April 9, 1968 O. A. GROSJEAN 3,376,823

ROTARY PISTON HYDRAULIC PUMP

Filed Jan. 11, 1966

FIG.2

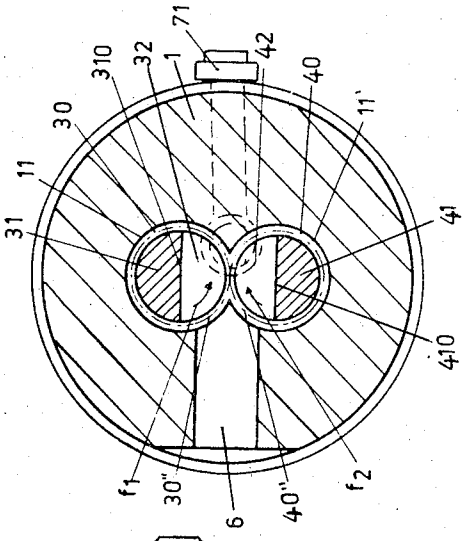


FIG.4a FIG.4b FIG.4c

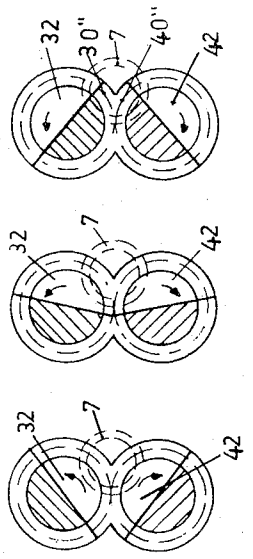


FIG.1

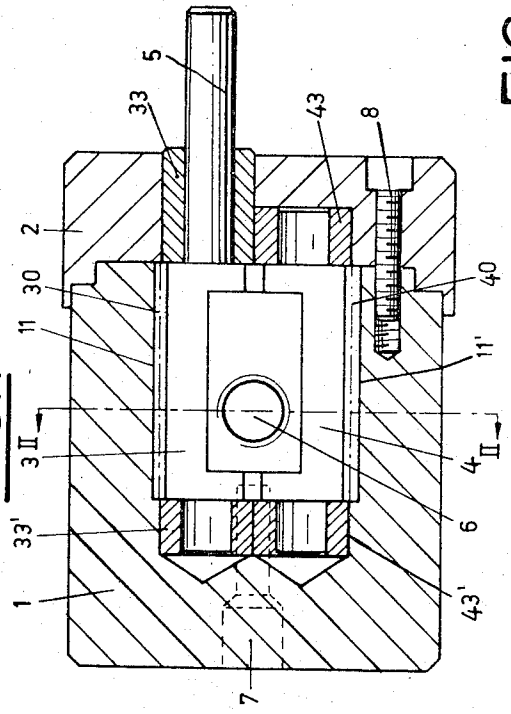
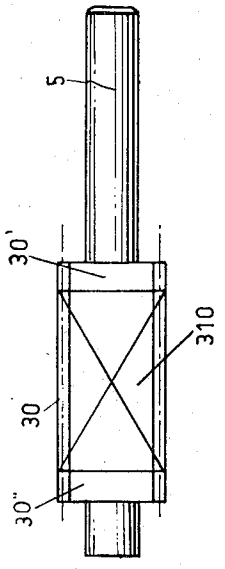


FIG.3



United States Patent Office

3,376,823

Patented Apr. 9, 1968

3,376,823

ROTARY PISTON HYDRAULIC PUMP

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Filed Jan. 11, 1966, Ser. No. 519,916
Claims priority, application Switzerland, Jan. 11, 1965, 454/65
3 Claims. (Cl. 103—126)

ABSTRACT OF THE DISCLOSURE

In a hydraulic pump, the rotary pistons are rotatably mounted in two parallel cylindrical chambers, one inlet and one outlet communicates with the chambers and each piston has a semi-circular cross-section, the cylindrical part of which has teeth forming a gear, one gear being rotated by a motor to drive the other gear, and both gears being adapted during operation of the pump successively to suck in fluid through the inlet conduit into the chambers, to block off the inlet conduit, and by centrifugal effect, to create an overpressure of fluid in the chamber whereby the fluid is driven out of the chambers across the teeth of the piston-gears through the outlet conduit. The speed of rotation of the pistons can be of 2700 r.p.m. and the pressure at the outlet can attain 18 atmospheres.

There exists a large variety of hydraulic pumps, most often driven by an explosion engine or by an electric motor. The rotation of the shaft of the pump causes generally by the intermediary of appropriate means a suction at the inlet of the conduit by which the liquid is taken in, and an overpressure of liquid driven out of the outlet of the pump. One such pump has used rotary, semicylindrical pistons, of which the active part is reduced by semicircular grooves which are provided there.

The diameter of the pistons of these pumps must be fairly large, which consequently makes such pumps relatively cumbersome, and causes the pistons to develop large moments of torque during rapid rotation.

The present invention aims precisely to reduce the dimensions and to increase the robustness of such pumps by providing a pump which departs considerably from those which have just been described.

The invention provides a hydraulic pump with rotary pistons comprising a body having two parallel cylindrical chambers and a piston rotatably mounted in each chamber, at least one inlet conduit communicating with the chambers, and at least one outlet conduit communicating with the chambers, each piston comprising a cylindrical gear provided with at least one recess extending along part of the length of the gear, one gear being adapted to be driven in rotation by a motor and to drive the other gear, both gears being adapted, during operation of the pump, successively to suck in fluid through the inlet conduit into the chambers, to block off the inlet conduit, and, by the centrifugal effect, to create an overpressure of fluid in the chambers, whereby the fluid is driven out of the chambers through the outlet conduit.

Preferably the bottom of each recess is substantially plane and is parallel to the axis of its corresponding gear. It is also preferable that the recess extend over the major part of the length of the gear.

The invention will be better understood with reference to the annexed drawings which represent by way of non-limiting example one particular embodiment of the present invention and in which:

FIGURE 1 is an axial section view of the pump;

FIGURE 2 is a sectional view along II—II of FIGURE 1 of the same pump;

FIGURE 3 is a side view of one of the pistons;

FIGURES 4*a*, 4*b* and 4*c* represent three successive positions of the pistons during operation of the pump.

Referring first of all to FIGURE 1, the pump has a cylindrical body **1** in which are provided two parallel cylindrical chambers **11** and **11'**, adapted to receive rotary pistons or gears **3** and **4** trunnioned in the bearings **33'**, **43'** and **33**, **43** respectively. These latter bearings are disposed in a cover **2** rigidly attached to the body **1** of the pump by the securing screw **8**. The shaft **5** of the driving gear **3** passes through the cover **2** and is actuated by a motor (not shown), for example an electric motor. The fluid is introduced into the pump by an inlet conduit **6**. The pump drives out the fluid through an outlet conduit **7**. The driving gear **3** meshes with the driven gear **4** by means of teeth **30** and **40** respectively.

Referring now to FIGURE 2, a screw **71** for regulating the outlet flow of the fluid is disposed and abuts perpendicularly to the outlet conduit **7**. The two rotary pistons formed by the gears **3** and **4** have a plane surface **310** and **410**, respectively, passing through the axis of the gears. The bodies **31** and **32** of the pistons **3** and **4**, respectively, are semi-circular in cross-section. The arrows f_1 and f_2 indicate the preferred direction of rotation for which the pump is the most efficient.

FIGURE 3 shows the gear **3**. This gear has a plane rectangular surface **310** constituting the active part of the piston. The gear **3** has teeth **30** on the cheeks **30'** and **30''** and extending between the cheeks on the cylindrical portion of the gear.

The operation of the pump, schematically shown by FIGURES 4*a*, 4*b* and 4*c* is as follows:

The pistons **3** and **4** driven in rotation in the direction of the arrows f_1 and f_2 by the shaft **5** of the driving gear **3**, offer, as shown in FIGURE 2, a volume into which the fluid is drawn from the inlet conduit **6**. The pistons then block the inflow of fluid (FIGURE 4*b*) which, emprisoned in the chambers **32** and **42**, is centrifuged by the rotation of the pistons and exerts on the surface of the chambers an overpressure, under the action of which part of the fluid escapes across the teeth of the cheeks **30''** and **40''** by the part of the conduit **7** which opens into the chambers.

The pistons, having arrived at the position represented in FIGURE 4*c*, block off the outlet conduit **7**. Part of the fluid introduced in the chambers **32** and **42** having been ejected, a suction is produced in the chambers which, when they are presented again in front of the inlet conduit **6**, sucks in fluid again. The pump only discharges during the period which separates the FIGURES 4*b* and 4*c*. Nevertheless, the elevated speed of rotation (2,700 revolutions per minute) generates a quasi-contiuous discharge.

Various modifications are possible. For example the recesses of the gears constituting the pistons can have a different form, that their bottom need not pass through the axis of the piston. Also the piston can have a single central cheek dividing the recess in two, in place of the two cheeks **30'** and **30''** at the ends of the recess. Moreover, the symmetrical position of the outlet conduit **7** with respect to the two chambers can be arranged differently, for example, a separate conduit could be provided in each of the cylindrical chambers. The pump according to the invention has the advantage of small dimensions, and can be, for example, of the same dimensions as the accompanying drawing. Thus the pistons have only to support small moments of torque.

The dismantling and the cleaning of this pump is particularly easy since it suffices to remove the cover **2** by unscrewing the securing screw **8** to have access to the gears **3** and **4** which can be removed immediately.

This pump is finally extremely robust, and is very re-

liable. It is particularly silent and the pressure at the outlet can attain 18 atmospheres.

What is claimed is:

1. A hydraulic pump comprising: a body having two parallel cylindrical chambers; a piston rotatably mounted in each chamber; at least one inlet conduit communicating with said chambers; at least one outlet conduit communicating with said chambers; each piston having a plane rectangular surface and a cylindrical portion having spaced teeth extending longitudinally along said cylindrical portion in communication with said outlet conduit, and forming passages parallel thereto whereby said pistons form gears; one of said gears being adapted to be rotated by a motor and meshing with said other gear to drive the same; both gears being adapted, during operation of the pump, successively to suck in fluid through said inlet conduit into said chambers, to block off said inlet conduit, and, by centrifugal effect, to create an overpressure in said chambers, whereby fluid is driven out of said chambers across said teeth of said pistons through said outlet conduit.

2. A pump according to claim 1, in which two cheeks

are provided on each of said gears, one cheek at each end of each gear, the teeth of said gears extending over said cheeks as well as over said cylindrical portion of said gear between said cheeks.

3. A pump according to claim 1, in which said outlet conduit is parallel to the axis of said gears and opens simultaneously into each of said chambers during rotation of said pistons.

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