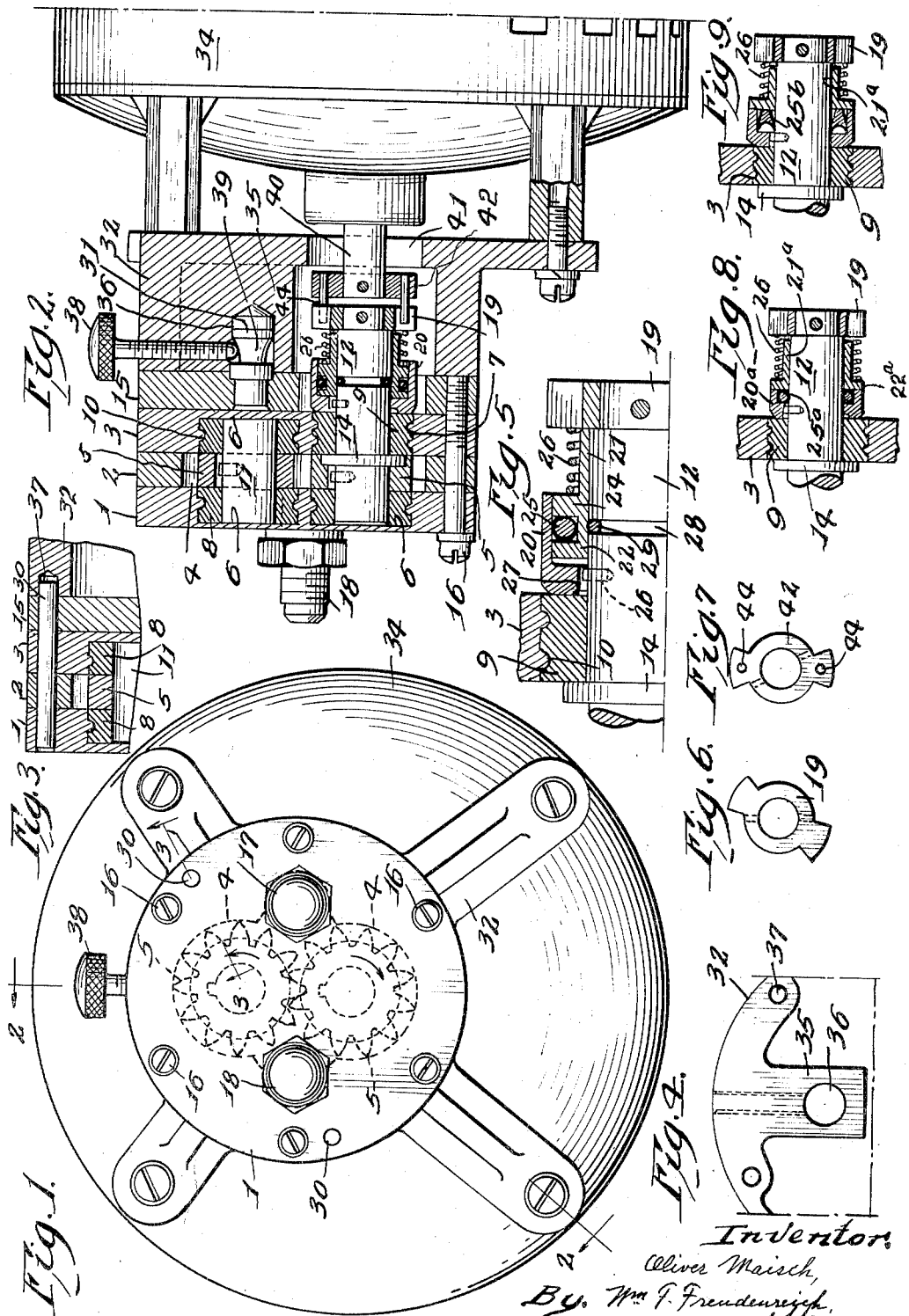


Sept. 25, 1956

O. MAISCH
METERING PUMP

2,764,100

Filed Dec. 12, 1952



Inventor:
Olliver Maisch,
By: Wm. F. Freudenreich,
Attorney.

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2,764,100

METERING PUMP

Oliver Maisch, Chicago, Ill.

Application December 12, 1952, Serial No. 325,730

4 Claims. (Cl. 103—118)

There is at present a great demand for low capacity pumps for industrial, commercial, chemical and biological laboratories and processing uses. By low capacity is meant the ability to pump any quantity of material from zero gallons to five gallons per minute, for example. Not only is great accuracy necessary, but the material that is pumped must not be damaged structurally or by being tainted by the materials used in the pump parts, or because of uncleanness of the pump surfaces with which it comes in contact.

It is the purpose of the present invention to produce a pump that shall fulfill the aforesaid requirements, as well as others which will hereinafter be made apparent.

Pumps of the type under consideration must be driven by motors or other means. One object of my invention is to produce a simple and novel combination of pump and driving means so constructed that the complete pump unit may be detached quickly and easily to permit thorough sterilization.

A further object of my invention is to produce a novel pump unit that may be attached to any driving means that includes a rotary shaft.

I have found that gear pumps are preferable to other pumps for low capacity service. One of the difficulties heretofore experienced with these gear pumps is leakage past the pump shaft coupled to the shaft of the means which drives the same. A further object of the present invention is to produce a seal which, for all practical purposes, eliminates leakage past the incoming pump shaft.

The various features of novelty whereby the present invention is characterized will hereinafter be pointed out with particularity in the claims, but, for a full understanding of the invention and of its objects and advantages, reference may be had to the following detailed description taken in connection with the accompanying drawing, wherein:

Figure 1 is an end view of one of my improved pumps, attached to a motor.

Fig. 2 is a section on irregular line 2—2 of Fig. 1, only a small fragment of the motor being shown.

Fig. 3 is a section on line 3—3 of Fig. 1, showing only a small fragment.

Fig. 4 is a face view, showing a fragment of an adapter between the pump unit and the motor.

Fig. 5 is an axial section through one half of the seal present in Fig. 2, on a larger scale and illustrating a condition created by incipient leakage.

Figs. 6 and 7 are face views of the two cooperating coupling elements mounted on the pump shaft and the motor shaft, respectively.

Fig. 8 is a sectional view corresponding to Fig. 2, showing only the seal, in a slightly modified form.

Fig. 9 is a view similar to Fig. 8, showing the same seal containing, however, a slightly different packing ring.

In the drawing the pump casing or housing, proper, comprises three thick, round discs 1, 2 and 3, placed flat against each other. The central disc 2 contains conventional pump chambers 2, 4 in which are located pump gears 5, 5. Discs 1 and 3 constitute the end walls of the

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pump. Each of the latter discs contains two chambers coaxial with the pump chambers. Chambers numbered 6 do not extend through the discs but are round wells opening into the pump chambers. Chamber 7, in disc 3, extends clear through this disc. In chambers 6 are ring-like, oilless, self-lubricating bearings 8, cast or molded into their positions of final use. Bearing 9 in chamber 7 is likewise self-lubricating, oilless and cast or molded in place. All four of these bearing chambers contain annular ridges 10, so that the bearings are locked into the end walls of the pump.

Upper gear 5 surrounds and rotates with a short shaft 11, mounted at its ends in two of the bearings 6 in walls 1 and 3, respectively. The lower gear surrounds and is driven by a longer shaft 12 which fits at one end into the lower of the bearings 8 in end wall 1, and which extends through bearing 9 and projects far beyond the pump casing. Shaft 12 has thereon an annular flange 14 that has a lapped bearing against the inner face of bearing member 9.

Discs 1, 2 and 3 are fastened together and to an adapter disc 15, which lies flat against disc 3, by long bolts 16. The pump is provided with an inlet 17 and an outlet 18, through wall 1.

In order to prevent leakage along shaft 12 to the exterior of the pump casing, flange 14 must be held tightly against bearing member 9. This may be done as follows. On the outer end of shaft 12 is a stop in the form of a coupling element 19. Surrounding the shaft is a sealing cup 20 the bottom of which bears against the outer face of bearing member 9. On the shaft is a tubular strut 21 slightly shorter than the distance between the stop and the bottom wall of the cup. On the part of the strut within the cup are two annular flanges 22 and 24, spaced apart from each other. In the channel between these flanges is an O ring packing 25. Surrounding the strut and bearing at its ends against stop 19 and flange 24, respectively, is a compression spring 26. This spring normally forces the strut to the left so as to press the bottom of the cup against bearing member 9. This also creates a pull on shaft 12, so that bearing member 9 is clamped between flange 14 on the shaft and cup 20. Cup 20 and bearing member 9 meet in a lapped joint.

Cup 20 is preferably held against rotation relative to shaft 12, this being accomplished by a pin 26 projecting radially from the shaft into a notch 27 in the bottom wall of the cup.

Also, if desired, that part of shaft 12, surrounded by the cup, may contain a circumferential groove 28, wherein is seated a packing ring 29 that contacts the inner surface of the tubular strut.

In the particular embodiment illustrated, there are two long dowel pins 30, 30 extending through discs 1, 2, 3 and 15 and protruding from the outer face of the latter. Also, in this embodiment, there is a heavy pump retaining pin 31 fixed at one end to disc 15 and projecting outward from the latter farther than do the dowel pins. These several pins are adapted to enter sockets in a member 32 secured in any suitable manner to one end of the casing of a motor 34. The body portion of member 32 is a cylindrical cup of the same diameter as the pump; its open end being closed by disc 15. Member 32 contains a thick radial partition 35 having therein a bore 36 into which pin 31 slidably fits. The sockets 37 for the dowel pins are in the rim of member 32.

A thumb screw 38 extends radially from the exterior of member 32 down through partition 35 and into bore 36. Pin 31 contains a wide peripheral groove 39 the bottom of which slopes upwardly as the distance from disc 15 increases. The screw enters this groove and, as it moves inwardly, engages the sloping bottom and produces a wedging effect to pull the pump tightly against

adapter 32. Pin 31 and screw 38 thus form a latch to hold the two units together.

The parts are so proportioned that the motor shaft 40 extends through a hole 41 in the center of the end wall of adapter 32, almost to and aligned with pump shaft 12. On the end of shaft 40 is a coupling element 42 similar to element 19 on shaft 12; these two elements being, in effect, cross arms. Secured to element 42, toward the ends thereof, are two pins 44, 44 that project past element 19, parallel to the common axis of the shafts. When the motor shaft turns, pins 44, acting through element 19, drive pump shaft 12.

It will be seen that the complete pump unit may be detached from the motor by simply backing off thumb screw 38 and pulling the unit off endwise. To attach the unit to the motor unit again, the dowel pins and pin 39 need only be registered with their sockets and the pump unit be pushed home axially; the thumb screw being then turned to secure the two units tightly to each other. Usually the coupling of the two shafts is automatically effected. Should the two coupling elements 19 and 42 be in such relative angular positions that the pins 44 strike element 19 instead of passing by the same, in making the assembly, one need only turn the pump shaft through a small angle to allow automatic coupling to be made.

In the use of the pump, the seal heretofore described makes it practically impossible for leakage from the pump chamber to take place along the pump shaft 12. Normally the clamping of oilless bearing 9 between flange 14 on the shaft and the bottom of cup 20, under the pressure of the spring, is sufficient to prevent any leakage, due to the considerable areas of the contacting flat surfaces between parts 9, 14 and 20. However, should incipient leakage occur, liquid will enter the cup 20 between the bottom wall thereof and flange 22 of the tubular strut through notch or channel 27. This is due to the fact that the lapped joint between cup 20 and bearing 9 is leak proof, whereas the relatively open joint between flange 22 and the bottom of the cup permits liquid to pass through this joint into the cup. When liquid enters the cup a differential pressure is set up, due to the large internal diameter of the cup; this pressure resulting in pressing strut 21 back against stop 19, as shown in Fig. 5; thereby causing the full pump pressure to be exerted in the direction to hold the cup against bearing 9.

In Fig. 8 the seal is simpler than that heretofore described, the cup 20^a being somewhat smaller and the strut 21^a being shorter, so that flange 22^a abuts against the rim of the cup. Only one packing ring 25^a is required in this form.

Fig. 9 shows the same seal as does Fig. 8, except that packing ring 25^b is in the form of a trough, the open side of which faces the bottom of the cup. The sides of the trough are tapered so as to terminate in thin flexible lips that touch both the shaft and the surrounding cup wall.

The parts of the pump casing may be made of various metals, stainless steel having been found satisfactory, or plastic material. Stainless steel or other metals may be used in the manufacture of the pump shafts. The insets, or shaft bearings, may consist of carbon or other self-lubricating oilless material.

The nature of the materials used in the pump depends on the use to which the pump is to be put. But, when a

pump is to be used for dispensing some particular liquid as, for example, blood plasma, biologicals and other sterile solutions, the materials must be such that the pump may be sterilized by steam in an autoclave.

I claim:

1. In a motor driven pump, a motor unit, a pump unit completely assembled in an operative state engaged with each other and shaped to provide between them a chamber, releasable fastening means bodily connecting the said units together, a motor shaft extending into said chamber, a pump shaft extending from the pump unit into said chamber in alignment with the motor shaft, and a coupling between said shafts; the coupling consisting of parts that interlock, causing the motor shaft to drive the pump shaft, upon moving said units into engagement with each other axially of the shafts, with the shafts aligned with each other; said fastening means including a pin protruding from the pump unit into a bore in the motor unit remote from and parallel to the shafts, and a screw in the motor unit engaging said pin and adapted to be gripped in the hand for turning the same.

2. In a motor driven pump, a motor unit, a pump unit completely assembled in an operative state, said units having flat faces in contact with each other and containing openings registering with each other, aligned shafts in said units extending through said openings and interlocked for rotation in unison while free to become disengaged through relative lengthwise movements, the motor unit having a bore extending into its aforesaid face parallel to said shafts, a pin protruding from the said face of the pump unit and entered in said bore, a screw extending into the motor unit radially of and into said bore for engagement with said pin, and means on the outer end of the screw adapted to be gripped in the hand for turning the screw.

3. A motor driven pump as set forth in claim 2, wherein the pin and the screw are provided with cooperating surfaces which, as the screw is tightened, cause the pin to be pressed lengthwise toward the inner end of the bore.

4. A motor driven pump as set forth in claim 3, wherein the motor unit contains in the face in contact with the pump unit a socket, and wherein the pump unit is provided with a dowel pin fitting slidably in such socket.

References Cited in the file of this patent

UNITED STATES PATENTS

1,957,038	Beidler	May 1, 1934
2,212,417	George	Aug. 20, 1940
2,253,597	Wyne	Aug. 26, 1941
2,309,683	Wahlmark	Feb. 2, 1943
2,412,588	Lauck	Dec. 17, 1946
2,451,279	DeLancey	Oct. 12, 1948
2,452,468	Johnson	Oct. 26, 1948
2,481,047	Sloane	Sept. 6, 1949
2,541,405	Chapman	Feb. 13, 1951
2,595,926	Chambers, Jr.	May 6, 1952
2,603,162	Lloyd	July 15, 1952
2,605,715	Brant	Aug. 5, 1952
2,619,039	Maisch	Nov. 25, 1952
2,619,040	Maisch	Nov. 25, 1952
2,650,842	Coopman	Sept. 1, 1953

FOREIGN PATENTS

518,995	Germany	Feb. 21, 1931
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