Oct. 25, 1949. R. H. McCLURE 2,485,980

ROTARY PUMP

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Fig. 1.

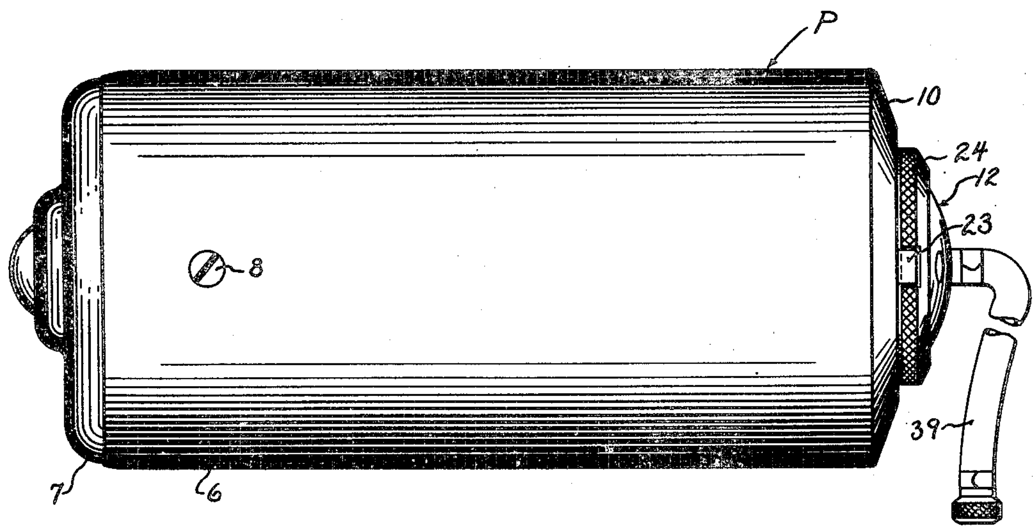

Fig. 2.

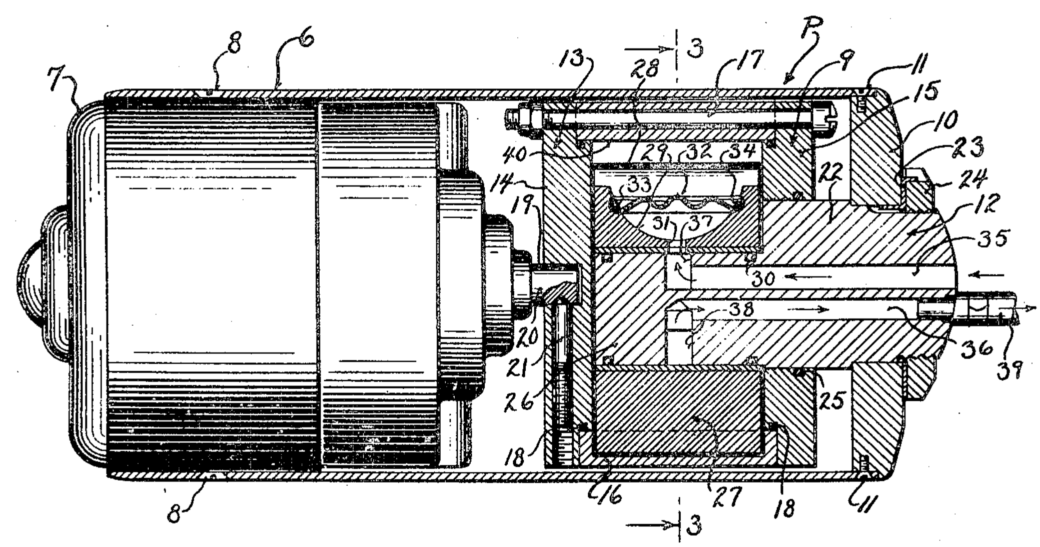

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Fig. 3.

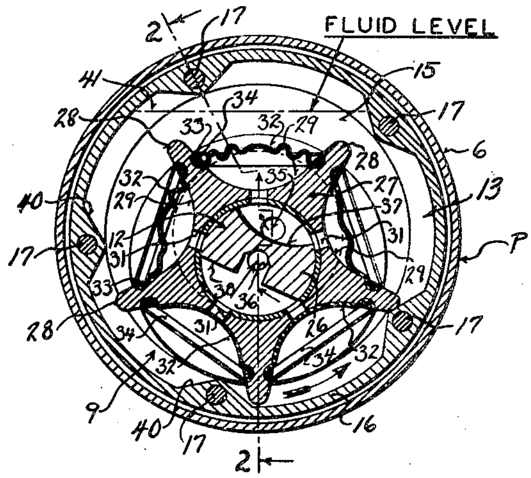


Fig. 4.

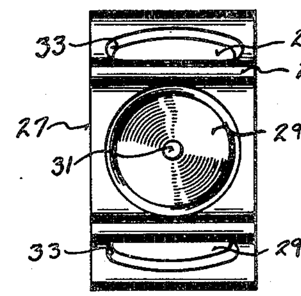
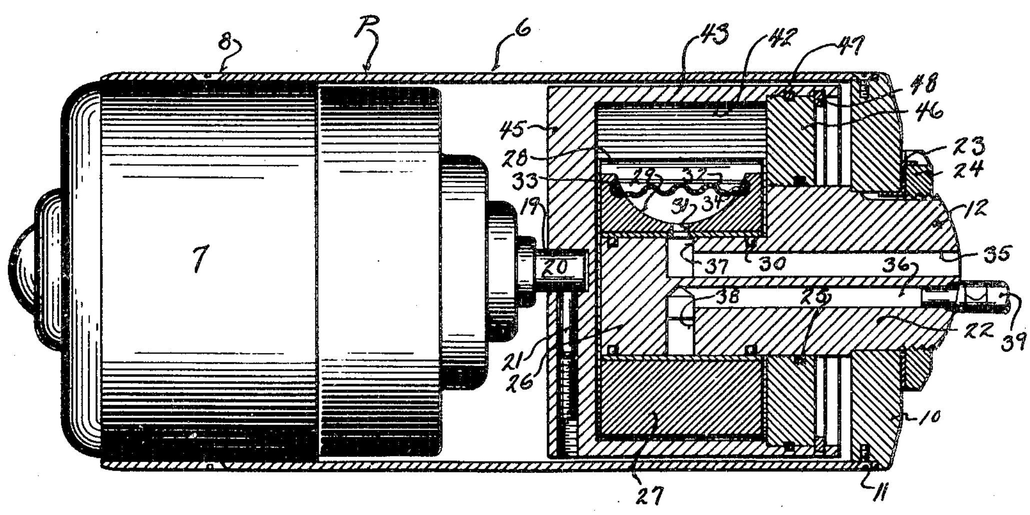


Fig. 5.



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ROTARY PUMP

Ralston H. McClure, Detroit, Mich., assignor of forty per cent to George W. Wright, Milwaukee, Wis.

Application September 3, 1946, Serial No. 694,516

9 Claims. (Cl. 230—79)

This invention appertains to pumps, compressors and the like and more particularly to a novel rotary pump for moving fluid from one point to another.

One of the primary objects of my invention is to provide a compact pump of exceedingly small compass, which will effectively and rapidly move fluid and place such fluid under compression at a desired place.

Another salient object of my invention is to provide an automatic rotary pump or compressor so constructed and arranged that the same will occupy a small space, whereby the pump can be conveniently used as an automotive vehicle accessory for quickly and efficiently inflating the pneumatic tires thereof without undue physical exertion on the part of the operator of the vehicle.

A further important object of my invention is to provide a combination rotary and bellows pump, which utilizes the rotary and centrifugal action of a moving mass of liquid for continuously operating a plurality of flexible diaphragms in proper sequence, for taking in, compressing and forcing out the fluid to be pumped.

A still further important object of my invention is to provide a pump of the above character which embodies a minimum number of parts; one which is comparatively noiseless in operation and one which will be simple and easy to manufacture and one which can be placed upon the market at a reasonable cost.

With these and other objects in view the invention consists in the novel construction, arrangement and formation of parts as will be hereinafter more specifically described, claimed, and illustrated in the accompanying drawing, in which drawing

Figure 1 is a side elevational view of my improved pump.

Figure 2 is a longitudinal sectional view through the same taken substantially on the line 2—2 of Figure 3 looking in the direction of the arrows.

Figure 3 is a transverse sectional view through the pump taken substantially on the line 3—3 of Figure 2 looking in the direction of the arrows.

Figure 4 is a top plan view of the rotor section of the pump showing the cavities or pockets therein for the fluid to be pumped.

Figure 5 is a longitudinal sectional view through a slightly modified form of my pump.

Referring to the drawings in detail, wherein similar reference characters designate corresponding parts throughout the several views the

letter P generally indicates my pump and the same includes a cylindrical housing 6 which can be formed from any desired material and treated in any preferred way to enhance the appearance thereof. One end of the housing receives a small electric motor 7 and this motor can be secured in the housing against movement, such as, by the use of screws 8. The opposite end of the housing receives the pump proper 9 and the pump is driven from the motor 7 as will be later described. The motor can receive its current from any suitable source of supply and can be operated from a storage battery of an automobile when the device is used as an accessory thereon.

The extreme forward end of the housing 6 can be closed by a plate 10 and this plate is rigidly secured to the housing by suitable fastening elements such as screws 11. This plate 10 forms means for carrying a support 12 for the pump proper 9.

The pump proper 9 includes a rotatable pump casing 13 which is of a substantially cylindrical shape and as shown in Figures 2 and 3 the pump casing may consist of end hub discs 14 and 15 and an annular shell 16. Bolts 17 can be employed for rigidly connecting the hub plates 14 and 15 and the shell together. Packing rings 18 can be employed for preventing the leakage of liquid from the casing. The hub plate 14 at its axial center is provided with a socket 19 for receiving the armature shaft 20 of the electric motor 7 and the casing 13 is keyed to the armature shaft for rotation therewith. A pin or key 21 can be employed for this purpose.

The hub plate 15 is rotatably mounted and supported upon the support 12 and this support can include a cylindrical solid body 22 concentrically arranged relative to the axis of the motor and this support is firmly secured to the end plate 10 by keys 23 and a nut 24 threaded on the support. The concentric cylindrical body portion 22 extends axially into the hub plate 15 of the rotatable casing and if desired antifriction bearings can be provided between the hub plate 15 and the body portion 22. A packing ring 25 is preferably carried by the hub disc 15 for engaging the body portion 22 so as to prevent leakage of liquid out of the rotatable casing. The inner end of the support 12 has turned thereon an eccentrically disposed bearing portion 26 and this bearing portion 26 is preferably disposed below the axis of the rotatable casing 13 and the armature shaft 20 and extends from the interior face of one hub plate to the other.

Rotatably mounted upon the eccentric bearing portion 26 is the pump rotor 27 and hence the pump rotor is eccentrically disposed relative to the axis of the rotatable casing 13 and the armature shaft of the motor. This rotor includes radially extending blades or fins 28 and is provided between the blades or fins with substantially semi-spherical shaped cavities or pockets 29. As shown, antifriction bearings 30 can be interposed between the rotor and the eccentric bearing portion 26.

Each cavity 29 is provided with a port 31 the purpose of which will later appear.

Each cavity is provided with a flexible diaphragm 32, and these diaphragms can assume the shape of the cavity. The edges of the diaphragms are firmly anchored to the walls of the cavity in fluid-tight engagement therewith. One method of securing the diaphragms in position is shown; and the cavities adjacent to their outer ends can be provided with an annular groove 33. The edges of the diaphragms are fitted in the grooves and are held therein by split resilient bands 34.

Formed longitudinally in the support 12 is a longitudinally extending inlet passage-way 35 and parallel to this inlet passage-way is an outlet passage-way 36. Communicating with the inlet passage-way is a slotted port 37 and the ports 31 of the cavities are adapted to register with the port slot 37 at predetermined times as will be later set forth. The eccentric bearing portion 26 is also provided with a slotted port 38 which has communication with the outlet passage-way 36. The cavity ports 31 are adapted to register with the port slot 38 at certain times as will also be later described.

The outlet passage-way 36 can have anchored therein a flexible tubing 39 for conducting the fluid under pressure to any desired point, such as pneumatic tire.

The inner face of the cylindrical shell 16 of the rotatable casing 13 can be provided at equidistantly spaced points with inwardly extending fins 40 for insuring the rotation or the carrying of liquid with the casing during the rotation thereof, but these fins 40 can be dispensed with entirely and the inner face of the casing can be treated in other manners, as will be later described, to insure the rotation of the liquid.

The rotatable casing is partly filled with a liquid through a filling plug or the like, such as to a line indicated by the reference character 41 in Fig. 3. However, in actual practice and in operation of the pump the casing will be filled by the liquid and the pulled out diaphragms.

In operation of my improved pump and compressor, the circuit is closed through the motor 7 and this will cause the rapid rotation of the pump casing 13. Liquid therein will rotate therewith and this is aided by the fins 28. Consequently there is a rapidly rotating mass of liquid within the casing which is also affected by centrifugal action. The rotation of this moving mass of liquid impinging against the blades 28 of the rotor will cause the rapid rotation of the rotor. As the rotor is below the axis of the casing the tendency of the liquid is to draw out the flexible diaphragms located at the part nearest the axial center of the casing and to push in on the diaphragms located furthest away from the axial center of the casing.

Now referring to Figure 3 it will be noted from the arrow that the casing 13 and the rotor 27 are turning in a counter-clockwise direction and the diaphragm on the right-hand side is being pulled out due to the liquid and the pull of the

liquid or vacuum thereon. At this time the port 31 of this particular cavity is registering with the inlet port slot 37 and consequently air will rush into this cavity. Following the cycle around, it will be seen that the upper-most cavity will have its diaphragm effected to the greatest extent and will be pulled out. As the port 31 is still in registration with the port slot 37 the cavity is still being filled with air. As the rotor turns the port 31 will be cut off from the port slot 37 and consequently the air in the cavity will be under compression. The cavity at the lower left-hand side has its port 31 in registration with the outlet port slot 38 and consequently as its diaphragm is forced inward the air will be forced from the cavity under compression into the outlet passage-way 36. This cycle continuously occurs during the rotation of the casing 13 and consequently there is a continuous supply of air under compression to the hose or tube 39.

The liquid used in the casing is preferably of a heavy nature such as thallium permate or the like. Mercury can be used to good advantage.

In lieu of providing definite fins, such as is shown at 40 in Figure 3, the interior of the casing can be merely roughened or provided with grooves 42 as shown in Figure 5. In this form I have also illustrated a slightly modified type of casing. As illustrated in Figure 5 the rotatable casing can have its outer circular wall 43 formed directly on the inner hub disc 45. The opposite hub disc 46 can be fitted within the outer wall 48 and against a shoulder 47 formed therein. A snap ring 48 can be utilized for holding the hub disc 46 in place.

Other changes in details can be made without departing from the spirit or the scope of the invention but what I claim as new is:

1. In a combined rotary and bellows pump or compressor, a rotatable closed casing partially filled with liquid material, means for rotating said casing, a rotor eccentrically mounted in the casing and rotated by the movement of the mass of liquid in the casing, and diaphragms carried by the rotor actuated in proper sequence by the movement of the mass of liquid in the casing during the rotation of the casing and rotor for taking in, compressing and forcing out fluid to be pumped.

2. A pump or compressor comprising a rotatable casing partially filled with a movable mass of liquid material, means for rotating said casing for imparting movement to the liquid material therein, a rotor eccentrically mounted in said casing for free rotation therein and rotated by the liquid material, said rotor having cavities in the periphery thereof, flexible diaphragms closing said cavities actuated in proper sequence for taking in, compressing and forcing out fluid to be pumped by the movement of the mass of material in said casing, said casing having spaced inlet and outlet ports for fluid to be pumped, said rotor having ports communicating with the cavities adapted to register with the inlet and outlet ports at predetermined times and in proper sequence during the rotation of the rotor.

3. A pump or compressor comprising a rotatable casing partially filled with a movable mass of liquid material, means for rotating said casing for imparting movement to the material therein, a rotor eccentrically disposed in said casing, means for rotatably supporting the rotor on an axis eccentric to the axial center of the casing, said means being provided with spaced inlet and outlet ports, said rotor having equi-distantly

spaced cavities in the periphery thereof, flexible diaphragms closing said cavities actuated in proper sequence by the movement of the mass of material in said casing for taking in, compressing and forcing out fluid to be pumped, and said cavities having ports adapted to register with the inlet and outlet ports at predetermined times and in proper sequence during the rotation of the rotor.

4. In a combined rotary and bellows pump or compressor, a casing rotatable about its axial center, means for rotating said casing, said casing being partially filled with a movable mass of liquid material, a rotor eccentrically mounted in the casing and rotated by the liquid, said rotor having spaced chambers therein, diaphragms closing said chambers actuated in proper sequence by the movement of the mass of material in the casing for taking in, compressing and forcing out fluid to be pumped, said rotor having a port for each chamber, the casing having inlet and outlet ports for liquid to be pumped, said ports for the chambers being adapted to register with the inlet and outlet ports and predetermined times and in proper sequence during the rotation of the rotor.

5. In a combination rotary and bellows pump or compressor, a cylindrical closed casing partially filled with a movable mass of liquid material rotatable about its axial center, means for rotating the casing for imparting movement to the material therein, a support, a rotor mounted within said casing on said support and rotatable about an axis eccentric to the axial center of the casing and rotated by the moving mass of material in the casing, said rotor having equidistantly spaced chambers in its periphery, flexible diaphragms closing said chambers actuated in proper sequence by the moving mass of material in the casing for taking in, compressing and forcing out the fluid to be pumped, said rotor having a port for each chamber, and said diaphragms and chambers being radially disposed relative to the axis of the rotor, the support for said rotor being provided with inlet and outlet ports, the ports of the chambers being adapted to register at predetermined times and in proper sequence with the inlet and outlet ports during rotation of the rotor on said support.

6. A pump or compressor comprising a housing, an electric motor in one end of said housing, a rotatable casing disposed in said housing having connection with the armature shaft of the motor at its axial center whereby said casing will be rotated within the housing, a plate secured to the housing in spaced relation to the motor, a support rigidly secured to the plate having a bearing portion concentric with the axial center of the casing for rotatably supporting the casing and an eccentric bearing portion extending into the casing, a rotor rotatably mounted on said eccentric bearing portion disposed at one side of the axial center of the casing, said casing being partially filled with a movable mass of liquid material movable with the casing, said rotor being driven by said material, said rotor also having equi-distantly spaced compression chambers in its periphery and ports communicating with said chambers, flexible diaphragms sealing the outer ends of said chambers and actuated in proper sequence by the moving mass of material in the casing for taking in, compressing and forcing out the fluid to be pumped, said support having inlet and outlet passage-ways therein for fluid, an inlet slot port communicating with the inlet passage-way covered by the rotor, an outlet slot port communicating with the outlet passage-way covered by said rotor, the ports of the rotor being adapted to register with the inlet and outlet ports at predetermined times and in proper sequence during movement of the rotor on said support.

7. In a combination rotary and bellows pump, a sealed casing having a movable mass of liquid therein, a rotor mounted in said casing rotated by said mass of liquid, means for rotating the casing on an axis concentric with the axial center of the casing, means rotatably supporting the rotor on an axis eccentric to the axial center of the casing and pump diaphragms carried by the rotor actuated in proper sequence by the movement of liquid incident to the rotation of the casing and rotor for taking in, compressing and forcing out the fluid to be pumped.

8. In a combination rotary and bellows pump, a rotor having equi-distantly spaced blades and chambers between said blades, said chambers having ports communicating therewith adjacent to their inner ends, and flexible diaphragms attached to the blades adjacent to their outer ends closing the outer ends of the chambers.

9. In a rotary pump, a rotor movable by the passage of liquid past the same having equidistantly spaced chambers in the periphery thereof and ports communicating with the inner ends of the chambers, and movable flexible diaphragms attached to the rotor closing the outer ends of said chambers.

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