

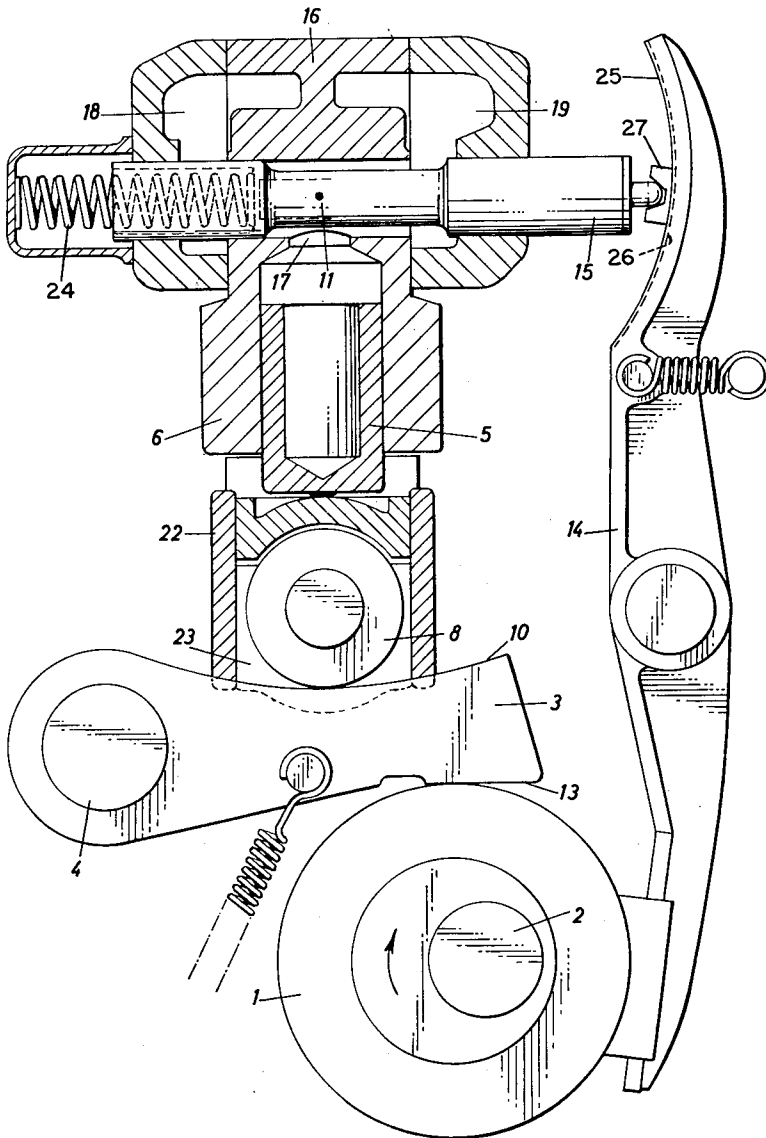
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HYDRAULIC RECIPROCATING PUMP APPARATUS

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1

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This invention relates to an hydraulic reciprocating piston pump apparatus of a type wherein a driven rotary body actuates the piston.

Usually apparatus of the above type has the piston rod end in direct engagement with the rotary body, say an eccentric, so that side thrust is transmitted through the piston rod to the piston. The piston rod end can be provided with a roller, shoe or other element for convenience in operation and to reduce friction.

According to the present invention there is provided a hydraulic reciprocating piston pump in which the piston is reciprocated by a driven eccentric through the medium of an interposed piston rocker arm pivoted about one end, characterised in that the flow of fluid to and from the cylinder is controlled by a reciprocating mechanical valve means, said valve means being positioned across the delivery end of the cylinder and operated by the same eccentric as the piston through the medium of a double-ended valve rocker arm mounted independently of the piston rocker arm, said double-ended valve rocker arm having one end operated by the eccentric and the other end operating the valve, said piston and valve being moved with a substantially ninety-degrees phase difference in relation to one another, and said valve means, piston and cylinder forming a single unit.

Moreover, the apparatus may include a number of the piston-cylinder units and rocker arms arranged with the cylinder units all on one side, or alternate sides, of the axis of their eccentrics.

An embodiment of the invention will now be described with reference to the accompanying drawing which is a part sectional view of a variable displacement pump-valve unit constructed according to the invention.

The invention, of which an embodiment will now be more particularly described, includes at least one mechanically operated pump unit of variable displacement although the unit may be fixed for constant displacement in which case the rocker arm need not be profiled.

As shown in the drawing mechanical valve means are incorporated and an additional double-ended rocker arm 14 has one end bearing against the profile of the eccentric 1 and is set at an angle of substantially 90° out of phase with the rocker arm 3. The opposite end of such additional double-ended rocker arm 14 is adapted to operate a spool (or other) form of reciprocating spring loaded valve 15, which is mounted in a valve block 16 having a cylinder port 17, a suction port 18 and a pressure outlet port 19. The cylinder 6 has a cradle 22 which carries and guides a crosshead 23 having a roller 8 (or its equivalent) bearing against the profile 10 of the rocker arm 3. The rocker arms 3 and 14 will move with a 90° phase difference with respect to one another and the valve 15 will be central, closing both ports 18, 19, at each end of the piston stroke. It will be understood that oil output from the pump is decreased as the cylinder 6 is swung about its pivot 11 towards the axis 4 and increased as it is swung towards the other end of the arm as before stated. A

2

number of these pump-valve units may be arranged in line on one side of the shaft 2 or on alternate sides. In this construction it is preferred that the enclosed volume of oil in each cylinder, i.e., oil sealed between the piston 5 and valve lands of spool 15, when the spool is in its central position, is as small as possible. Only two fluid-tight joints are required for each cylinder-valve block, i.e., suction and output. Moreover, the arrangement is very compact. The valve 15 is spring loaded by the spring 24. The end of the rocker arm 14 nearest the valve 15 has a curved face 25 and guide means 26 which carries the slidable block 27 which engages the end of the valve 15 and permits relative movement of the valve 15 and block 27 with respect to the rocker arm 14 during adjustment of the cylinder 6 about its pivotal axis.

What I claim is:

1. Hydraulic reciprocating piston pump, comprising a cylinder, a piston in said cylinder, a driven eccentric, a first rocker arm interposed between said piston and said eccentric and pivoted to rock about one end, said cylinder being pivotally mounted in relation to the first rocker arm, said first rocker arm being profiled facing said cylinder as a curve struck from the pivotal axis of the cylinder, said piston having end means engaging with said profiled face and variable in position over the limits of such profiled face, said cylinder opening into a valve body located across the delivery end of said cylinder, said body and cylinder forming one structure movable together about a common pivot, said body being provided with a suction port and a pressure outlet port, a reciprocable valve in said body to control the flow of hydraulic fluid between the said ports and said cylinder, a second pivoted rocker arm of double ended formation, said second pivoted rocker arm on one side of its pivot engaging said eccentric and on the other side engaging one end of said valve, said piston and said second rocker arm being mounted in relation to said eccentric to be operated with a substantially ninety-degree phase difference in relation to one another.

2. Hydraulic reciprocating piston pump as defined in claim 1, wherein said end means comprises piston carrier guide means, a crosshead in said guide means and attached to the piston to reciprocate therewith, and a rotary element carried by said crosshead to engage said profiled face of said first rocker arm.

3. Hydraulic reciprocating piston pump as defined in claim 1, wherein said second rocker arm at its end nearest said valve has a curved face and guide means, a slidable block in said guide means, said block engaging an end part of said valve to allow relative oscillatory movement during adjustment of said cylinder about its pivotal axis during which movement said block is automatically adjustable in said guide means.

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