

Dec. 24, 1968

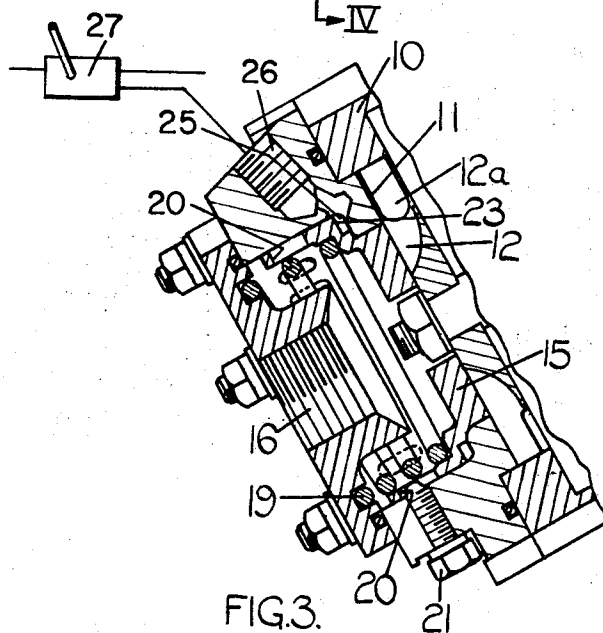
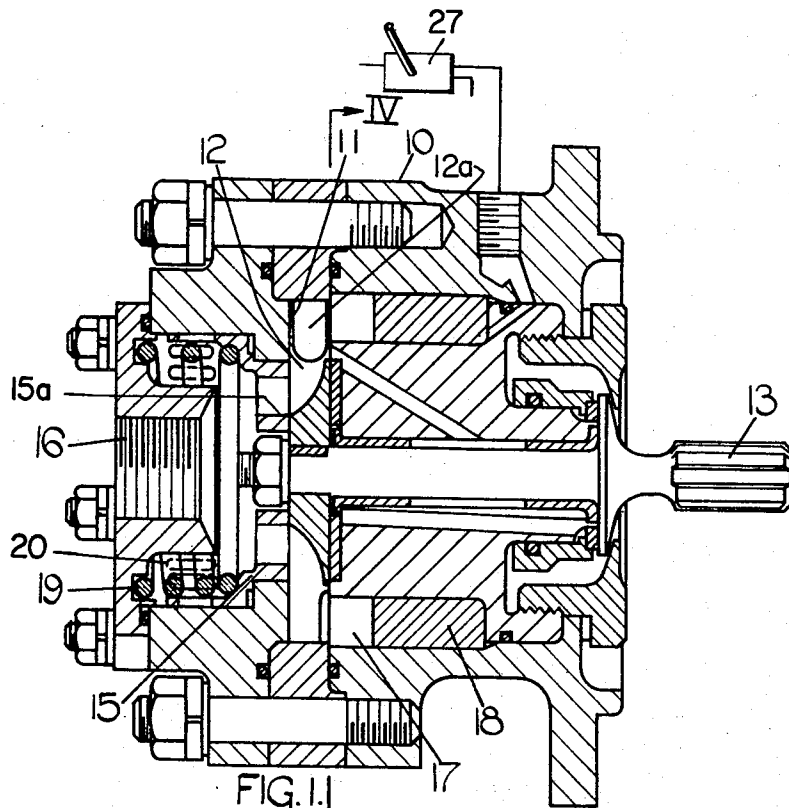
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3,417,705

LIQUID DISPLACEMENT PUMPS

Filed June 13, 1966

2 Sheets-Sheet 1



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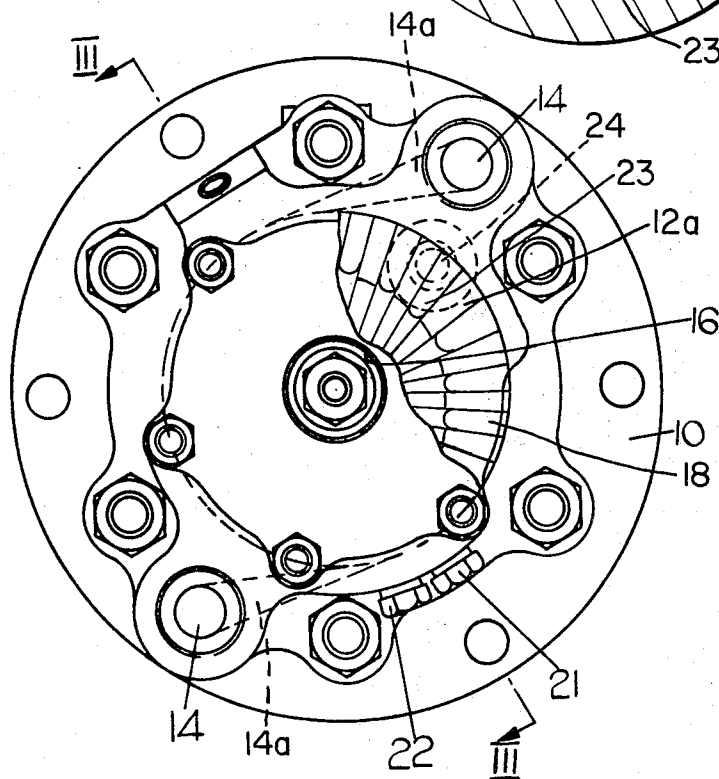
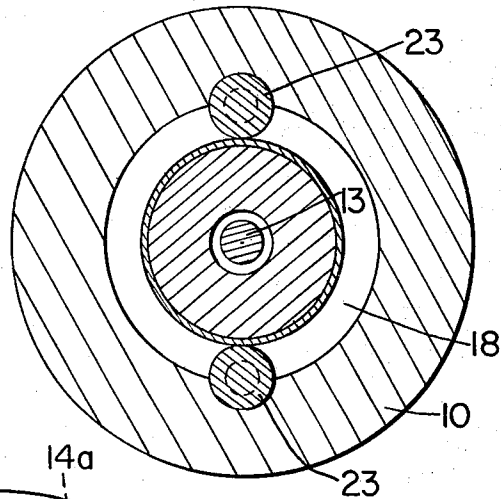


FIG. 2.

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LIQUID DISPLACEMENT PUMPS

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ABSTRACT OF THE DISCLOSURE

A liquid displacement pump having a body, a bladed rotor mounted within a cavity in the body, an inlet and an outlet in the body angularly spaced positions in the cavity, an inlet plate in which are formed ports communicating with the inlet in the body, the inlet plate being movable between a first position in which it is closely adjacent to the rotor side face so that inlet of liquid is confined to a position angularly spaced from the outlet, and a second position in which the inlet port is spaced from the rotor so that liquid entering the cavity can do so over a relatively large area of the side face of the rotor, and means for use when the inlet plate is in said first position for defining a part annular recess in the wall of the cavity of the body at the side of the rotor remote from the inlet plate.

This invention relates to liquid displacement pumps of the kind having a body, a bladed rotor mounted in a cavity in the body, an inlet and an outlet in the body at respective positions spaced from one another, the outlet being disposed to receive liquid leaving the rotor blades under the action of centrifugal force, as the rotor rotates.

The object of the invention is to provide a pump of the kind specified in a convenient form.

In accordance with the present invention a liquid displacement pump of the kind specified has an inlet plate movable between a first position in which it is closely adjacent to the rotor side face so that entry of liquid through an inlet port in the plate is confined to a position angularly spaced from the outlet and a second position in which the inlet port in the plate is spaced axially from the rotor so that liquid entering the cavity through the inlet port can do so over a relatively large area of the side face of the rotor, and means, operable when the pump is intended for use with the inlet plate in its first position, for defining a part-annular recess in the wall of the cavity in the body adjacent to the opposite side face of the rotor from the inlet plate, said recess being defined between the position of the inlet and that of the outlet.

The invention will now be described by way of example with reference to the accompanying drawings in which:

FIGURE 1 is a cross-sectional view of a pump constructed in accordance with this invention,

FIGURE 2 is an end elevation view,

FIGURE 3 is a fragmentary cross-sectional view on the line III—III in FIGURE 2, and

FIGURE 4 is a cross-sectional view on the line IV—IV in FIGURE 1.

In these drawings there is illustrated a pump which is particularly suitable for supplying liquid fuel to a gas turbine engine, the pump having a multi-part body 10 defining a cylindrical cavity 11 in which is mounted a bladed rotor 12, the rotor being connected to a shaft 13 which can be driven by the engine to which the pump is intended to supply fuel.

The rotor blades 12a, in this example, extend radially and a leading face of each is formed with a concave generally part-cylindrical recess to form a scoop at the

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outer end of the blade, the rotor being capable of sweeping substantially the whole of the cavity 11.

In the cylindrical wall of the cavity is formed a pair of diametrically opposite tangential outlets 14a communicating with respective outlet passages 14 as illustrated in FIGURE 2. An axially movable inlet plate 15 forms one side wall of the cavity 11, this inlet plate 15 being loaded towards the rotor 12 by a spring 19 and having a pair of diametrically opposite inlet ports 15a which communicate with a central inlet 16 in the body 10 of the pump, the inlet ports being angularly spaced from the ends of the outlets in the cavity 11 respectively.

The inlet plate 15 can be moved between a first position in which it is closely adjacent to the side face of the rotor 12 as illustrated so that the inlet ports confine entry of liquid to the rotor 12 to regions spaced angularly from the outlets respectively, and a second position in which the inlet plate 15 is axially spaced from the side face of the rotor 12. The inlet plate can be moved from the first position to the second by fluid pressure entering an annular space 25 between the body 10 and the inlet plate 15 through a passage 26, which conveniently communicates with the outlet passages 14 or other sources of pressurised fluid. A control valve 27 is also provided for manual or automatic control of the flow to the space 25.

The inlet plate 15 has a flange in which are formed spaced slots 20 engageable by two screws 21, 22 by means of which angular setting of the inlet plate 15 may be achieved.

The opposite side wall of the cavity 11 in the body 10 is formed with an annular recess which is divided into a pair of part-circular recesses 17 by a pair of fixed abutments 23, these recesses 17 each extending between the position of one inlet port 15a in the inlet plate 15 and that of an associated outlet 14a respectively.

The recesses 17 are of channel shape in cross-section and their bases are constituted by the crown of an annular piston 18 which can be moved towards and away from the rotor by fluid pressure obtained through the control valve 27 from the pump outlet. Springs 24 urge the piston 18 towards the rotor 12.

In use, when the inlet plate 15 is in the first position, the piston 18 is moved away from the rotor 12 to define the recesses 17.

It is believed that when in this mode, the liquid tends to follow a part-toroidal path through the spaces between the rotor blades and through the recesses 17, between the inlet ports and the outlets respectively.

However, when the inlet plate 15 is moved to its second position, spaced from the rotor 12, the liquid can enter the cavity 11 over a relatively large area of the face of the rotor 12, the recesses 17 being entirely filled by the piston 18.

It has been found that when the inlet plate 15 is in the first position and the recesses 17 are defined, the outlet pressure rises substantially constantly from zero when the pump is stationary but the rate of rise of pressure with increasing speed tends to be in excess of requirements for a gas turbine engine. However, a change in the mode of operation of the pump, by moving the inlet plate 15 to the second position and dispensing with the recesses 17, has been found to afford a more gradual pressure rise for increasing speed of the pump.

It will be understood that only one part-annular recess may be provided, with a single inlet port and a single outlet. Furthermore, other control means may be provided for defining and filling the recess or recesses as required.

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

1. A liquid displacement pump comprising a body, de-

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fining an interior cavity, a rotor mounted within the cavity in the body, the body having an inlet and an outlet at spaced positions, there being an inlet plate movably mounted within the body and defining an inlet port spaced angularly from the outlet, the inlet plate being movable between a first position in which it is closely adjacent to the rotor side face, and a second position in which the inlet plate is spaced axially from the rotor, and means, operable when the pump is to be used with the inlet plate in its first position, defining a part-annular recess in the wall of the cavity in the body adjacent to the opposite side face of the rotor from the inlet plate, said recess being defined between the position of the inlet and that of the outlet.

2. A liquid displacement pump as claimed in claim 1 in which the inlet plate is urged towards the first position by a spring and is movable in the opposite direction by fluid pressure means.

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3. A liquid displacement pump as claimed in claim 1 in which the means defining a part-annular recess comprises a piston movable in the body and arranged to define a boundary wall of the recess.

4. A liquid displacement pump as claimed in claim 1 in which there are two inlet ports in the inlet plate and two associated outlets in the body, there being defined two part annular recesses between the positions of the inlet ports and the positions of the associated outlets respectively, when the inlet plate is in its first position.

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