Jan. 20, 1970 N. LAING 3,490,379

CIRCULATING PUMP

Filed June 17, 1968

Fig. 1

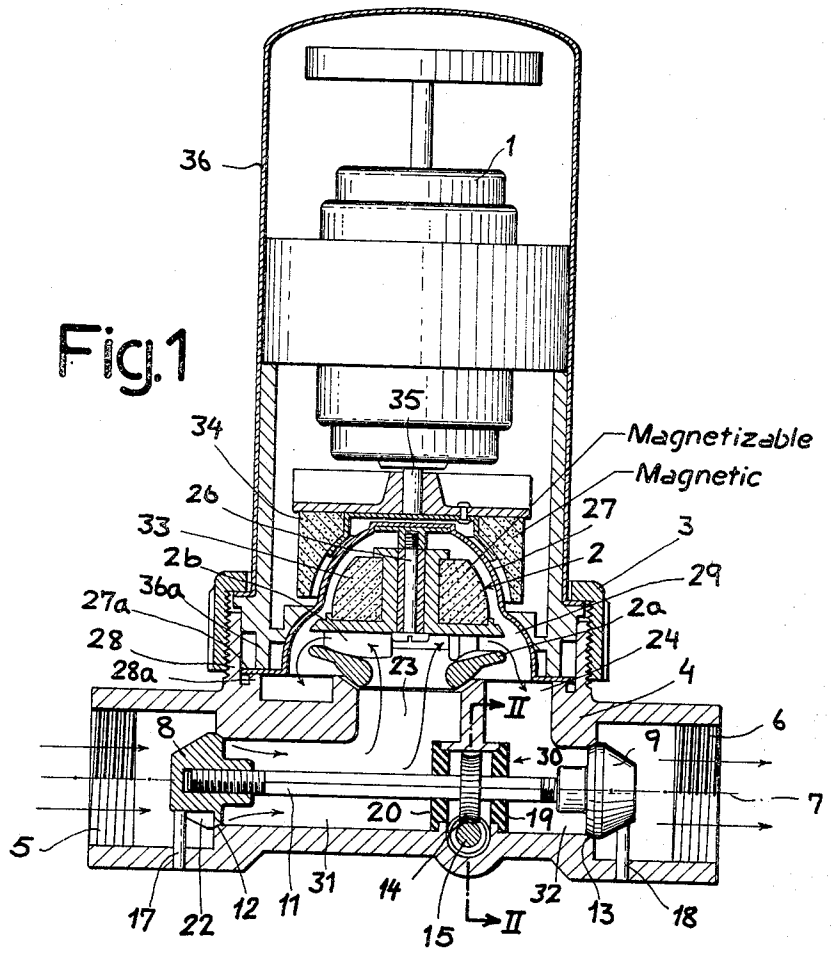
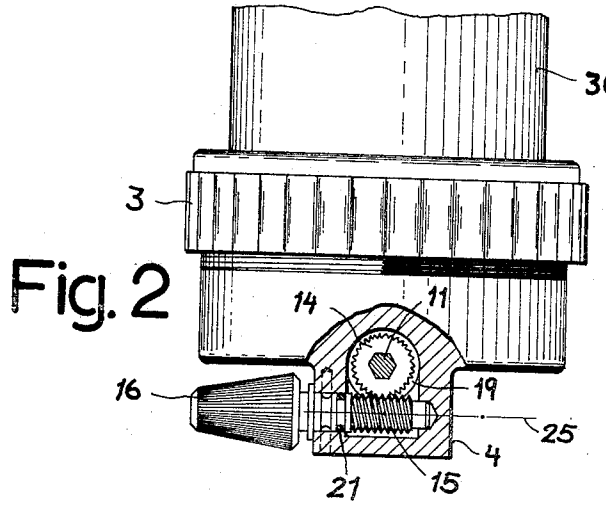


Fig. 2



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CIRCULATING PUMP

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U.S. Cl. 103—87 10 Claims

ABSTRACT OF THE DISCLOSURE

A pump housing with inlet and outlet ports at opposite ends is provided with a pair of valve seats respectively facing these ports, two normally ineffective valve bodies being mounted on a common shaft which is manually rotatable to draw them onto their respective seats. The shaft is journaled in a partition which divides the interior of the housing into two compartments communicating with each other through a demountable lateral extension containing an impeller for the circulation of fluid from the inlet to the outlet.

My present invention relates to a pump installed in a conduit for the circulation of a fluid, e.g., water used for utility purposes.

The removal of the impeller assembly of such a pump, for inspection or repair, necessitates the closure of valves upstream and downstream of the pump housing to prevent the loss of fluid and the intrusion of air or contaminants into the circulation system. The separate opening and closure of these valves is time-consuming; also, their presence outside the pump housing may be inconvenient where space is limited.

It is, therefore, the general object of my present invention to provide means in a fluid pump for facilitating the demounting of the impeller and its drive motor without requiring the presence of such external valves.

A more particular object of this invention is to provide means for enabling the simultaneous opening and closure of the inlet and outlet ports of a pump housing with detachable impeller assembly.

The foregoing objects are realized, pursuant to my present invention, by the provision of an extension detachably mounted on the pump housing to accommodate the impeller assembly, this extension having a passage communicating with an inlet compartment and an outlet compartment of the pump housing separated by a fluidtight partition. Two valve seats, formed between these compartments and respective ports, are closable by normally ineffective valve members which can be moved into engagement with their seats by operating means advantageously comprising a common actuator for both valve members, specifically a rotatable worm in mesh with a worm gear on a shaft whose extremities are threaded with mutually opposite pitch and mate with complementary threads of these members. The worm gear may be flanked by a pair of closely spaced packing disks, traversed by the shaft, which form part of the aforementioned partition.

The above and other features of my invention will be described in greater detail hereinafter with reference to the accompanying drawing in which:

FIG. 1 is an axial sectional view of a circulating pump according to my invention; and

FIG. 2 is a cross-sectional view taken on the line II—II of FIG. 1.

The pump shown in the drawing comprises a housing **4** which forms a pump chamber divided into two compartments **31**, **32** by a partition generally designated **30**.

Compartment **31** communicates with an inlet port **5** through an annular valve seat **12**, closable by a valve member **8**, while compartment **32** communicates with an outlet port **6** through a similar seat **13** which is closable by a valve member **9**. The two valve members, held against rotation by radial pins **17**, **18** engaging in respective outer grooves **22** (as particularly illustrated for valve body **8**), are movable along the common axis **7** of ports **5**, **6** and seats **12**, **13** under the control of an axially extending shaft **11** of polygonal cross-section; the two extremities of this shaft, threaded with mutually opposite pitch, are matingly received in threaded bores of valve members **8** and **9**, respectively. Thus, rotation of shaft **11** in a predetermined direction draws the valve members **8**, **9** onto their seats **12**, **13** whereas rotation in the opposite sense drives these members apart and separates them from their seats to unblock the flow of fluid therethrough.

To rotate the shaft **11**, a worm gear **14** mounted thereon is in mesh with a worm **15** integral with an external knob **16**, the axis **25** of worm **15** being transverse to the shaft. Worm gear **14** is flanked by a pair of packing disks **19**, **20** which form part of the partition **30** and insure a fluidtight seal between compartments **31** and **32**. A packing ring **21** on the shaft of worm **15** affords further protection against leakage of fluid from housing **4**.

The pump housing **4** is formed with two lateral apertures **23**, **24** communicating with inlet compartment **31** and outlet compartment **32**, respectively. An impeller rotor **2** is rotatably journaled on a pin **26** inside a cowl **27** rigid with that pin, a peripheral zone **27***a* of this cowl resting on an internal shoulder **28***a* of an annular boss **28** which surrounds the apertures **23** and **24**. Aperture **23**, centered within the boss **28**, is overlain by a guide ring **2***a* spaced from the body of rotor **2** by a set of involute-shaped vanes **2***b*; the spaces between these vanes form passages for the discharge of water or other fluid from compartment **31** into a ring space **29** opening into the eccentric aperture **24**, the fluid thus entering the compartment **32** as indicated by the arrows in FIG. 1. The assembly is similar to that shown in my prior U.S. Patent No. 3,354,833.

Rotor **2** is provided with ferromagnetic armatures **33** entrainable by magnetic poles **34** on the shaft **35** of an electric drive motor **1**; the poles **34** rotate around the cowl **27** inside an extension **36** of housing **4** which also encloses the motor **1**. Extension **36** is detachably secured to housing **4** by means of a clamping nut **3** engaging the threaded outer surface of boss **28**; a flange **36***a* projecting axially form motor housing **36** bears upon shoulder **28***a* through the intermediary of cowl portion **27***a* to clamp the cowl firmly in place, thus forming a fluidtight envelope around the fluid path from aperture **23** to aperture **24**.

Before detaching the assembly **1**, **2**, **27**, **36** from the pump housing **4**, knob **16** is manually rotated to force the valve members **8** and **9** onto their seats, thus tightly sealing the pump chamber **31**, **32** against the outside; clamping nut **3** may now be unscrewed to permit removal of housing extension **36** and cowl **27** so as to give access to motor **1** as well as rotor **2**; packing disks **19**, **20** are then also accessible through ports **24** and **23**, respectively. The self-locking action of worm drive **14**, **15** prevents accidental dislodgement of the valve members **8**, **9** from their seats in the disassembled state of the unit.

The arrangement shown and described is, of course, capable of various structural modifications without departing from the spirit and scope of my invention.

I claim:

1. A fluid pump comprising a housing with an inlet port and an outlet port at opposite ends of a pump chamber; partition means dividing said chamber into an inlet compartment and an outlet compartment; a first

valve seat between said inlet port and said inlet compartment; a second valve seat between said outlet compartment and said outlet port; an extension detachably mounted on said housing and provided with a passage communicating with said compartments; impeller means in said passage for displacing a fluid from said inlet port to said outlet port; first and second valve means normally spaced from said first and second valve seats for letting said fluid pass therethrough; and operating means for moving said first and second valve means into flow-blocking engagement with said first and second valve seats, respectively.

2. A pump as defined in claim **1** wherein said operating means comprises a common actuator for both said valve means.

3. A pump as defined in claim **2** wherein said seats are a pair of aligned shoulders, said first and second valve means comprising a pair of valve bodies nonrotatably disposed beyond said shoulders and provided with coaxial threads of mutually opposite pitch, said operating means including a link rotatably journaled in said partition means and provided with threaded extremities in mating engagement with said coaxial threads, said actuator being operatively coupled with said link for rotating same.

4. A pump as defined in claim **3** wherein said actuator comprises a worm rotatable about an axis transverse to said link, the latter being a shaft provided with a worm gear in mesh with said worm.

5. A pump as defined in claim **4** wherein said partition means comprises a pair of closely packing disks flanking said worm gear.

6. A pump as defined in claim **1** wherein said impeller means comprises a rotor, a motor for driving said rotor, magnetic coupling means between said motor and said rotor, and a cowl between said motor and said rotor forming a fluidtight enclosure for the latter.

7. A pump as defined in claim **6** wherein said housing is provided with lateral apertures communicating with said compartments and with an annular boss surrounding said apertures, said extension being secured to said boss.

8. A pump as defined in claim **7** wherein said boss is formed with an internal shoulder, said extension having a flange bearing upon said shoulder with interposition of a peripheral zone of said cowl.

9. A pump as defined in claim **8** wherein said boss is externally threaded, further comprising a clamping nut screwed onto said boss for holding said extension in position.

10. A pump as defined in claim **6** wherein said cowl is provided with an internal pin, said rotor being journaled on said pin for removal from said housing together with said cowl.

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