

July 8, 1941.

E. C. DUDLEY

2,248,449

HYDRAULIC PUMP

Filed April 29, 1940

2 Sheets-Sheet 1

Fig. 1

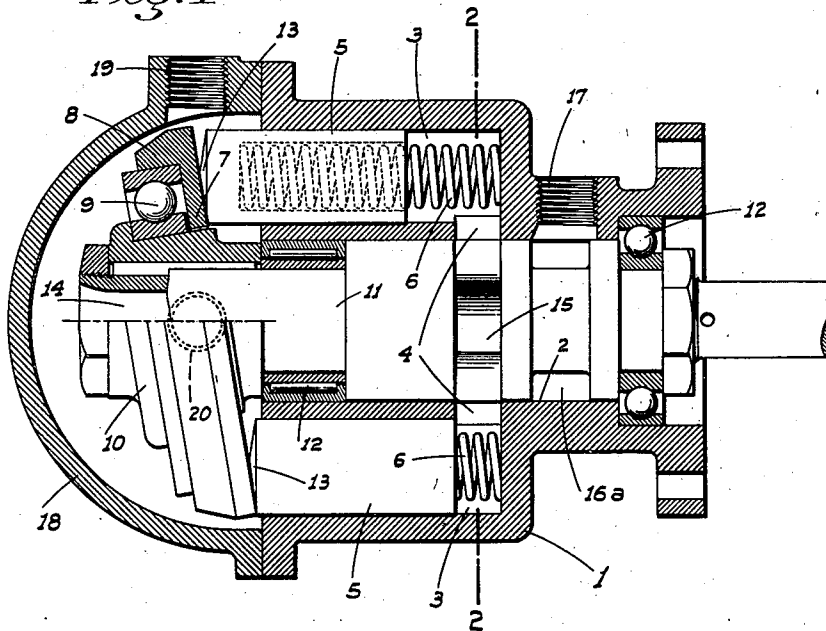
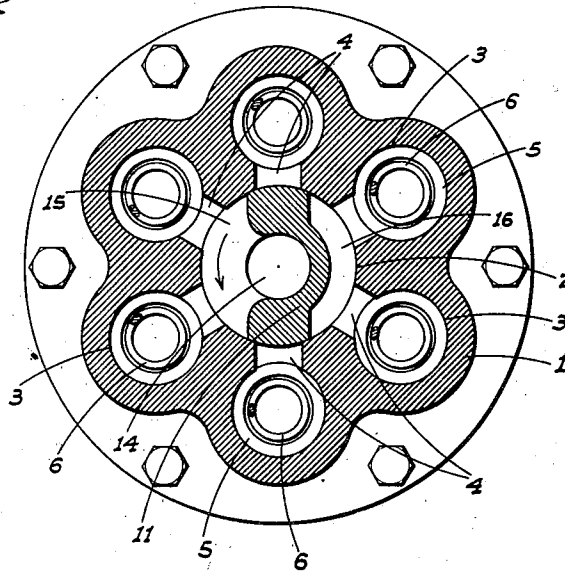


Fig. 2



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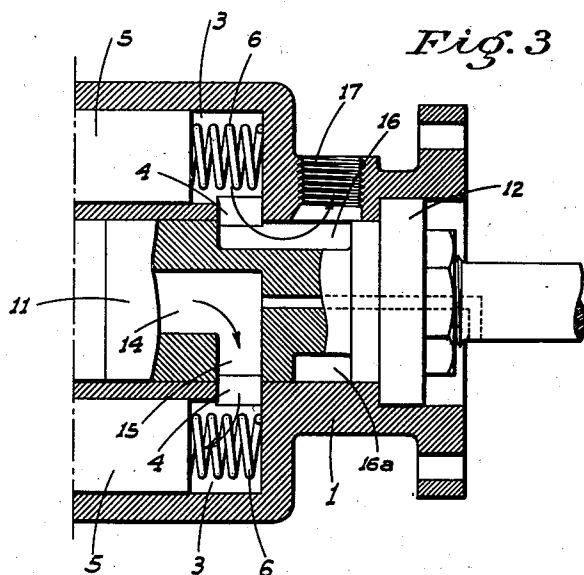
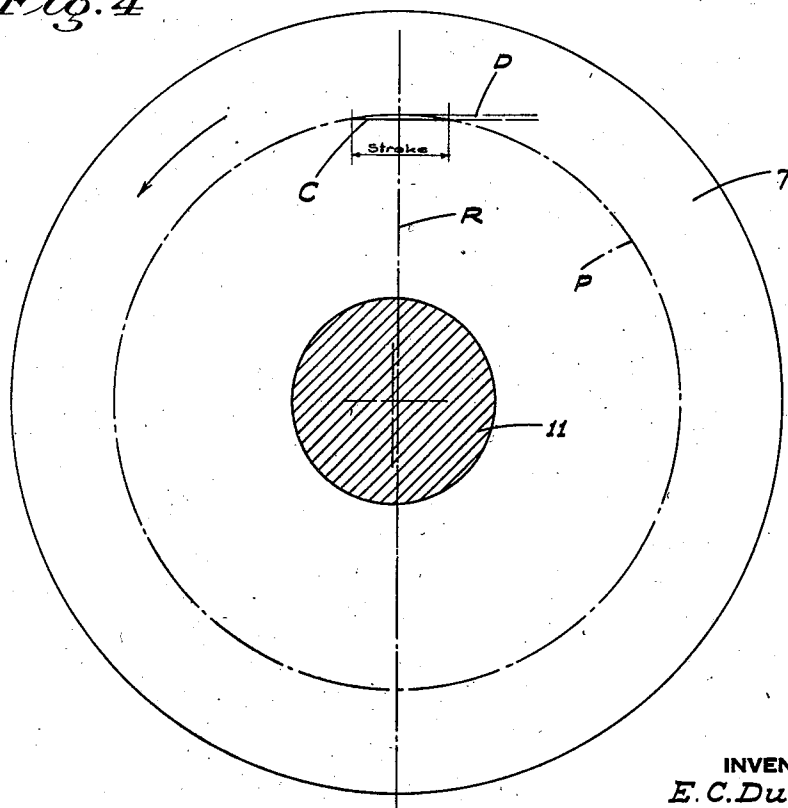


Fig. 4



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2,248,449

HYDRAULIC PUMP

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Application April 29, 1940, Serial No. 332,224

2 Claims. (Cl. 103—173)

This invention relates to high pressure hydraulic pumps, and particularly to one of relatively small size adapted for mounting on a tractor to supply pressure for operating hydraulic implement controls and the like.

The principal object of my invention is to provide a pump of the reciprocating piston or plunger type which may be operated at high speed and with high efficiency and will generate high pressure, and in which the operating or driving means is so constructed that side thrust on the pistons is largely eliminated, thus reducing wear, friction and possible leakage and resultant loss of pressure and reducing the power necessary to operate the pump.

A further object is to provide, in a multiple cylinder and piston pump, a single valve which controls the inflow and outflow of fluid to and from all the cylinders, and which is a unit with the drive shaft, thus reducing the number of parts necessary, and making for greater simplicity without loss of efficiency.

A further object of the invention is to produce a simple and inexpensive device and yet one which will be exceedingly effective for the purpose for which it is designed.

These objects I accomplish by means of such structure and relative arrangement of parts as will fully appear by a perusal of the following specification and claims.

In the drawings similar characters of reference indicate corresponding parts in the several views:

Figure 1 is a sectional elevation of my improved pump.

Figure 2 is a transverse section on line 2—2 of Fig. 1.

Figure 3 is a fragmentary sectional elevation of the pump, showing the pistons and valve when the opposed pistons are in half-stroke positions.

Figure 4 is a diagrammatic elevation of the operating cam on its working face.

Referring now more particularly to the characters of reference on the drawings, the pump comprises a casing 1 having a central bore 2 surrounding which are cylinders 3 open to one end of the casing and terminating at their inner closed end short of the opposite end thereof. The cylinders at their inner end have ports 4 communicating with bore 2.

Pistons 5 are slidable in the cylinders and project from the outer end thereof, being urged outward, or on the suction stroke, by compression springs 6. The pistons at their outer end are engaged by the adjacent flat face of a cam disc 7.

This disc is provided about its periphery with a forward flange 8 forming a support for a ball bearing 9. This bearing is mounted on a hub 10 which in turn is fixed on a drive shaft 11 projecting through and turnable on bearing 12 in bore 2 adjacent its ends. The disc and bearing 9 are disposed with their common axis in angular relation to the axis of the drive shaft to an extent sufficient to provide the desired stroke movement of the pistons. In order to provide flat contact of the pistons with the disc irrespective of the position of the disc relative thereto, said pistons at their outer end are peaked as at 13 on an angle the same as that of the disc, as shown.

As the disc rotates, it will be obvious that the pistons will be successively moved directly in on a pressure stroke against the resistance of springs 6, there being thus one pressure and one suction stroke with each complete revolution of the disc. If the shaft 11 is centered with the disc (and the piston circle) in the plane of the back piston engaging face of the disc, there would be a certain amount of slippage of the disc against the pistons, which would create severe friction and wear especially evident on the pressure or load stroke.

To offset and overcome this slipping on said load stroke, the drive shaft is offset relative to the center of the disc in a particular manner as shown in Fig. 4. This offset is computed and disposed as follows: A chord C whose length equals that of the piston stroke is laid out against the piston-center circle P at the foremost point on the back face of the disc (which determines the outermost end of the suction stroke). The center of the drive shaft is then disposed on the leading side of and at right angles to a radial line R drawn centrally of the disc and chord, a distance equal to the radial depth D of said chord at the center. By so disposing the drive shaft, the disc "climbs" relative to the piston circle as the disc forces the pistons in on the load stroke, an amount just sufficient to offset the slippage which would otherwise be had. While this arrangement increases the slippage on the suction stroke of the pistons, there is then no pressure between the pistons and disc, and therefore such slippage does not cause any appreciable wear.

The drive shaft is bored as at 14 from its end beyond the disc to a point adjacent ports 4, where a port 15 leads from said bore to the periphery of the shaft to communicate with the ports 4 in successive order; the arcuate extent of the port 15 being sufficient to communicate

with several pistons at one time while they are on the suction stroke. The drive shaft is also longitudinally and arcuately recessed as at 16 opposite to and separated from port 15 to establish communication between ports 4 and an annular deep groove 16a formed in the drive shaft beyond port 15 and which groove is always in communication with an outlet port 17 in the body leading from bore 2 beyond the cylinders. The drive shaft thus functions as a rotary valve, which controls the flow of oil into and out of the cylinders from the one port in each in proper timed order and without the use of any additional parts being necessary.

The body at the open end of the cylinders is enclosed by a cap 18 having an intake port 19 for oil as well as one or more other return ports as indicated at 20. Oil is thus fed into the shaft to be taken into the cylinders, and at the same time the cam disc, ball bearing, and adjacent wearing parts are maintained in a bath of oil.

The drive shaft projects beyond the opposite end of the body where it is adapted for connection to a source of power.

From the foregoing description it will be readily seen that I have produced such a device as substantially fulfills the objects of the invention as set forth herein.

While this specification sets forth in detail the present and preferred construction of the device, still in practice such deviations from such detail may be resorted to as do not form a departure from the spirit of the invention, as defined by the appended claims.

Having thus described my invention, what I claim as new and useful and desire to secure by Letters Patent is:

1. A hydraulic pump comprising a body, a cylinder therein closed at one end, a bore in the body parallel to the cylinder, a port between the bore and cylinder at the closed end of the latter, a fluid outlet leading radially from the bore, a

piston slidable in the cylinder and projecting from the end of the body opposite the closed end of the cylinder, a rotary drive shaft projecting through the bore to a termination beyond said opposite end of the body, instrumentalities to reciprocate the piston on suction and pressure strokes and including an element on the shaft to engage the projecting end of the piston, the shaft having a bore leading from the plane of the cylinder port to said shaft termination, and a port leading from the shaft bore to the periphery thereof to communicate with the cylinder port; means to supply fluid to the shaft bore, an outlet leading from the body bore beyond the shaft port, means on the shaft forming a closure in the body bore between the outlet and shaft port, means integral with the shaft forming a passage opposed to the shaft port and positioned to establish communication between the cylinder port and outlet when communication between the shaft and cylinder ports is broken, and a cap secured on said opposite end of the body and enclosing the adjacent end of the piston, shaft and the element thereon; the cap having a fluid intake port adapted for connection to a source of supply.

2. A hydraulic pump comprising a cylinder open at one end, a piston slidable in the cylinder, a spring urging the piston on the suction stroke and out from the open end of the cylinder, a drive shaft parallel to the cylinder, a cam disc about the shaft with its axis at a predetermined angle to the axis of the shaft and having a face engaging the piston at its outer end and means mounting the disc on the shaft so that the axis thereof at said face is offset from the shaft axis an amount equal to the radial difference between a chord whose length is that of the piston stroke, and the piston center circle touching said chord at its ends.

EDWARD CLIFFORD DUDLEY.