Sept. 23, 1924. 1,509,169

G. McFARLAND

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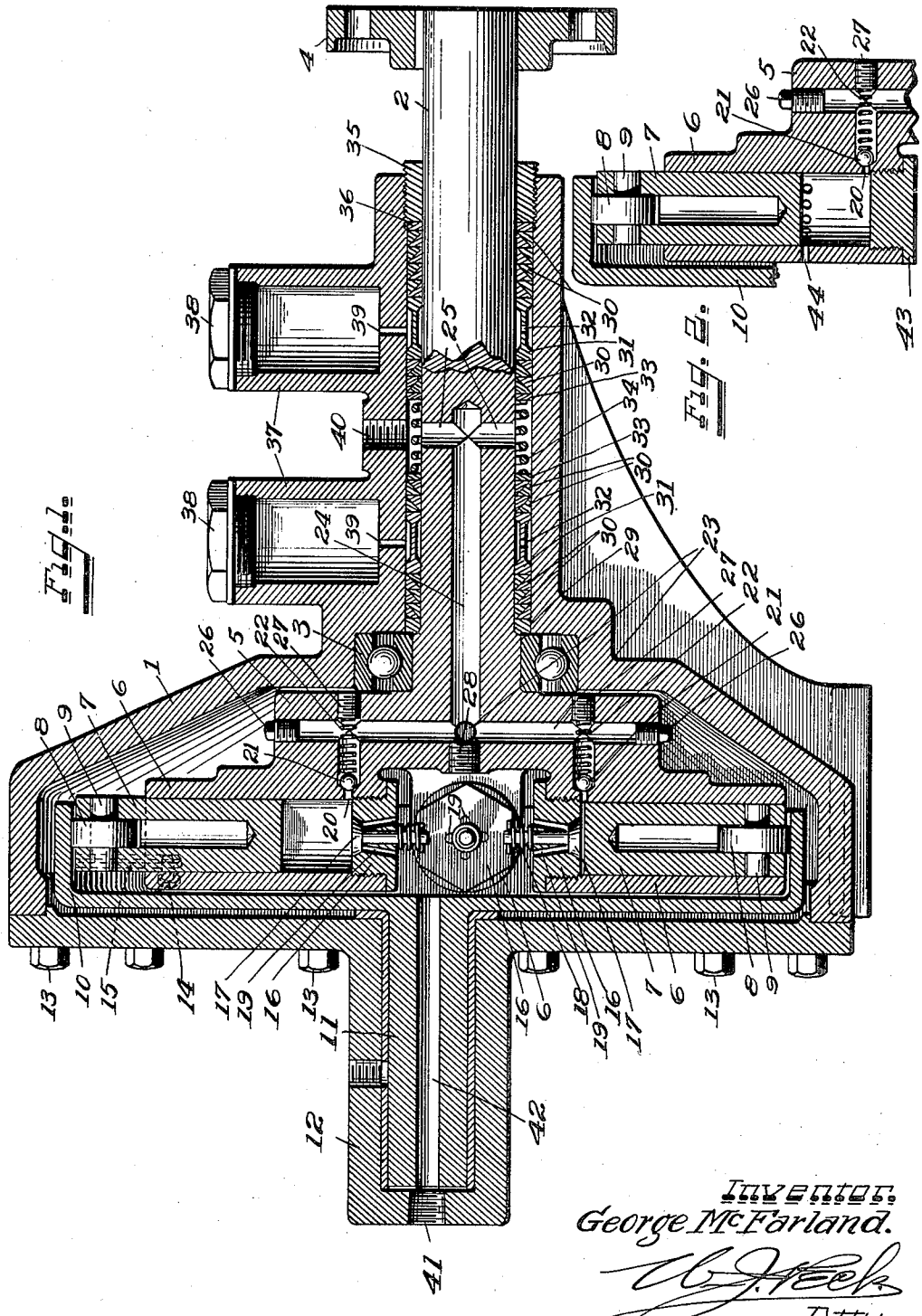


Fig. 2.

Fig. 1.

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To all whom it may concern:

Be it known that I, GEORGE MCFARLAND, a citizen of the United States, and a resident of Fort Madison, in the county of Lee and State of Iowa, have invented certain new and useful Improvements in Pumps, of which the following is a full, clear, and exact description, reference being had to the accompanying drawing, forming part of this specification.

My invention relates to that class of pumps which are primarily intended for compressing air or gases and to those pumps of this class wherein the cylinders are radially mounted on a rotating member.

One object of my invention is to provide a structure wherein the element of the machine which produces the stroke of the piston, revolves with, or is driven by, the piston carrier and its associated parts, thereby reducing the friction of the machine to a minimum.

Another object of my invention is to carry the discharge of the pump to a suitably sealed joint between the drive shaft of the pump and the housing, and there to transfer the compressed fluid or gas to a suitable conductor whereby it may be conveyed to the place desired.

Another object of my invention is the provision of a suitable compensating and sealing packing for the drive shaft of the machine.

Other objects of my invention will appear and be described in the specification.

The novelty of my invention will be hereinafter more fully set forth and specifically pointed out in the claim.

In the accompanying drawing;

Figure 1, is a central sectional side elevation of a pump embodying my invention in its preferred form of construction.

Figure 2, is a detail sectional view of a modified form of cylinder and associated parts showing a different arrangement of intake for the cylinders.

The same numerals of reference are used to indicate identical parts in both figures.

In the embodiment of my invention as illustrated in the drawing, 1 represents a main frame or housing within which the drive shaft 2 is journalled as by the ball bearing 3, the shaft 2 being provided with a drive flange 4 by means of which it may be connected to any suitable driving element, not shown.

The shaft 2 carries, at the end opposite to that which carries the flange 4, a series of arms 5, each of which carries a cylinder 6 within which is fitted a piston 7 which carries an operating roller 8 journalled therein by means of the pin 9, the operating rollers 8 being adapted to bear against a stroke member 10 which is provided with a trunnion 11 journalled in the end plate 12 which is suitably connected to the main frame 1 as by the cap screws 13.

Any suitable means may be provided to maintain the pistons and the rollers which they carry, in proper relation to the stroke member, such as the screw 14 which engages a key-way 15 in the piston.

The inner ends of the cylinders 6 are closed by plugs 16 each of which carries an inlet valve 17 held to its seat by a spring 18, a series of intake ports 19 passing through the plugs 16, these ports being closed by the valve 17 when the latter is on its seat.

Each cylinder is provided with an outlet port 20 which is normally closed by a ball or other suitable valve 21 which is held to its seat by a spring 22, each outlet port 20 communicating with a radially arranged passage 23 which communicates with the common outlet passage 24 which leads to the cross passage 25 of the drive shaft 2. I prefer to drill the various passages just described, and to plug the ends of these passages as by the plugs 26, 27, and 28, so that at any time desired, the plugs may be removed and the passages cleaned and any obstruction which may have accumulated therein, removed.

A sealing-packing space or chamber is provided in the main frame or housing 1 and, beginning adjacent the bearing 3, this space contains first a solid washer 29, then a series of mating beveled washers 30 which are split and arranged with the splits out of alignment, then a solid sealing ring 31 which is provided with an inner and an outer groove and a port 32 giving communication between the grooves, then another series of mating beveled washers 30, then a solid washer 33, then a compression spring 34, then another washer 33, another series of mating beveled washers 30, another sealing ring 31, a final set of mating beveled washers 30, and the gland 35 which is preferably screwed into the outer end of the housing 1, the gland 35 bearing against a

washer 36 which in turn bears against and holds in place the various packing rings described.

To provide a supply of sealing medium, preferably oil, the main frame or housing 1 is provided with a reservoir 37 arranged over each of the sealing rings 31, each reservoir being provided with an air tight cover 38 which may be removed for the purpose of replenishing the supply of oil when required, and an oil passage 39 leading to the sealing ring 31, whereby the system of packing and the sealing rings may be properly lubricated and a supply furnished to properly seal the joint between the housing 1 and the shaft 2.

An outlet port 40 is provided in the housing 1, this port communicating with the space occupied by the compression spring 34, into which space the cross ports 25 discharge, and from this outlet port 40 the product of the machine is conveyed by any suitable piping, not shown, to the required place.

An inlet port 41 is provided in the end plate 12, and this port communicates with an inlet passage through the trunnion 11, this passage being shown at 42 and leading into the space between the inner ends of the cylinders 6 and supplying the intake ports 19.

In that form of construction shown in Fig. 2, the plugs 16 are replaced by solid plugs 43 and the cylinders 6 are provided with intake ports 44 arranged at a point about opposite the inner end of the pistons when the latter are at their outermost position.

It is to be noted that the stroke member 10 is arranged with its axis of rotation eccentric to the axis of rotation of the shaft 2 to the end that the stroke member lies close to the outer ends of the cylinders at one position of the cylinders and at a distance from the ends of the cylinders at another position, the difference corresponding to the stroke of the pistons 7.

The operation of the machine is as follows:

Assuming the parts of the machine to be in the position shown in Fig. 1, and the shaft 2 set in motion; when the speed of the shaft has reached a number of revolutions per minute as will cause the pistons to be forced outwardly by centrifugal force, the rollers 8 will bear against the stroke member, the pressure of these rollers being sufficient to cause this member to rotate with the previously rotating portion of the machine, and due to the eccentric setting of the stroke member, the pistons will be forced into the cylinders to compress the air or gas which they contain and to force it out through the outlet ports and passages previously described, whereupon, when the end of the compressing stroke has been reached, centrifugal force will cause the pistons to again move outwardly on the suction stroke, each cylinder of the machine functioning in this manner alternately.

By permitting the stroke member to rotate with the balance of the machine, the only action of the rollers 8 with relation to the stroke member is that due to the arcuate difference in the distance between any pair of the rollers due to the difference in the radial distance from the center of the shaft 2 to the axis of the rollers 8, as the structure revolves.

It is to be noted that the construction and arrangement of the packing between the shaft 2 and housing 1 is such that as this packing wears, the compression spring 34 constantly presses the various sections of this packing together and maintains it in a tight condition, and further that the length of the sealing rings is great enough to allow a considerable shift in their position without causing these rings to pass beyond the point at which the oil feed opening 39 will supply these rings with the required amount of oil.

It is also to be noted that a pump constructed in accordance with the above description can be operated at a comparatively high rate of speed with satisfactory results, and that it may be successfully used to receive air or gas at a comparatively high pressure and raise this pressure with only the expenditure of sufficient energy to produce the difference in pressure between the inlet and the outlet pressures.

Having thus fully described my invention, I claim:

In a pump the combination of a housing, a shaft journalled therein and passing through a sealing packing, a cylinder structure carried by the shaft and provided with radially arranged cylinders, a reciprocating piston in each cylinder, a rotating stroke member cooperating with the pistons and journalled in the housing eccentrically to the shaft, an inlet passage through the rotating stroke member and communicating with the inlet to each cylinder, and an outlet passage from each cylinder through the shaft and the sealing packing to a point outside the housing.

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