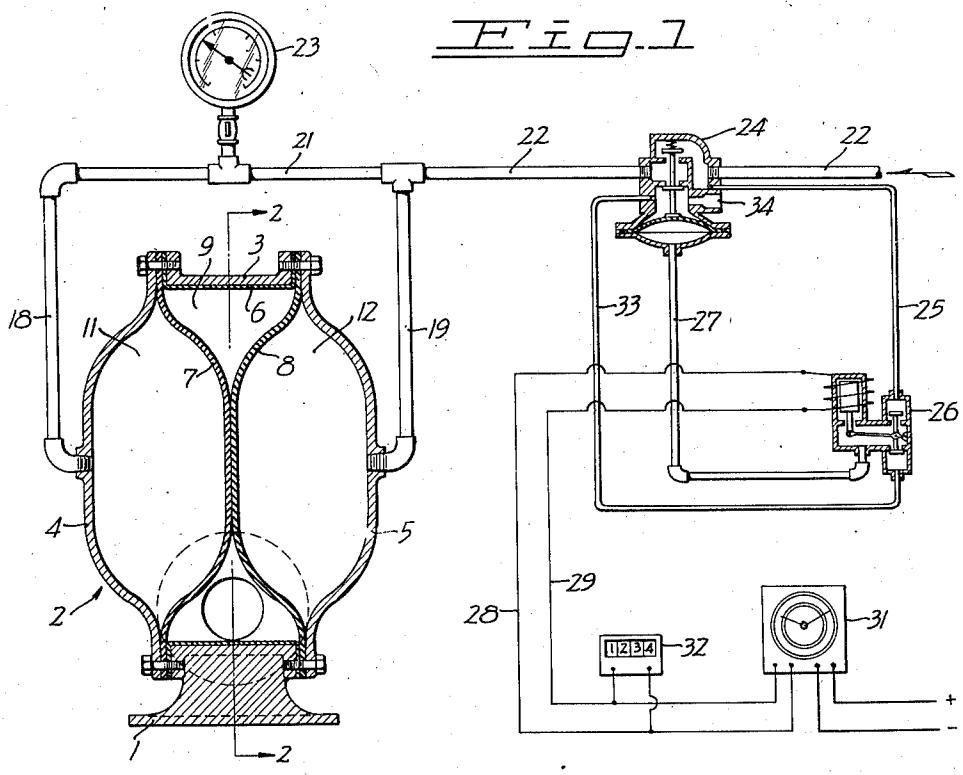
May 7, 1946. E. H. HERBERT 2,399,803

DIAPHRAGM PUMP

Filed Jan. 13, 1945

Fig. 1



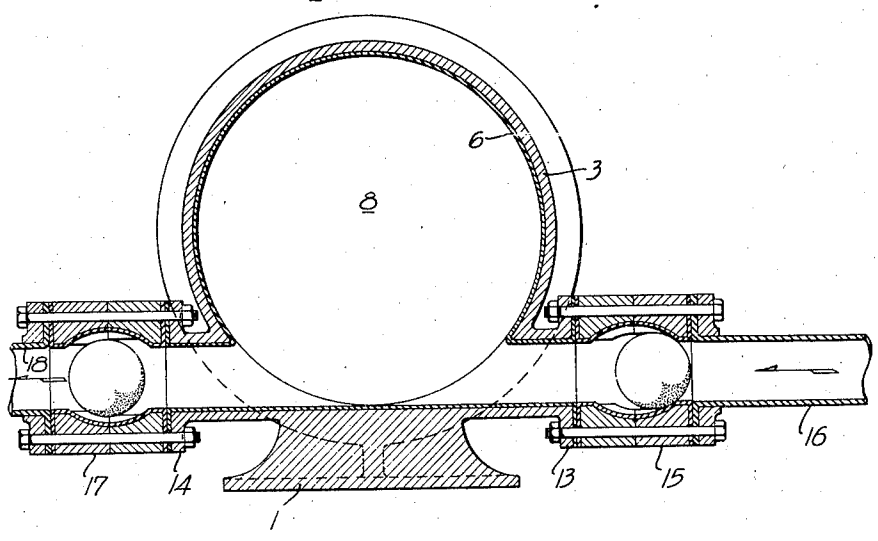


Fig. 2

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Patented May 7, 1946

2,399,803

UNITED STATES PATENT OFFICE

2,399,803

DIAPHRAGM PUMP

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Application January 13, 1945, Serial No. 572,634

3 Claims. (Cl. 103—152)

This invention relates in general to diaphragm pumps and constitutes an improvement in the pump disclosed in my Patent No. 2,311,229 of February 16, 1943.

The pump disclosed in the patent above referred to comprises a casing having outwardly dished heads and divided centrally by an elastomer diaphragm into a slurry chamber and a working medium chamber. The ports to these two chambers are of necessity located on the axis of the pump. One difficulty encountered with a pump of this design is that during the work stroke of the diaphragm, the diaphragm frequently closes off the slurry chamber port before all of the slurry is expelled from the chamber. In other words, the diaphragm does not necessarily progressively contact the walls of the dished head of the slurry chamber from a point to which it is secured to the head to the slurry outlet. Furermore, the diameter of the pump casing is one of the factors determining its capacity. It is not feasible to obtain additional capacity by increasing the depth of the dished heads, for in doing this the area of the diaphragm would have to be far in excess of the medial cross sectional area of the pump and consequently there would be considerable difficulty in forcing the diaphragm to buckle back and forth across the medial plane of the pump.

In general, the object of this invention is the provision of a diaphragm pump having substantially twice the capacity of a pump of the type described in my aforesaid patent although of the same diameter and one in which no slurry can be trapped between the casing and its diaphragm.

More specifically, the object of my invention is the provision of a diaphragm pump containing two opposed, simultaneously actuated diaphragms.

The invention possesses other advantageous features, some of which, with the foregoing, will be set forth at length in the following description where that form of the invention, which has been selected for illustration in the drawing accompanying and forming a part of the present specification, is outlined in full. In said drawing, one form of the invention is shown, but it is to be understood that it is not limited to such form, since the invention as set forth in the claims may be embodied in a plurality of forms.

Referring to the drawing:

Figure 1 is a mid-section taken through a pump and its control members embodying the objects of my invention.

Figure 2 is a transverse section taken on the line 2—2 of Figure 1.

The pump illustrated in these figures comprises a base 1 on which is mounted a casing generally designated by the reference numeral 2, including an outwardly flanged cylindrical body 3 and outwardly dished heads 4 and 5. For the purpose of making the interior surface of the body 3 resistant to the chemicals, it is provided with a rubber lining 6. Bolted and sealed between the flanges of the body 3 and the dished heads 4 and 5 is a pair of opposed flexible diaphragms 7 and 8 preferably made of a fabric reinforced rubber and molded normally to have substantially the same contour or form as the dished heads. The body 3 and the two opposed diaphragms therefore define a collapsible slurry chamber 9 and the two dished heads and their associated diaphragms define expandable working medium chambers 11 and 12.

Formed on the lower side of the body 3 is a pair of opposed, tangentially disposed flanged slurry inlet and outlet connections 13 and 14. Bolted to the inlet connection 13 is an outwardly closing ball check valve 15 communicating through a pipe 16 with a source of slurry or other material to be pumped (not shown). Bolted to the pump outlet 14 is an inwardly closing ball check valve 17 communicating through a pipe 18 by which the slurry passing through the pump can be conveyed to any point desired.

The working medium chambers 11 and 12 are connected with a suitable source of fluid under pressure by pipes 18, 19, 21 and 22, a pressure guage 23 being inserted in the pipe 21 for guaging the pressure to which the chambers 11 and 12 are periodically subjected.

Disposed in the pipe 22 is a fluid pressure responsive, diaphragm actuated two way valve 24 adapted in the expanded position of its diaphragm, as shown in Figure 1, to permit the passage of fluid through the pipe 22.

Also in this position of the diaphragm, communication is established through a small pipe 25, a two way solenoid operated valve 26 and a small pipe 27, between the right end of the pipe 22 and the fluid chamber immediately below the diaphragm of the valve 24 to thereby raise the diaphragm and the valve stem associated with it.

The solenoid coil of the valve 26 is in circuit through lines 28 and 29 with a clock controlled switch 31, a counter 32 being shunted across the lines 28 and 29. The clock controlled switch 31 therefore governs the cycle of operation of the valve 26.

In the lower position of the valve **26** (lower position of solenoid and valve stem) fluid from the chamber beneath the diaphragm of the valve **24** is permitted to pass through the pipe **27**, across the lower portion of the valve **26**, through the pipe **33** and through the vent **34** of the valve **24** to atmosphere. It should also be noted that when the diaphragm of the valve **24** is in its lower position, communication is established through this valve between the left side of the pipe **22** and the vent **34**, thereby permitting the pump diaphragms **7** and **8** to be expanded outwardly during the intake stroke of the pump.

As a result of this construction, the clock controlled, solenoid operated diaphragm actuated valve **24** operates to establish communication successively between a source of working fluid under pressure and the chambers **11** and **12** and then between the chambers **11** and **12** and atmosphere. During the intake stroke of the pump, slurry passes through the check valve **15** into the expanded slurry chamber **9** and during the work stroke of the pump, the pump diaphragms **7** and **8** move inwardly toward each other until they "kiss" as shown in Figure 1, thereby expelling slurry from the slurry chamber **9** and forcing it through the check valve **17**.

By resorting to the use of two opposed pump diaphragms, a pump is obtained having twice the capacity of a single diaphragm pump without the necessity of increasing the diameter of the pump and at very little additional cost. Furthermore, in this type of pump, it is impossible for any slurry to be trapped in any pockets formed between the diaphragms and the casing, as can occur in connection with my previously patented pump.

I claim:

1. A pump comprising: a generally cylindrical body closed at each end by a pair of dished heads; a valved slurry inlet and a valved slurry outlet formed in said body adjacent to its periphery; a pair of diaphragms sealed across the ends of said body and arranged to form therewith, and with said heads, a pair of opposed and expandible working medium chambers and a single unobstructed intermediate slurry chamber; and a fluid pressure inlet and outlet provided in each of said dished heads.

2. A pump comprising: a generally cylindrical body closed at each end by a pair of outwardly dished heads; a pair of flexible diaphragms sealed across the ends of said body and forming therewith, and with said dished heads, a pair of opposed and expandible working medium chambers and a single unobstructed intermediate slurry chamber; a valved slurry inlet and a valved slurry outlet associated with said body in communication with said slurry chamber and means for establishing communication between a source of fluid under pressure and each of said working medium chambers.

3. A pump comprising: a generally cylindrical body closed at each end by a pair of outwardly dished heads; a pair of flexible diaphragms sealed across the ends of said body and forming therewith, and with said dished heads, a pair of opposed and expandible working medium chambers and a single unobstructed intermediate slurry chamber; a valved slurry inlet and a valved slurry outlet associated with said body in communication with said slurry chamber; a conduit in communication with each of said working medium chambers and adapted to be placed in communication with a source of fluid under pressure and means including a valve associated with said conduit for periodically permitting the reversal of the flow of fluid there-through.

ELMER H. HERBERT.