WABBLE PLATE TYPE PUMP

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This invention relates to a pump, particularly of the wabble plate type, and an object of my invention is to provide a pump of this type in which there is a substantially constant pressure at the outlet of the pump. This constant pressure is automatically accomplished by a pressure regulatork mechanism, this valve mechanism in turn adjusting the stroke of the pistons.

Another object of my invention is to provide a novel rotary valve which will direct the fluid both into and out of the cylinders.

A feature of my invention resides in the novel means of adjusting the position of the wabble plate by means of links, the links in turn being controlled by a pressure actuated piston valve.

Other objects, advantages and features of invention may appear from the accompanying drawing, the subjoined detailed description and the appended claims.

In the drawing

Figure 1 is a transverse sectional view of my improved wabble plate type pump taken on line 1—1 of Figure 2.

Figure 2 is a transverse sectional view taken on line 2—2 of Figure 1.

Figure 3 is a sectional view taken on line 3—3 of Figure 1.

Referring more particularly to the drawing, the numeral 1 indicates a substantially cylindrical housing the forward portion 2 of which may be termed the cylinder block in which a plurality of cylinders 3 are formed. The cylinders 3 extend horizontally through the block 2 and a piston 4 is mounted in each of the cylinders. The means to reciprocate the pistons 4 will be subsequently described. It will be noted that the cylinders 3 are open at both their front and rear ends. The fluid enters and leaves the cylinders at the left end, as viewed in Figure 1, that is, the end adjacent to the head 5 which covers the front end of the cylinder block 2. The head 5 is suitably attached to the block 2 by means of stud bolts, or the like.

A shaft 6 extends into the housing 1 and is journaled at one end on the bearings 7. These bearings are mounted in the housing 1 substantially as shown. The drive shaft 6 is rotated by a suitable source of power not shown. The inner end of the shaft 6 is journaled on bearings 7 which are arranged between the shaft and the inner surface of the cylinder block 2.

To reciprocate the pistons 4, I provide a wabble plate including an inner ring 8 which encircles the shaft 6. Journalled on the ring 8 is an outer ring 9 and this outer ring is formed with radially extending pins 10 upon which pinmats 11 are mounted, each of the pinmats extending to one of the pistons 4. Thus, the pistons 4 are reciprocated in the cylinders 3 in a manner which is usual and well known in the art.

On the inner end of the shaft 6, I provide a disc valve 12, the outer portion of which is seated on a ring seat 13 on the cover 5. The inner portion of the valve is seated on the seat 14 formed on the cylinder block 2.

An annular intake chamber 15 is formed around the shaft 6 and back of the inner portion of the valve 12. An intake port 16 extends into the annular chamber 15. An inlet control port 17 in the valve 12 admits fluid successively to each of the cylinders 4 as the pistons 4 are moving on their intake strokes. Since the valve 12 is attached to and, therefore, rotates with the shaft 6 it will be evident that the port 17 will be properly timed to admit fluid successively to each of the cylinders 3.

On the compression stroke of the pistons 4, fluid under pressure is forced out through the outlet valve 18, this port being also formed in the outer portion of the valve 12, substantially as shown. The port 18 permits the fluid under pressure to flow into the chamber 19 within the head 5, and will then flow out through the outlet port 20 for useful work.

So that a substantially constant pressure may be maintained at the outlet port 20, I provide the following construction whereby the wabble plate 8 may be adjusted so that the strokes of the pistons 4 can be varied. The inner end of the shaft 6 is counterbored, as shown at 21. This counterbore extends inwardly from the inner, or left hand end, of the shaft 6, as viewed in Figure 1. A fluid pressure actuated piston 22 is mounted in the bore 21 adjacent the inner end of the shaft 6 and fluid pressure in the chamber 19 can thus be exerted on the face of the piston 22. A block 23 is slidable mounted in the bore 21 and this block is connected to the fluid pressure actuated piston 22 by a stem 24 which is an integral part of the valve 22 and threads into the block 23. A spring 25 in the bore 21 bears against the back of the fluid pressure actuated piston 22 and urges the piston outwardly or towards the left, as viewed in Figure 1. The inner end of the spring 25 rests on the drive pin 26 which extends transversely through the shaft 6 and into the inner ring 8 of the wabble plate. A link 27 is fixed at its lower end to the block 23 and the upper end is pivotally attached to the ring 8 of the wabble plate. A second link 28 is pivotally attached to the block 23 at its inner end and the outer end is unattached but bears against one face of the ring 9 when the wabble plate is being adjusted, as will be further described. The link 28 projects through a slot 29 in the shaft 6 and bears against the edges of this slot as the link 28 moves horizontally.

Whenever the pressure in the chamber 19 rises to a point where it overcomes the tension of the spring 25, the piston 22 will be moved inwardly, thus pushing the block 23 inwardly and this causes the link 27 to move horizontally at the same time the link 28 is swung on its inner pivot 30, thereby pulling in one direction on the ring 8 and pushing in the opposite direction on the ring 9, thus tending to move the wabble plate to a position at right angles to the center line of the shaft 6, thereby shortening the stroke of the pistons 4 and thus reducing the quantity of flow at the outlet 20. The tension of the spring 25 can be adjusted by threading the stem 24 into or out of the block 23.

In operation the housing 1 and the cylinder block 2 are stationary. The shaft 6 is rotated, and as this shaft rotates it will also rotate the inner ring 8 of the wabble plate. The outer ring 9 of the wabble plate is attached to the pistons 4 by the respective pinmats 11, thereby reciprocating the pistons 4 in the cylinders 3, due to the inclined position of the wabble plate relative to the center line of the shaft 6. Fluid is drawn into the inlet 16 into the chamber 15. The valve port 17 permits fluid to flow successively into each of the cylinders 3 during the intake stroke of the pistons 4. On the pressure stroke of the pistons 4 a valve port 18 in the ring valve 12 permits the fluid under pressure to flow outwardly into the chamber.
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1. A wabbie plate type pump comprising a housing which includes a cylinder block having a plurality of cylinders formed therein, a piston in each of the cylinders, a shaft extending into the housing, a wabbie plate mounted on said shaft, a pin bytem extending from each piston to the wabbie plate, said housing having an intake port therein extending to said cylinders and an outlet port extending from the cylinders, said shaft having a counterbore therein extending from the end of the shaft within the housing, fluid pressure actuated piston in the counterbore, said fluid pressure actuated piston being acted upon by fluid pressure at said outlet port, a block slidably mounted in said counterbore, means connecting the block and fluid pressure actuated piston, a link attached at one end to said block and the other end of the link bearing against the wabbie plate, said shaft having a slot therein through which the link extends.

2. A wabbie plate type pump comprising a housing which includes a cylinder block having a plurality of cylinders formed therein, a piston in each of the cylinders, a shaft extending into the housing, a wabbie plate mounted on said shaft, a pin bytem extending from each piston to the wabbie plate, said housing having an intake port therein extending to said cylinders and an outlet port extending from the cylinders, said shaft having a counterbore therein extending from the end of the shaft within the housing, fluid pressure actuated piston in the counterbore, said fluid pressure actuated piston being acted upon by fluid pressure at said outlet port, a block slidably mounted in said counterbore, means connecting the block and fluid pressure actuated piston, a link attached at one end to said block and the other end of the link bearing against the wabbie plate, said shaft having a slot therein through which the link extends, and a spring bearing against the fluid pressure actuated piston urging said piston towards the open end of the counterbore.

3. A wabbie plate type pump comprising a housing which includes a cylinder block having a plurality of cylinders formed therein, a piston in each of the cylinders, a shaft extending into the housing, a wabbie plate mounted on said shaft, a pin bytem extending from each piston to the wabbie plate, said housing having an intake port therein extending to said cylinders and an outlet port extending from the cylinders, said shaft having a counterbore therein extending from the end of the shaft within the housing, fluid pressure actuated piston in the counterbore, said fluid pressure actuated piston being acted upon by fluid pressure at said outlet port, a block slidably mounted in said counterbore, means connecting the block and fluid pressure actuated piston, a pair of links, each of said links being attached at one end to said block, the outer end of one of the links being pivotally secured to the wabbie plate, and the outer end of the other link bearing against the wabbie plate, said shaft having slots therein through which the links extend.

4. A wabbie plate type pump comprising a housing which includes a cylinder block having a plurality of cylinders formed therein, a piston in each of the cylinders, a shaft extending into the housing, a wabbie plate mounted on said shaft, a pin bytem extending from each piston to the wabbie plate, said housing having an intake port extending into the housing, a wabbie plate mounted on said shaft, a pin bytem extending from each piston to the wabbie plate, said housing having an intake chamber formed therein surrounding the shaft, and an intake port extending into the intake chamber, said housing having an outlet chamber formed between the intake chamber and the outlet chamber, said disc valve being arranged between the intake chamber and the outlet chamber, said disc valve having a port therein whereby fluid flows from the cylinders to the outlet chamber, said shaft having a counterbore therein extending from the inner end of the shaft within the housing, the open end of the counterbore being opened to the outlet chamber, a fluid pressure actuated piston, a link attached at one end to said block and the other end of the link bearing against the wabbie plate, said shaft having a slot therein through which the link extends.

5. A wabbie plate type pump comprising a housing which includes a cylinder block having a plurality of cylinders formed therein, a piston in each of the cylinders, a shaft extending into the housing, a wabbie plate mounted on said shaft, a pin bytem extending from each piston to the wabbie plate, said housing having an intake chamber formed therein surrounding the shaft, and an intake port extending into the intake chamber, said housing having an outlet chamber formed around the inner end of the shaft, and an outlet port extending from the outlet chamber, a disc valve fixedly mounted in the shaft, said valve being arranged between the intake chamber and the outlet chamber, said disc valve having a port therein whereby fluid flows from the cylinders to the outlet chamber, said shaft having a counterbore therein extending from the inner end of the shaft within the housing, the open end of the counterbore being opened to the outlet chamber, a fluid pressure actuated piston, a link attached at one end to said block and the other end of the link bearing against the wabbie plate, said shaft having a slot therein through which the link extends.
shaft, said valve being arranged between the intake chamber and the outlet chamber, said disc valve having a port therein whereby fluid flows from the cylinders to the outlet chamber, said disc valve having a second port therein whereby fluid flows from the intake chamber to said cylinders, said shaft having a counterclockwise therein extending from the inner end of the shaft within the housing, the open end of the counterclockwise being opened to the outlet chamber, a fluid pressure actuated piston slidably mounted in the counterclockwise, a block slidably mounted in said counterclockwise, means connecting the block and the fluid pressure actuated piston, a link attached at one end to said block and the other end of the link bearing against the wobble plate, said shaft having a slot therein through which the link extends, and a spring bearing against the fluid pressure actuated piston and urging the fluid pressure actuated piston towards the open end of the counterclockwise.

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