Sept. 3, 1968 R. T. J. SKINNER 3,399,625

LIQUID DISPLACEMENT PUMPS

Filed Aug. 23, 1966

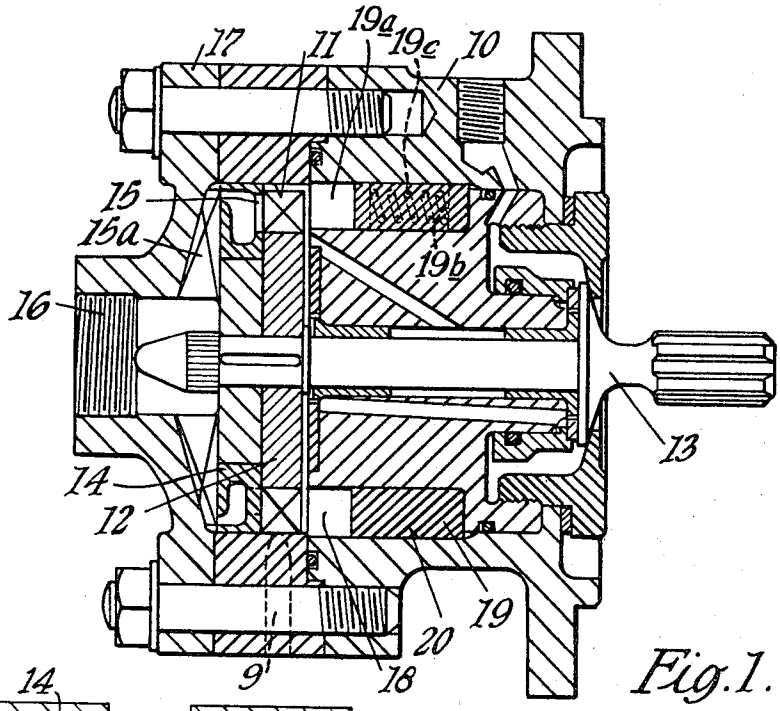


Fig. 1.

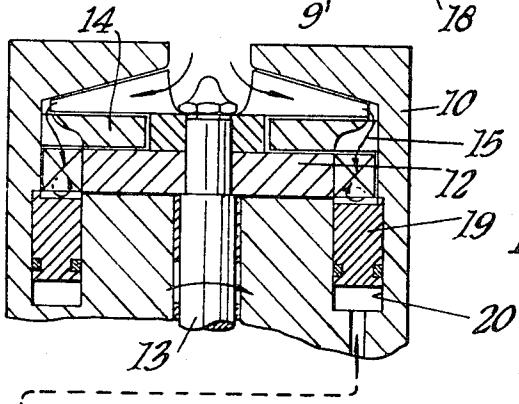


Fig. 2.

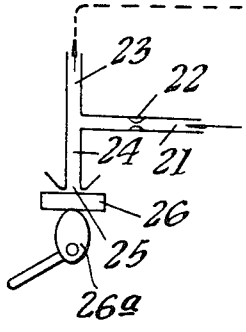


Fig. 3

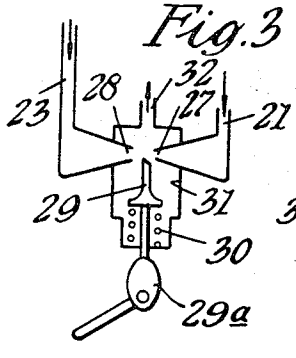
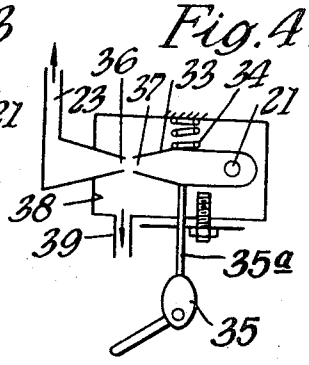


Fig. 4.



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LIQUID DISPLACEMENT PUMPS

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ABSTRACT OF THE DISCLOSURE

A liquid displaceemnt pump comprising a body with an interior cavity, a bladed rotor in the cavity, an inlet and an outlet at positions spaced around the rotor periphery, a part annular recess in the wall of the cavity extending around the rotor periphery between the inlet and outlet, a piston defining the base of the recess, and means responsive to the pressure in the pump outlet for moving the piston to vary the volume of the recess.

This invention relates to liquid displacement pumps of the kind having a body, a bladed rotor mounted within a cavity in the body, an inlet and an outlet at positions spaced from one another around the rotor, and a part-annular recess defined in the wall of the cavity in the body, said recess extending around the periphery of the rotor between the position of the inlet and that of the outlet.

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

A liquid displacement pump according to the present invention has the base of the part annular recess and movable towards and away from the rotor, and liquid pressure operable means responsive to the pressure of liquid in the pump outlet for moving said piston towards the rotor to reduce the volume of the recess.

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

FIGURE 1 is a cross-sectionable view of a pump to which the invention is applied.

FIGURE 2 is a fragmentary view of part of the pump illustrating one form of the invention.

FIGURES 3 and 4 show alternative controls for the pump.

In the example shown in FIGURE 1 there is provided a liquid displacement pump which is suitable for supplying fuel to an internal combustion engine. The pump has a body **10** which defines a generally cylindrical internal cavity **11** within which is mounted a bladed rotor **12** connected to a shaft **13** which can be driven by the engine to which the pump is intended to supply fuel. The rotor blades, in this example, extend radially and can sweep the whole of the cavity **11**, and in the cylindrical wall are a pair of diametrically opposite tangential outlets one of which is shown at **9**.

One side wall of the cavity **11** is formed by an inlet plate **14** defining a pair of inlet openings **15** which communicates through an impeller **15***a* with an inlet port **16** formed in a part **17** secured to the pump body **10**. The inlets **15** (one of which is shown only) are spaced angularly from the outlets **9** respectively.

The opposite side wall of the cavity **11** has an annular

recess **18** of channel shape in cross-section and this is divided by a pair of fixed abutments **19***a* into a pair of semi-circular recesses, each of which extends between the position of one of the inlets and that of an associated outlet, the recess **18** being at the outer edge of the cavity **11** and the radial width of the recess **18** being approximately a quarter of the radius of the rotor **12**.

The base walls of the portions of recess **18** are formed by the crown of an annular piston **19** disposed in an annular chamber **20** within the body **10**, the piston **19** having two cavities **19***b* in its crown for accommodation of the fixed abutments **19***a*.

Communicating with the outlets **9** of the pump is a by-pass passage **21** including a fixed restrictor **22**, the passage **21** communicating with two further passages **23**, **24**, one of which leads to the space at the opposite end of the piston **19** from the rotor **12**, and the other of which leads to an outlet **25** controlled by a member **26**, the pressure in the passage **23** thus determining the movement of the piston **19** to reduce the volume of the recess **18**. The forces acting upon the piston to maintain it at the extremity of its travel remote from the rotor **12** are provided by springs **19***c* and by the pressure of liquid in the recesses between the inlets and outlets, the latter pressure increasing from the inlet to the outlet in each case.

By varying the setting of the member **26**, the movement of the piston can be varied in accordance with requirements. Cam means **26***a* is provided for controlling the member **26**.

FIGURE 3 shows an alternative form of control in which the by-pass passage **21** from the pump outlet has a discharge orifice **27** arranged adjacent to a receiving orifice **28** at the end of the passage **23** to the chamber **20** behind the piston **19**. Between the two orifices **27**, **28** is a knife **29**, the position of which is controlled as desired by an external cam means **29***a* against a spring **30**. The orifices **27**, **28** are disposed in an enclosure **31** having a drain passage **32**.

In FIGURE 4 is shown a further form of control in which the by-pass passage **21** from the pump outlet communicates, at the point of pivotal mounting, with the interior of a hollow lever **33**. This lever is controlled against a spring **34** by a cam **35** and arm **35***a*. A discharge nozzle **36** at the free end of the lever **33** is arranged to discharge into a receiving nozzle **37** at the end of the passage **23** leading to the chamber **20**. The parts are disposed in an enclosure **38** having a drain passage **39**. It will be understood that other forms of control can be used to obtain similar results. The control of the member **26**, the knife **29** or the lever **33** can be achieved by any suitable parameter or manually as desired.

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

1. A liquid displacement pump having a body, a bladed rotor mounted within a cavity in the body, an inlet and an outlet at positions spaced from one another around the rotor, a part annular recess defined in the wall of the cavity in the body, said recess extending around the periphery of the rotor between the position of the inlet and that of the outlet, a piston defining the base of the part annular recess and movable towards and away from the rotor, and liquid pressure operable means responsive to the pressure of liquid in the pump outlet for moving

said piston towards the rotor to reduce the volume of the recess.

2. A liquid displacement pump as claimed in claim 1 in which the liquid pressure operable means comprises a control whereby the pressure in a chamber at the side of the piston remote from the rotor can be varied in accordance with the pressure in the pump outlet and also accordance with at least one other factor.

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