

Jan. 3, 1950

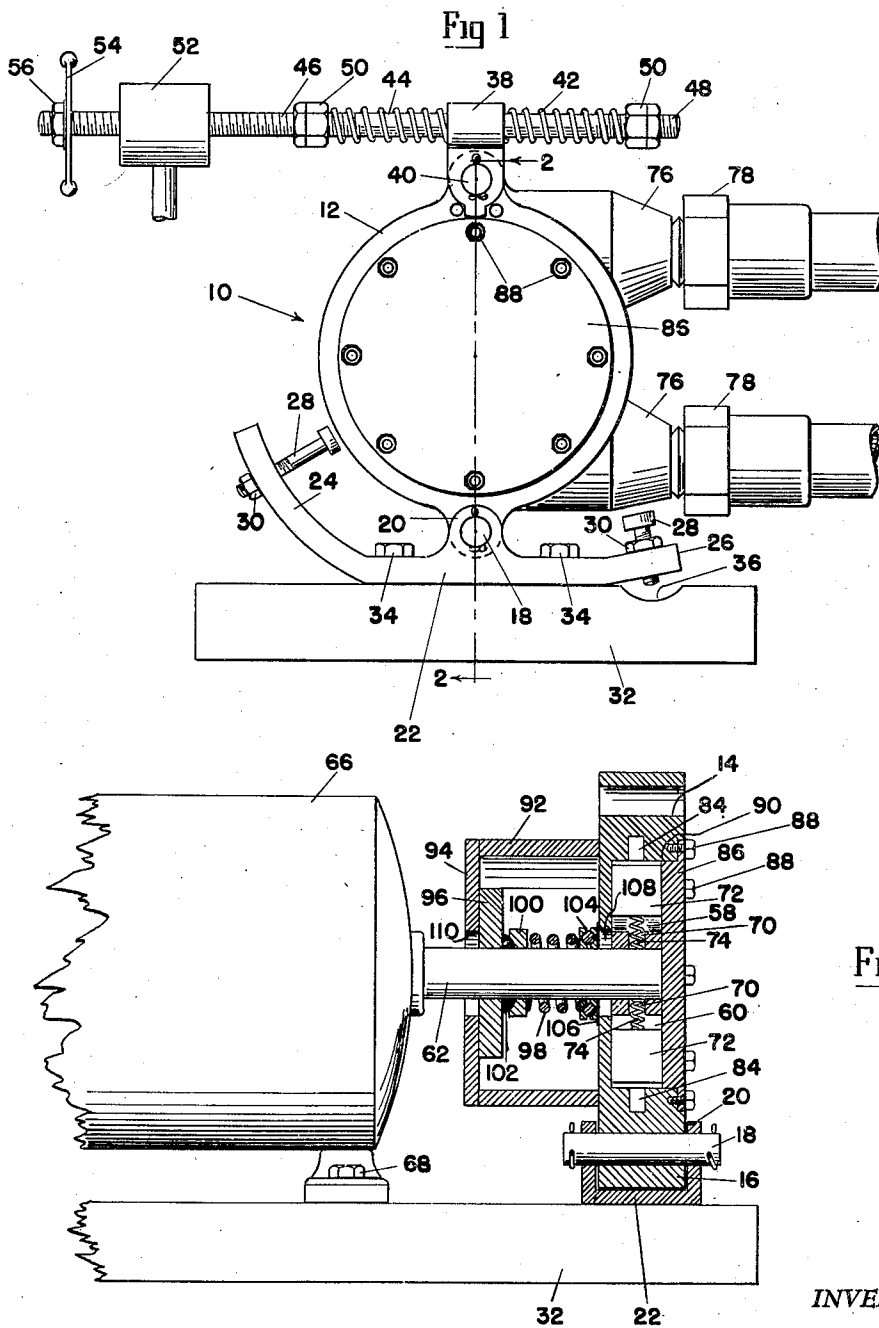
H. J. BUSH

2,493,525

VARIABLE AND REVERSIBLE FLOW PUMP

Filed April 10, 1946

3 Sheets-Sheet 1



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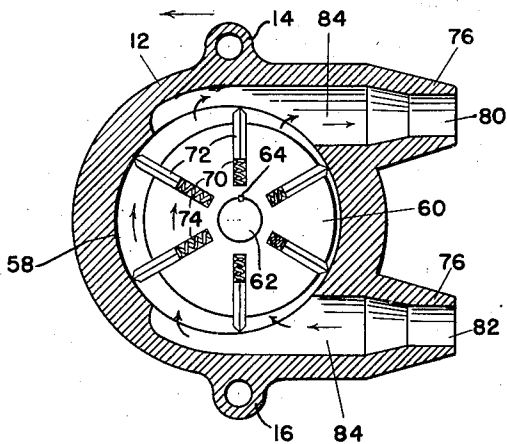


Fig 3

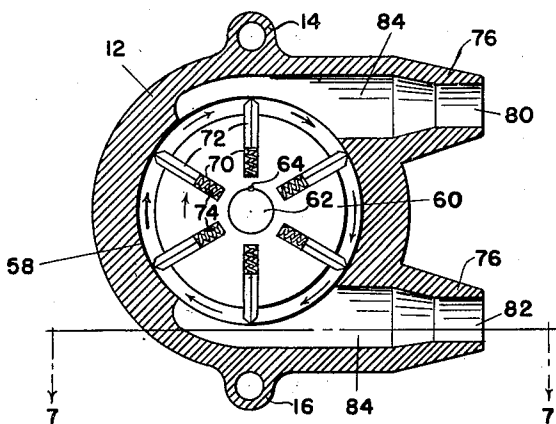


Fig 4

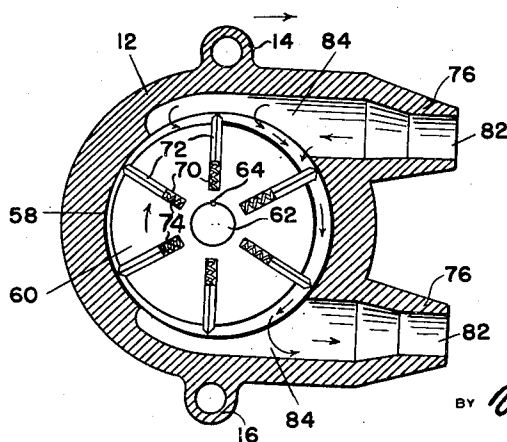


Fig 5

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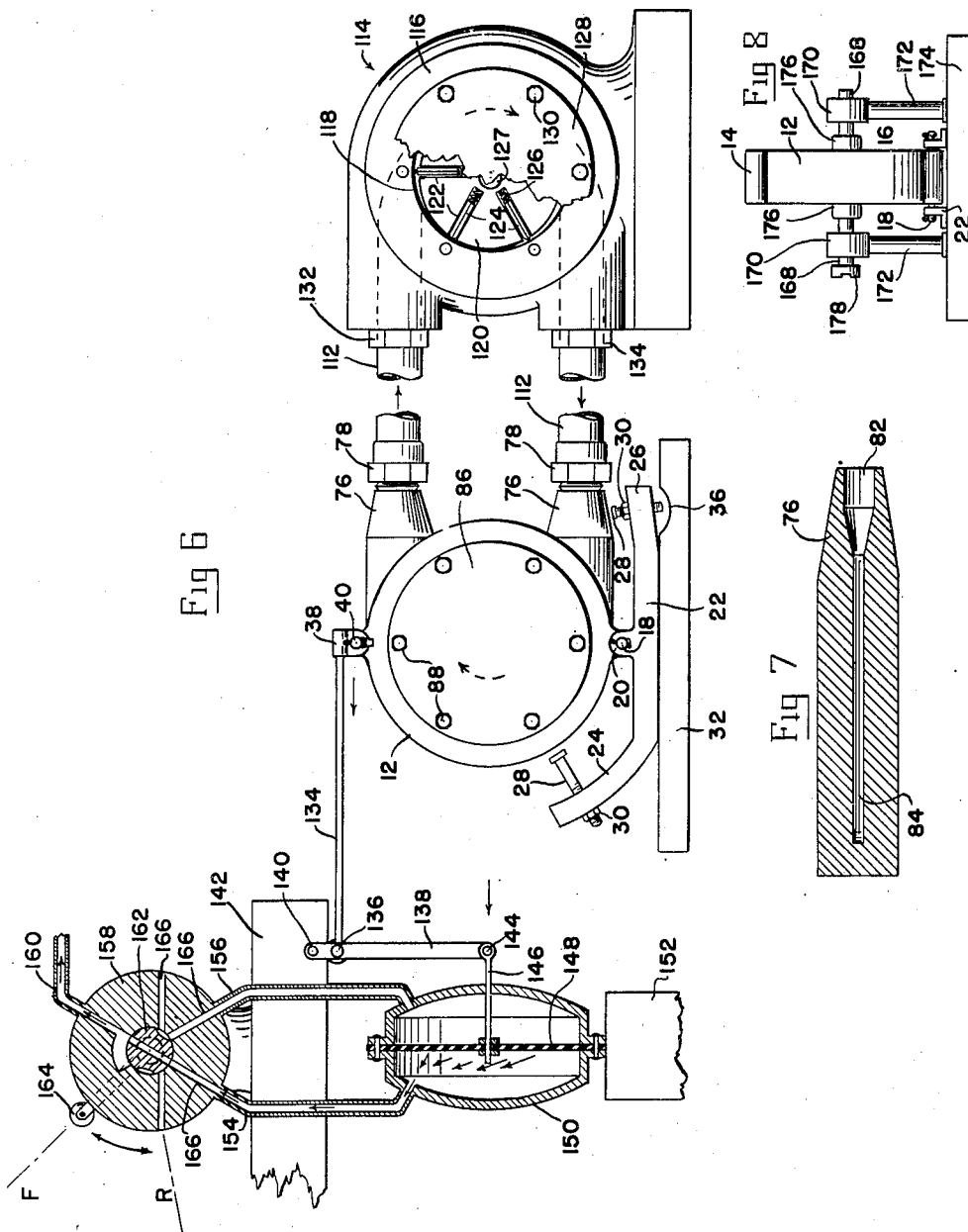
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UNITED STATES PATENT OFFICE

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VARIABLE AND REVERSIBLE FLOW PUMP

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6 Claims. (Cl. 103—120)

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This invention relates to improvements in rotary, vane type pumps and the primary object of the invention is to provide a positive pump which merely by manipulation of the pump housing will pump varied volumes of gas or fluid containing a lubricant in a forward or reversed direction, while the rotor of the pump continues to turn in the same direction at the same speed, and in which the rotor may be turned in either clockwise or anti-clockwise direction at constant or varied speeds.

Another object of the invention is to provide a pump which when forced to receive a gas or fluid containing a lubricant will act as a positive motor, in which the direction and speed at which the rotor turns can be controlled merely by manipulation of the pump housing and without necessarily changing the volume or direction of fluid flow to the pump.

The pumping unit can be used alone for pumping of any liquids to any given pressure in either direction without the use of valves. The unit being constructed of materials impervious to liquids being handled. In this capacity of operation a manually adjustable control with overload spring would be used.

The pumping unit can be used to supply hydraulic force for presses up to almost any pressure. In this case the unit could be controlled by a lever for manual control and overload springs could be used to control maximum pressure. Speed of the press with which the unit is used would depend on the size of the pump.

The pumping unit may be used to drive the receiving unit, which in turn would be used to drive stationary machinery or mobile equipment, such as cars, trucks, buses or similar vehicles. For such application the units may be set at an angle to each other, any ratio between the units can be obtained. Maximum volume between units can differ i. e., where a special ratio range is required, such as in driving heavy, light, fast or slow machinery. In this capacity the units would be acting as a variable speed reducer or increaser.

The pumping and receiving units may be built into a single compact unit, affording any increased or decreased ratio, without the use of flexible connecting hoses and the pump flow may or may not be reversible as desired.

With the above and other objects and applications in view the invention consists of the novel details of construction, arrangement and combination of parts more fully hereinafter described,

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claimed and illustrated in the accompanying drawings in which:

Figure 1 is an elevational view of an embodiment of the invention partly broken away;

Figure 2 is a sectional view on the line 2—2 of Figure 1 with the control mechanism removed;

Figure 3 is a vertical section of the pump with the rotor in position for forward flow;

Figure 4 is the same with the rotor in clockwise travel and neutral position;

Figure 5 is the same with the rotor in position for reverse flow;

Figure 6 is an elevational view partly in section of a pumping unit, receiving unit and control therefore;

Figure 7 is a sectional view on the line 7—7 of Figure 4; and

Figure 8 is an elevational view of a pumping unit.

Referring more in detail to the drawings the numeral 10 designates the pumping unit which comprises the housing 12 which is provided at its top and bottom periphery with apertured, enlargements 14 and 16 respectively. A pin 18 mounts the housing 12 by insertion in the enlargement 16 in the fulcrum 20 of the base 22 and the base 22 has upturned ends 24 and 26 respectively to mount the bolts 28 which limit the maximum movement of the housing on the pin 18 and nuts 30 retain the bolts 28 in any desired position. The base 22 is secured to a suitable support 32 by bolts 34 and a depression 36 in alignment with the bolt 28 in the end 26 permits full movement of the bolt as desired.

A hanger 38 is mounted on the enlargement 14 by means of the pin 40 and an overload spring 42 mounted on the rod 44 is carried by the hanger 38. The rod 44 is threaded at 46 and 48 to receive the pressure adjustment nuts 50 and the threaded portion 46 is receivable in the complementary threaded bracket 52. A handle 54 secured to the free end of the portion 46 and retained thereon by nut 56 controls the pivotal movement of the housing on the fulcrum 20 of the base.

The housing 12 is provided with the circular working chamber 58 in which the rotor 60 is mounted and is suitably connected in driving relation with the shaft 62 by the key 64. The shaft 62 is a drive shaft from any suitable power plant 66 which is secured by bolts 68 to the support 32. The rotor 60 is provided with diverging open ended slots 70 in which are slidably mounted the impeller vanes 72. It will be noted from Figures 3 to 5 inclusive that the vanes are in sections and

are free to move independently of each other within the slots and are held in constant contact with the wall of the chamber 58 at all times by the springs 74 which engage the inner end of the slots and the inner ends of the vanes. It will also be noted that the ends of the sections are inclined downwardly from the center thereof.

The housing 12 is provided with nozzles 76 which are threaded to receive flexible pipe adapters 78 and passages 80 and 82 respectively communicate with the working chamber 58 by means of ports 84 and the housing is provided with a removable cover plate 86 secured thereto by bolts 88.

The cover plate is bevelled at 90 to prevent leakage and sufficient clearance is provided between the plate and rotor for lubricating purposes.

The seal for the housing 12 comprises the circular shell 92 and fixed rear seal plate 94 against which the rotating seal 96 bears by reason of the spring 98 which engages at one end the seal cap washer 100 which engages the seal washer 102 which engages the seal 96, the other end of the spring 98 engages the thrust bearing 104 which bears against the flat washer 106 which prevents the thrust bearing from entering the clearance 108 between the housing 12 and shaft 62 and the thrust bearing prevents friction between the spring 98 and washer 106 and all seal parts rotate except the plate 94 and washer 106. The seal would be a carbon or metal seal backed up by a rubber seal which is in turn backed up by a cup and spring. The spring holds a tension on the seal parts against the removable fixed seal plate which is made of a hard polished metal with a soft wearing surface and the seal plate has clearance 110 around the shaft and the shell 92 has clearance around the seal to allow for shell movement and since the drive shaft carries the rotor no bearings are required in this unit.

The rotor 60 which is smaller than the working chamber 58 rotates at a speed of driving shaft 62 within the chamber of the housing 12. When the housing 12 is centered on the rotor as shown in Figure 4, no fluid is being displaced due to equal clearance between all points of the rotor and housing, and even if the rotor was turning no fluid would be displaced.

With the rotor 60 turning on a constant axis the top of the housing is moved from a vertical center, creating unequal clearance between the rotor and housing. With the rotor turning in clockwise direction and the housing moved to the left as shown in Figure 3, fluid would be drawn in passage 82 and be carried by vanes 72 around the chamber 58 to passage 80 and forced outwardly thereof. Therefore the further off center the housing is moved the greater the volume of fluid displaced.

If the housing is moved to the right as shown in Figure 5, the direction of the flow of liquid will be reversed since the clearance of the rotor and housing at the ports determine the flow of the liquid. Thus the direction of the flow of the liquid is changed while the rotation of the rotor is constant in the same direction.

In Figure 1 one method of controlling the housing is shown but other methods can be used as desired and the annular distance between the passages 80 and 82 must not be greater than the annular distance between the points of two succeeding vanes. The clearance between the fixed seal and shell permit movement of the housing about the shaft.

In Figure 6 the pumping unit 10 is connected

by flexible couplings 112 to the receiving unit 114 which is constructed in like manner as is the pumping unit having the housing 116 a working chamber 118 rotor 120, slots 122, two piece vanes 124, springs 126 and the shaft 127. The housing has the removable cover 128 secured by bolts 130 and inlet 132 and outlet 134 all other elements not shown would be of the same construction as previously described, for the pumping unit. However, in this instance the hanger 38 is connected to a lever 134 pivoted at 136 to a link 138 pivoted at 140 to a suitable support 142 and at 144 to an arm 146 connected to a diaphragm 148 within a vacuum cylinder 150 mounted on a suitable support 152. Passages 154 and 156 leading from opposite sides of the diaphragm to a valve housing 158 having connection 160 with the intake manifold of an internal combustion engine. A valve 162 having a lever 164 thereon will connect ports 166 in the valve housing 158 to control the flow of the fluid in the pumping unit by action on the diaphragm of the cylinder 150.

This set up could be used for cars, trucks, buses or similar vehicles, and the cylinder 150 being controlled by the accelerating pedal of the vehicle would cause movement of the pump housing 12 and subsequent output of the pumping unit.

With engine idling the vacuum cylinder would exert no force and action of rotor would hold the housing 12 in vertical or center position.

A slight depression of the accelerating pedal would cause the vacuum cylinder to exert a slight force on the housing 12 thereof causing pumping action.

The greater the depression of the pedal the stronger the vacuum pull. The vacuum pull will be balanced by the pressure on the outlet side against the rotor under any and all conditions.

If the vehicle were climbing a hill outlet force would overcome vacuum force because even if vacuum cylinder actuation is full the manifold vacuum on any engine drops when engine is under a strain. Therefore, the ratio between pump and receiving units would automatically be increased to the point where the engine would maintain proper manifold vacuum. When the strain is eliminated the ratio will automatically reduce to normal.

In Figure 8 the shaft 168 carrying the rotor is separate from the drive shaft, not shown, and the shaft 168 is journaled in bearings 170 on bearing brackets 172 mounted on a suitable support 174 and seals 176 are provided on both sides of the housing 12, a suitable coupling 178 on the end of the shaft 168 is provided for connecting the shaft to a drive shaft.

Thus a pumping unit has been provided that can be controlled manually or automatically, can be mounted directly on a drive shaft or have coupling therewith and can be used with stationary machines or in motor vehicles.

It is believed that the operation and construction of the invention will be apparent to those skilled in the art and it is to be understood that changes in the details of construction, arrangement and combination of parts may be resorted to provided they fall within the spirit of the invention and the scope of the appended claims.

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

1. A device of the character described, comprising a base, a body pivoted on said base, upturned opposed ends on said base, means on the upturned ends of said base for limiting the move-

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ment of said body, a working chamber in said body, liquid inlet and outlet ports for the working chamber, a rotor mounted in said body, sectional vanes mounted in said rotor, spring elements acting on said vanes to displace the vanes outwardly to engage the walls of the working chamber and means for moving said body on its pivot to increase and decrease the clearance of the rotor with the said working chamber, whereby the volume and direction of flow of liquids through said body is changed depending upon the movement of said body to the right or left of the vertical plane of said body.

2. The invention as in claim 1 wherein a power unit having a drive shaft is mounted adjacent said base and said rotor is mounted on the drive shaft of the power unit.

3. The invention as in claim 1 wherein automatic vacuum means is provided for moving said body on its pivot.

4. The invention as in claim 1, wherein a sealing means having a fixed part and a rotary part is provided for said body.

5. The invention as in claim 1, wherein a sealing means is provided having a fixed part mounted on said body, a central opening in said fixed part having a greater circumference than said shaft, a rotating disc seal in said body on said shaft closing the central opening of said fixed part, and a spring on said shaft engaging said rotary disc to force said disc into constant contact with said fixed part.

6. A pumping device comprising a base, a pump body having a circular pump chamber and a pair of fluid passages communicating therewith, pivot means attaching said pump body to said base for oscillatable movements relative thereto, means on said base limiting oscillatable movement of said pump body, said pump body having an elongated

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opening communicating with said pump chamber and including the geometric axis thereof, a driving shaft extending through said elongated opening and into said pump chamber, a source of power anchored to said base and drivingly supporting said driving shaft, an impeller rotor drivingly secured to said shaft and rotatably mounted within said pump chamber, said rotor having a predetermined diameter less than that of said pump chamber whereby said pump body can be displaced relative to said rotor, said rotor being provided with a plurality of radial slots, impeller vanes slidably mounted in said slots, spring means in said slots forcing said vanes radially outward against the pump chamber periphery, control means for shifting said pump body on said pivot means relative to said shaft for selectively displacing the pump chamber axis to either side of the rotor axis whereby the quantity of fluid and its direction of relative flow through said passages is controlled, and means carried by said driving shaft and pump body sealing said elongated opening against fluid leakage from said pump body along said shaft.

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