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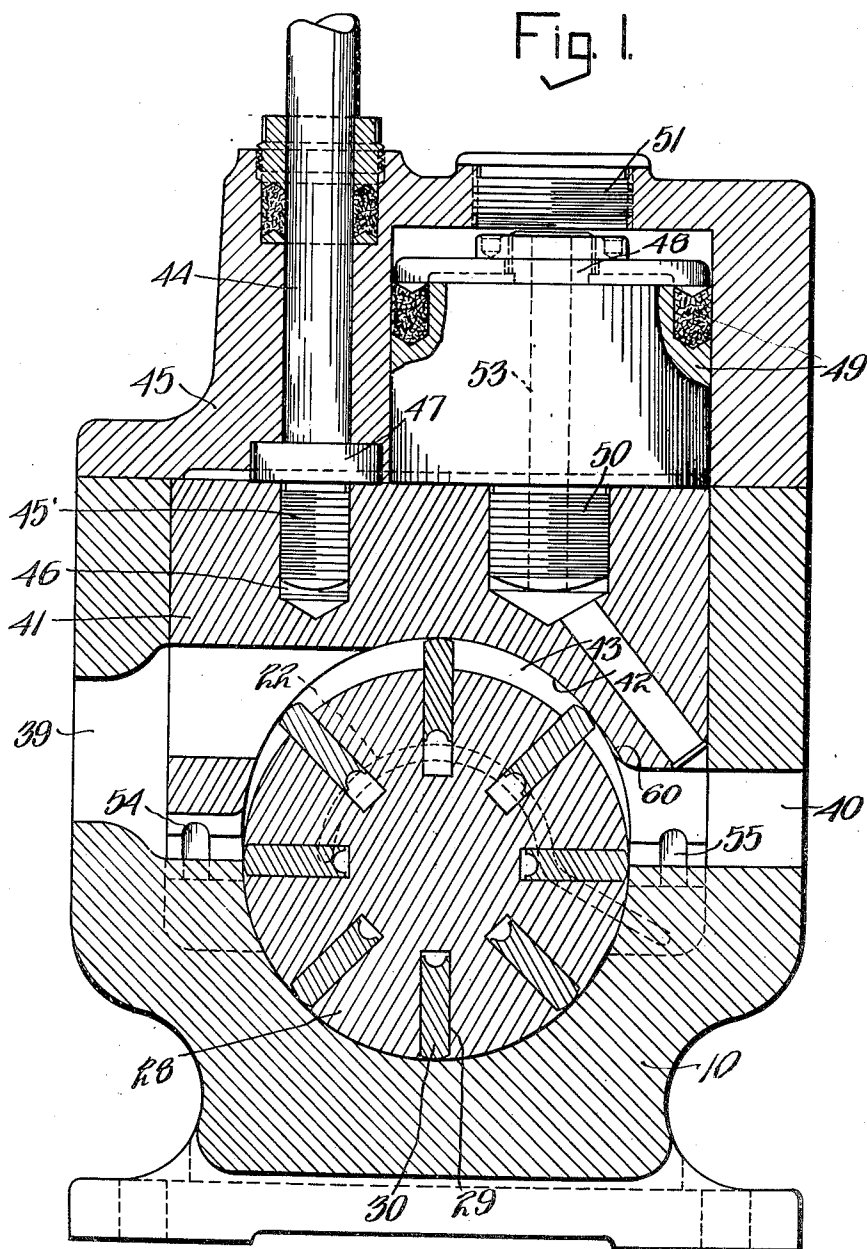
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1,697,041

VARIABLE CAPACITY PUMP

Original Filed July 13, 1926

2 Sheets-Sheet 1



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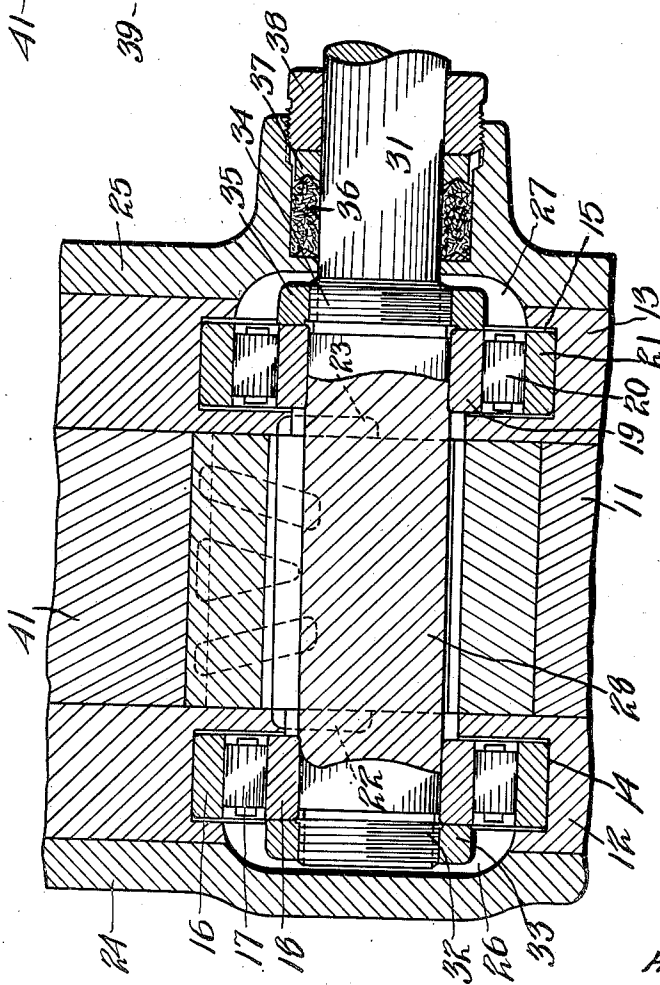
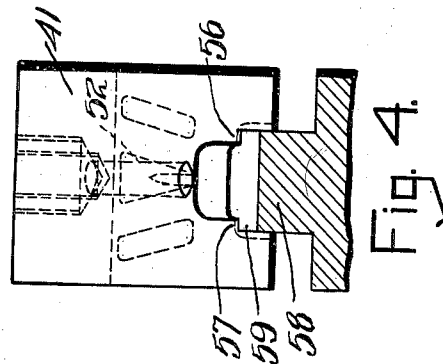
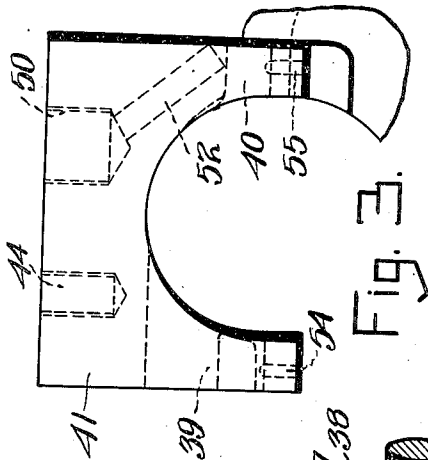


Fig. 2.

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UNITED STATES PATENT OFFICE.

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VARIABLE-CAPACITY PUMP.

Original application filed July 13, 1926, Serial No. 122,197. Divided and this application filed May 13, 1927. Serial No. 191,155.

My invention relates to pumps and has for its object to provide a variable capacity pump. A further object is to provide means for balancing the pressure on opposite sides of the means used to vary the capacity of the pump. Further objects and advantages will become apparent as the description proceeds.

Referring to the accompanying drawings which are made a part hereof and on which similar reference characters indicate similar parts,

Figure 1 is a sectional view of a pump showing the rotor and the capacity varying means,

Figure 2, a sectional front elevation of the pump,

Figure 3, a side elevation of the adjustable block, and

Figure 4, an end elevation at right angles on line 4—4 of Fig. 3.

This application is a division of a co-pending application of Amos P. Steiner and Harold E. Balsiger, Ser. No. 122,197, for hydraulic speed change, filed July 13, 1926.

In the drawings reference character 10 indicates a pump casing composed of a chambered central member 11 and end members 12 and 13 secured thereto in any conventional manner, as by bolts or screws, not shown. The members 12 and 13 are provided with chambers 14 and 15 for the reception of bearing elements 16, 17, 18, 19, 20 and 21 of conventional construction. The inner sides of said plates 12 and 13 are provided with arcuate grooves 22 and 23 for a purpose which will later appear. Additional plates 24 and 25 are secured to the ends of the casing by bolts or screws, not shown. These plates are provided with dished cavities 26 and 27 to provide additional clearance for the bearing elements, above mentioned.

Within the casing is mounted a pump rotor 28. This rotor is provided with radial slots 29 for the reception of vanes 30. The rotor is preferably integral with a shaft 31 upon which it is mounted. The shaft and the rotor however may be separate, the rotor being keyed to the shaft in any manner well known in the art.

The shaft 31 is provided at the inner end with screw threads 32 for the reception of a nut 33. Screw threads 34 provided near the

other end of the rotor receive nut 35. The nuts 3 and 35 secure the roller-race 16, above mentioned, in position.

The shaft 31 is mounted in suitable roller-bearing elements, previously mentioned, and extends through the side member 25. Suitable packing material 36 held in position by members 37 and 38 provide against leakage of fluid past the shaft.

The central member 11 of the casing has therein suitable openings 39 and 40 providing inlet and outlet ports for the pump.

A sliding block 41 having an inner cylindrical surface 42 forms a part of the pumping chamber. The sliding block 41 is used to vary the capacity of the pump and is adjustably mounted in the casing 10 above the rotor 28 and is movable toward and away from the rotor so that by adjusting the position of said block 41, the pumping chamber 43 may be increased or decreased in volume to vary the flow of pressure fluid through the pump. The sliding block 41 is supported on the end of a shaft 44 which extends outwardly through a cap 45 and which may be provided with a hand wheel, not shown. The said shaft 44 has its inner end provided with screw threads 45' which engage cooperating threads in a recess 46 of the sliding block 41. An annular enlargement 47 is provided on the shaft 44 which engages the under side of the cap 45 and forms a stop and prevents axial movement of the shaft when the block 41 is being screwed down. As shown, the shaft to which the sliding block is connected is mounted toward one side or eccentrically of the rotor 28 of the pump. An unbalanced condition, caused by pressure fluid on the inner surface of the block, would make difficult the rotation of the shaft 44 to raise and lower the sliding block 41.

To facilitate raising and lowering the block, I preferably provide means for partially balancing the sliding block 41 which comprises a piston 48 having a packing element 49 and a small reduced end 50 threaded into and movable with the sliding block 41. A cylindrical opening 51 is provided in the cap 45 for the reception of the piston 48. A passage 52 extends from the discharge side of the pump to a second passage 53 which extends through the piston 48 and through

which passages pressure fluid may pass to the outer extremity of the piston 48 and press the piston and the sliding block downwardly toward the rotor of the pump in proportion to the pressure within the same. The base area of said piston 48 is such that the total pressure acting on said piston to push it down is less than the total pressure acting to push block 41 up. This difference in pressure tends to steady said block 41.

In order to prevent complete stoppage of the spaces between the extremities of the sliding block and the pump body or housing, relief passages 54 and 55 are cut on each side of the ports. On account of this construction, when the block 41 is lowered any pressure fluid which might be entrapped and stop the downward movement of the block is released through the passages 54 and 55. As shown in Fig. 4, cooperating surfaces or stops 56 and 57 on each side of the ports limit the downward movement of the block 41 so that it never comes in contact with the rotor. The housing is provided with a tongue 58 which is adapted to project into and interlock with the recess 59 in the sliding block 41. A groove or relief passage 60 is formed in the discharge side of the block 41 to allow pressure to build up gradually between the blades. This structure prevents an objectionable pounding caused by pressure building up between the blades too abruptly.

The grooves 22 and 23 are in communication with the discharge passage 40 whereby fluid under pressure is delivered to the inner ends of the vanes 30 to force them against the inner surface of the pumping chamber during a part of the rotation of the rotor. This provides a better seal against leakage of fluid past the ends of the vanes.

The method of operation is believed to be clear from the structure shown and described. The rotor 28 is driven by any suitable source of power through the medium of the shaft 31 whereupon fluid is drawn in through the inlet passage 39 and delivered through the outlet port 40 by means of the vanes or impellers 30. As indicated, the impellers are held in contact with the inner wall of the pumping chamber by centrifugal force together with the discharge pressure of the pump acting against the inner ends of these vanes through passages 22 and 23.

In order to vary the volumetric output of the pump, the rod or shaft 44 is rotated to move the block 41 toward or from the rotor. It is obvious this will decrease or increase the volume of the pumping chamber 43 and therefore vary the volumetric output of the pump.

In order to relieve the upward pressure on the block 41, passages 52 and 53 connecting the upper part of this block with the discharge side of the pump admits pressure fluid above the block to counter-balance the pressure against the under side.

It will be obvious to those skilled in the art that various changes may be made in my device without departing from the spirit of the invention and I, therefore, do not limit myself to what is shown in the drawings and described in the specification, but only as set forth in the appended claims.

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

1. The combination of a housing, a cylindrical opening in said housing, a block having one surface forming a portion of the cylindrical opening, said block being movable to vary the size of said opening, a rotatable member within said cylindrical opening, radially disposed blades carried by said rotatable member, means for moving said block inwardly and outwardly to vary the capacity of the pump and manually operably eccentrically mounted means for adjustably varying the extent of movement of said block and means for balancing the block to permit it to be manually manipulated, substantially as set forth.

2. The combination of a housing, a fluid pump in said housing, a slidable block in the housing having an arcuate inner wall forming a portion of the casing for the pump said block having a recess formed in its extremities to prevent fluid from being entrapped between the ends of the block and the remainder of the casing for the pump, substantially as set forth.

3. The combination of a housing, a fluid pump in said housing, a slidable block in the housing having an arcuate inner wall forming a portion of the casing for the pump said block having a recess formed in its extremities to prevent fluid from being entrapped between the ends of the block and the remainder of the casing for the pump, said block having its wall adjacent the discharge side of the pump cut away to permit fluid to engage both sides of the blades, substantially as set forth.

4. The combination of a housing, a cylindrical opening in said housing, a block forming a portion of the wall of said cylindrical opening, said block being movable to vary the size of the opening, a rotatable element in said cylindrical opening, a cap on said housing over said block, a shaft extending through said cap and having a stop on one end for engaging the cap, the inner end of said shaft being threaded to said block whereby rotation of the shaft will move the block inwardly or outwardly to vary the size of the opening and means connecting the discharge port of the pump with a chamber above the block to equalize pressure on both sides thereof to facilitate adjustment of the block, substantially as set forth.

5. The combination of a housing, a cylindrical opening in said housing, a block form-

ing a portion of the wall of said cylindrical opening, said block being movable to vary the size of the opening, a rotatable element in said cylindrical opening, a cap on said housing over said block, a shaft extending through said cap and having a stop on one end for engaging the cap, the inner end of said shaft being threaded to said block whereby rotation of the shaft will move the block inwardly or outwardly to vary the size of the opening, fluid inlet and outlet passages through said housing and block communicating with said cylindrical opening, said rotatable element having a plurality of radial blades and means for forcing said blades outwardly as they pass through the entire arc of the pumping chamber, substantially as set forth.

6. The combination of a housing, a cylindrical opening in said housing, a block forming a portion of the wall of said cylindrical opening said block being movable to vary the size of the opening, a rotatable element in said cylindrical opening, a cap on said housing over said block, a shaft extending through said cap and having a stop on one end for engaging the cap, the inner end of said shaft being threaded to said block whereby rotation of the shaft will move the block inwardly or outwardly to vary the size of the opening, fluid inlet and outlet passages through said housing and block communicating with said cylindrical opening, said rotatable element having a plurality of radial blades and means for forcing said blades outwardly as they move through the pumping chamber, said means being inactive when

the blades are in another position of their movement, substantially as set forth.

7. A variable capacity pump comprising a housing, a rotor mounted in said housing, radial vanes slidably mounted in said rotor, a block mounted in said housing, said block containing a semi-circular recess adapted to accommodate said rotor, co-acting means on said block and housing to provide a smooth movement of said vanes past said co-acting points, substantially as set forth.

8. A pump comprising a housing, a cylindrical pumping chamber in said housing, a rotor eccentrically mounted in said chamber to provide a crescent like pumping chamber between the rotor and an adjustable block forming one side of the chamber, radially movable vanes mounted in said rotor, and means for gradually subjecting said blades to the pressure on the discharge side of the pump upon rotation of the rotor, substantially as set forth.

9. A pump comprising a housing, a cylindrical chamber in said housing, inlet and outlet ports to said chamber, a rotor in said chamber, radially movable vanes mounted in said rotor, an arcuate groove in the inner side of the housing communicating with the discharge side of the pump and extending a distance greater than the arcuate distance between two vanes, substantially as set forth.

In witness whereof, I have hereunto set my hand at Waynesboro, Pennsylvania, this 19th day of April, A. D. nineteen hundred and twenty-seven.

HAROLD E. BALSIGER.