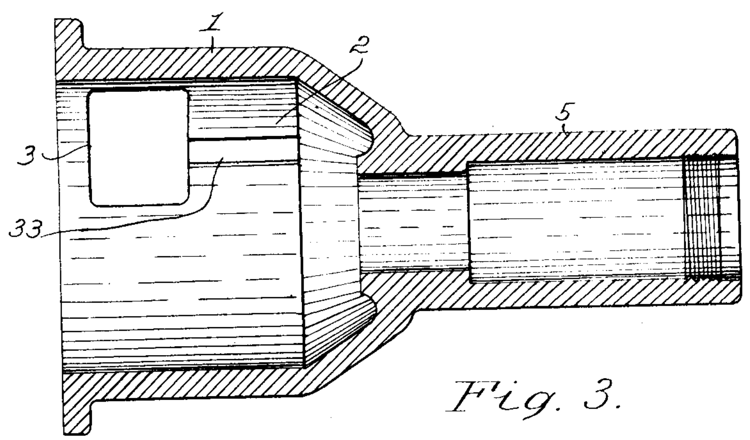


Fig. 3.

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UNITED STATES PATENT OFFICE

AMOS VERNER JENSEN, OF CEDAR FALLS, IOWA, ASSIGNOR TO VIKING PUMP COMPANY, OF CEDAR FALLS, IOWA

ROTARY PUMP

Application filed February 20, 1930. Serial No. 429,962.

My invention relates to improvements in rotary pumps, and the object of my improvement is to so coordinate the fluid propelling elements of such a pump, that a certain degree of back pressure arising in the discharge conduit of the pump under a particular condition of service may be utilized in automatically stopping the fluid propulsion by the creation of a relieving passage between such elements whereby they rotate idly until said particular pressure condition ceases.

This object I have accomplished by the means which are hereinafter described and claimed, and which are illustrated in the accompanying drawings, in which Figs. 1 and 2 are like vertical longitudinal axial sections of my improved rotary pump, Fig. 1 showing the fluid propelling elements operatively engaged as in pumping use, while Fig. 2 shows a displacement of one of said elements to effect the purpose of my invention. Fig. 3 is a vertical longitudinal axial section of the casing only of said pump, with the cover plate removed. Fig. 4 is a front elevation of the pump with the cover plate removed, but showing a part of the latter in place in transverse section, and also showing a portion of the casing body broken away. Fig. 5 is an elevation of the inner face of said cover plate.

It is to be understood that modifications of my device not shown herein are nevertheless within the scope of my invention and protected by the appended claims.

Rotary pumps of the type illustrated are effective for the pumping and delivering of any kind of fluid or liquid. They are used to a great extent in filling stations for the delivery of petrol or other fluid in desired quantities, as by a hose in communication with the discharge port of the pump, the hose having a valve-controlled delivery spout or nozzle for convenience in quickly shutting off the delivery of fluid when the desired quantity has been delivered. This shutting off by the operator usually occurs while the pump is still in active operation. It becomes necessary to automatically prevent the operating pump from bursting the hose or pump by the building up of excessive pressure therein.

It is customary for petrol vending machine manufacturers to build a by-pass relief valve into the pumping system connecting the discharge to the suction line which automatically opens at a predetermined pressure and thus protects the motor, pump and auxiliary equipment from damage due to overload. The building in of a by-pass valve in this manner, by pipe fittings and unions is expensive and not entirely satisfactory due to the multitude of joints which may spring a leak. Furthermore, with a by-pass valve piped from the discharge to the suction line gives rises to an intermediate condition that renders the discharge pressure inaccurate. This is due to the fact that the vacuum in the suction line exerts a pulling force on the valve, thus causing same to relieve at a lower pressure than if no vacuum existed. As metering equipment is designed to function accurately at but one predetermined pressure, and practically all installations have a varying amount of suction lift, the builders of petrol vending aquipment have been confronted with the undesirable necessity of adjusting each particular pumping unit to its own peculiar installation condition. Even then it has been possible to obtain only mediocre results for the reason that as the liquid level in the supply tank lowers the suction lift increases and the relief valve opens at a gradually lower pressure, thus causing the petrol metering equipment to register inaccurately.

My improvement in rotary pumps does away entirely with the necessity of building a by-pass relief valve into the system by means of pipe fittings, thus eliminating expensive labor and the possibilities of leakage of liquids at the many joints.

Furthermore, my invention also eliminates the undesirable effect of vacuum on a relief valve, as a pump built in accordance with the description herein showed a constant discharge relief pressure with the vacuum in the suction line ranging from two to sixteen inches of mercury. Liquid vending equipment manufacturers incorporating my rotary pump invention with their metering systems could place their units in operation without paying heed to the suction lift conditions existing at the various installations for the above reason that the condition of vacuum existing has no effect on the relief pressure for which the pump is built to operate.

The numeral 1 denotes a pump cylinder or casing having an inlet-port 3 and a discharge-port 4 on its opposite side both in communication with the interior space 2 of the casing. The open front of said casing is closed by a cover-plate 6 secured by screws 8. The casing is diminished rearwardly conically to have a cylindrical termination 5 whose central axial hollow receives a rotatable shaft 15 which may be driven by means not shown. Rotatably fitted in the forward casing chamber 2 is a rotor 24 having on its front face the crown teeth 25 ordinarily in mesh with teeth 13 of an internal gear idler 12 rotatably mounted on a bearing-sleeve 11 secured on the inner end of a stub-shaft 10 whose forward part is seated in a bearing-seat fixedly of the cover-plate and its forwardly projecting boss 7, and secured by a nut 9. The shaft 10 is positioned eccentrically relative to the central driving shaft 15. This leaves a gap between the teeth of the rotor and idler in the lower part of the casing which is filled by a crescental boss 14 extending therebetween from the cover-plate 6, so that the teeth of the rotor and idler closely sweep opposite faces of the crescent 14 to close the gap therebetween. The hub 26 of the rotor 24 is centrally hollowed to fit longitudinally slidably upon the forward part of the shaft 15 and is slotted at 27 to receive an arcuate spline 28 seated in a depression in said shaft, whereby the rotor is permitted to have limited lateral movement upon the shaft non-rotatably. A headed screw 30 is seated in a threaded central hole in the forward end of the shaft 15 to secure a fastener washer 29 thereon to hold the rotor upon the shaft.

A shallow rimmed disk 22 is mounted upon the shaft 15 against the forward shoulder of an expanded part thereof, the latter having a bearing-sleeve 21 around it. The disk 22 has a notch which receives the rear portion of the spline 28 to prevent relative rotation of the disk upon the shaft, and a coiled compression spring 23 is seated around the hub 26 of the rotor, engaged with the rear rotor wall and with said disk 22 to its rear, and tends yieldingly to retain the rotor in its forward or working position shown in Fig. 1. To the rear of the bearing-sleeve 21 a collar 16 is mounted on the shaft 15 and has a transverse groove 17 whereby the collar may be immovably locked to the shaft.

This locking of the collar 16 to the shaft is due to the action of a screw 34 which longitudinally crosses the gap at the split of the collar, and when tightened cramps the thin partially separated portion slightly forwardly, to grip bitingly on the shaft at its inner forward angle.

A gland nut 20 closes the enlarged hollow of the part 5 at the rear, and an annular slidable mechanical closer 19 on the shaft 15 is kept engaged with the front face of said nut by pressure of a spring 18 to prevent leakage of lubricating oil outwardly. The spring 18 and mechanical closer 19 at all times rotate together with the shaft and collar 16.

As shown best in Fig. 3, and at one end in Fig. 4, the numeral 33 denotes a shallow longitudinal groove in the inner wall of the casing, and which extends from the rear of the rotor 24 as far as the communication with the suction port 3. This groove provides a means of escape for liquid imprisoned behind the rotor at the instant the discharge pressure forces the rotor back into relieving position.

In case a pump device has a conduit, hose or other delivery device placed in communication with the discharge-port, said delivery device having a valve-controlled or other means for shutting off its delivery, and the pump is working, by closing said valve means, a considerable pressure will arise in said hose or delivery device, creating back pressure upon the intermeshed gears 24 and 12, which serve as coordinated pumping pistons within the casing, and this would in an ordinary pump endanger the hose, or interfere with the pistons in their actions, which may thus cause serious damage to the pump and motor, or other employed driving means. However, it will be perceived that this back pressure in the device illustrated, upon the front face of the rotor 24 causes the rotor to slide rearwardly back upon its shaft 15 within the casing, while compressing the spring 23, as shown in Fig. 2, whereby a by-pass or through gap or passage 31 is opened between the rotor and idler, and rotor and head at 32, permitting the fluid in the discharge-port 4 to by-pass into the suction area, the rotor and idler meanwhile rotating idly under this condition as the motor continues in operation.

The above construction of my device thus largely conduces to the safety and economy of operation, in such situations, where the operator is engaged in duties which at a distance prevent him from shutting off the motor at once.

When the motor is shut off, the back pressure condition is removed, the spring 23 reacts immediately to propel the rotor 24 forwardly into its former working position, the interspaces 31 and 32 then being eliminated.

Having described my invention, what I claim as new, and desire to secure by Letters Patent, is:

1. In a rotary pump, a casing having inlet- and discharge-ports, and pumping mechanism therein for propelling fluid from one

port to the other, of a pair of meshing gears of which one is a resiliently controlled element included in said mechanism adapted to yield by back pressure of fluid in the discharge-port to open a return by-pass through the mechanism, permitting the mechanism without becoming unmeshed to run idly at a predetermined fixed discharge pressure.

2. In a rotary pump, a casing having inlet- and discharge-ports, and coacting mesh geared piston devices mounted rotatably in said casing to propel a fluid from one port to the other, one of said piston devices being resiliently controlled and mounted for limited longitudinal movements to and from the other said piston device without becoming unmeshed, to open a return by-pass between them to one of said ports, permitting both pistons to rotate idly.

3. In a rotary pump, a casing having inlet- and discharge-ports, coacting and intermeshed rotor and idler piston-gears mounted rotatably in said casing intermediate said ports, one of the gears being mounted also for limited longitudinal movement to and from the other gear without becoming unmeshed therefrom while leaving a liquid-by-pass opening between them and between said ports when moved away from the other, and resilient means mounted in the casing to bear yieldingly against said longitudinally movable gear to normally replace it in a working position eliminating said by-pass opening.

In testimony whereof I affix my signature.

AMOS VERNER JENSEN.