

Sept. 23, 1947.

W. W. TAYLOR

2,427,818

PUMP

Filed Dec. 29, 1945

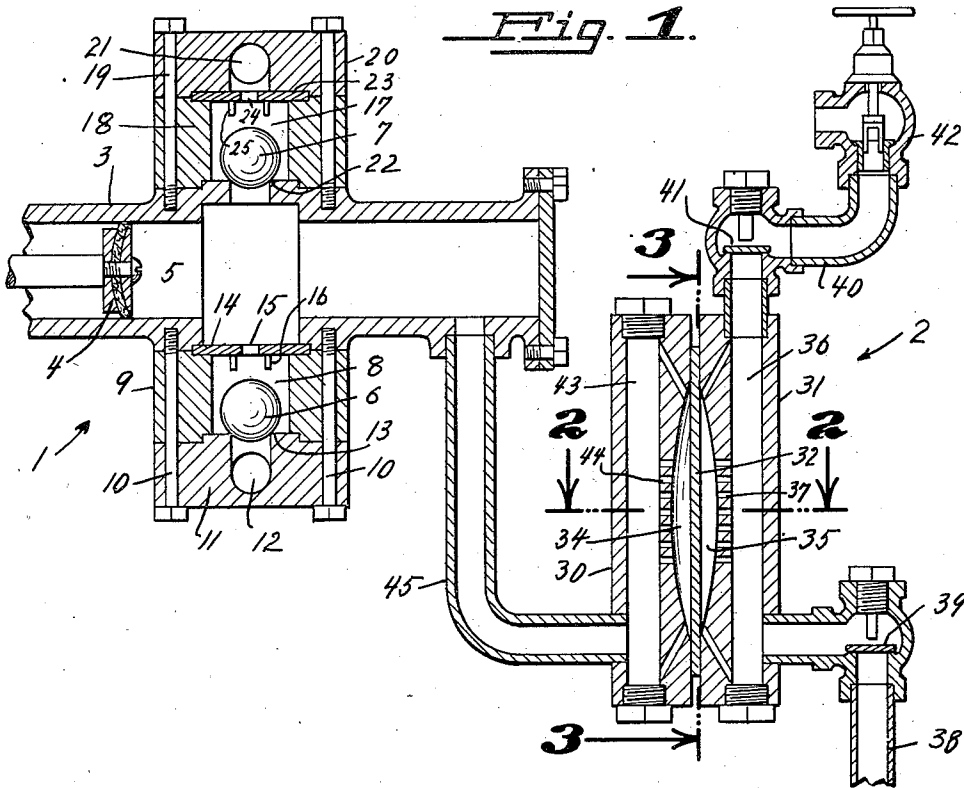


Fig. 3.

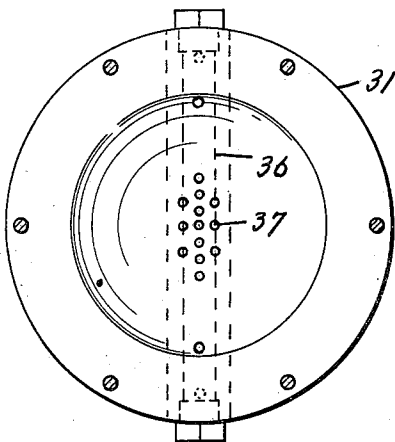
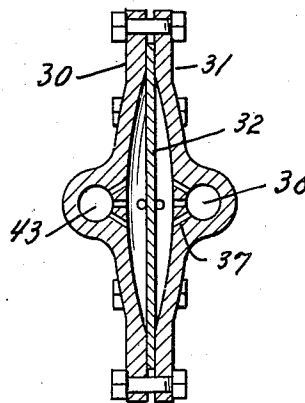


Fig. 2.



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2,427,818

PUMP

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Application December 29, 1945, Serial No. 637,801

8 Claims. (Cl. 103—9)

1

The present invention relates to improvements in pumps, and has particular reference to a double pump arrangement whereby two different liquids may be pumped to a common destination in separate paths.

My pump arrangement is intended particularly to be used in connection with a cleaning machine for motor vehicles or the like, such as is disclosed in the Malsbary et al. patent, No. 2,295,228. In this patent it is proposed to provide a single pump for pumping from two tanks, one containing clear water and the other a concentrated cleaning solution, toward a heating coil for final discharge through a hose and a nozzle.

It was found subsequently, that a diluted cleaning solution, passing through a pump, had certain injurious effects on the pump, while a concentrated solution might pass through a pump without such effect.

It was proposed, therefore, in a co-pending application, Serial Number 549,973, to provide two pumps, one for the clear water, and one for the concentrated solution, both pumping toward the same coil.

It was further proposed, in the interest of economy, and coordination, to interconnect the two pumps, so that one would drive the other through the medium of the fluid drive between the two pumps, whereby the reciprocating motion of the piston of the larger water pump would be transmitted to the reciprocating element of the smaller solution pump, which latter was presented as a diaphragm pump.

It was found, however, that a plain fluid drive between the two reciprocating members was unsatisfactory in certain respects on account of pressure losses, which would cause the diaphragm pump to develop less pressure than the main pump. This would make it impossible to force the diaphragm pump discharge into the main pump discharge, in the absence of compensating factors.

In my co-pending application, Serial Number 603,069, now Patent No. 2,413,851 of January 7, 1947, I disclosed one way in which a fluid drive between the two pumps can be made effective to produce substantially equal pump pressures.

In the present application it is proposed to provide a second arrangement by means of which the fluid drive may be made effective to produce substantially equal pressures in both pumps.

Further objects and advantages of my invention will appear as the specification proceeds, and the novel features of the same will be fully defined in the claims attached hereto.

2

The preferred form of my invention is illustrated in the accompanying drawing, forming part of this application, in which:

Figure 1 shows a vertical section through my double pump arrangement;

Figure 2, a horizontal section taken along line 2—2 of Figure 1; and

Figure 3, a face view of one of the castings used in my diaphragm pump, as seen from line 3—3 of Figure 1.

While I have shown only the preferred form of my invention, it should be understood that various changes or modifications may be made within the scope of the claims hereto attached without departing from the spirit of the invention.

More particularly, I wish to point out that, while I have shown the main pump as a piston pump and the auxiliary pump as a diaphragm pump, any suitable reciprocating pump may be substituted for either of them.

Referring to the drawing in detail, my pump arrangement comprises in its principal features, a main pump 1 and an auxiliary pump 2. The main pump may be of any suitable form, and is here shown as comprising a housing 3 having a piston 4 reciprocable therein, and having a pump chamber 5 with suitable intake and discharge valves 6 and 7.

The intake valve 6 is mounted in a passage 8 formed by a tubular member 9 which latter is clamped upon the housing by means of bolts 10 passing through a head 11. This head is formed with an intake passage 12 and furnishes a seat for the valve, as at 13.

It will be noted that, due to this construction, the entire valve structure is mounted upon the outside of the pump housing, and can be readily removed for exchange and repair services.

Between the tube 9 and the pump housing, I provide a washer 14 having a restricted opening 15 and having a pair of spacing prongs 16 to prevent the valve 6 from closing the opening 15 on the suction stroke of the pump.

It will be noted that the washer 14 is mounted in such a manner that it may be easily removed with the valve structure, and that it can be readily interchanged with washers having different sizes of openings.

The principal idea of introducing the washer 14 is to provide an easily replaceable and exchangeable means for restricting the port area of the intake, for purposes which will be explained hereinafter.

The delivery valve 7 is mounted in a similar

fashion in a passage 17 formed by a tube 18 clamped upon the pump housing by means of bolts 19 passing through a head 20 formed with a delivery passage, as at 21.

A valve seat is provided on the pump housing, as at 22, and a washer 23 is arranged between the head 20 and the tube 18, and has a restricted opening 24 and prongs 25, as previously described in connection with the intake valve.

The principal object of introducing the washer is again to restrict the port area of the delivery passage by a means which is easily replaceable and exchangeable for a washer with a different port opening.

The diaphragm pump may be constructed substantially along the same lines as described in my co-pending Patent 2,413,851 of January 7, 1947. It is preferably made of two castings 30 and 31 having the diaphragm 32 clamped therebetween. The two castings are concave opposite the diaphragm to form chambers 34 and 35.

The casting 31 is formed with a vertical passage 36 communicating with chamber 35 through a number of apertures 37. The passage 36 communicates, at its lower end, with an intake passage 38 having a valve 39, and, at its upper end, with a discharge passage 40, having a valve 41 which serves as the discharge valve.

The amount of solution passing through the diaphragm pump may be controlled by a metering valve 42 arranged in the discharge passage, or in the intake passage.

I prefer, however, to place the metering valve in the discharge passage because this saves wear and tear on the diaphragm. Where the valve is placed in the intake and set for metering, the diaphragm retracts only part way on the suction stroke and strikes the perforated wall of casting 31 with full force on the drive stroke, tending to tear itself to pieces. Where the valve is in the discharge passage, and is made to meter, the diaphragm can retract into contact with the perforated wall 30 on the suction stroke, but the maximum pressure would only be atmospheric pressure which would not be sufficiently strong to be detrimental. On the outstroke the diaphragm could not completely unload and therefore would not strike the outer wall (casting 31) at all.

The casting 30 of the diaphragm pump is also formed with a vertical passage 43 which communicates with the chamber 34 through a plurality of perforations 44. This passage is closed at both ends, as shown, and communicates at a point intermediate its length, with a pump chamber of the first or main pump through a conduit 45.

In the normal operation of this pump arrangement, the plunger 4, on its back stroke, lifts the valve 6 and sucks liquid into the pump chamber from the intake 12. At the same time it will produce suction on the diaphragm 32 and will cause liquid to be drawn into the chamber 35 through the valve 39.

On the outstroke or drive stroke, the plunger will force the liquid through the delivery valve 7 of the main pump, and will at the same time, urge the diaphragm 32 outward for driving liquid contained in the chamber 35 through the delivery valve 41.

Thus, the diaphragm will move back and forth for pumping action in the same manner as the plunger 4. But, it will be found that, if the main pump is allowed to function in its normal manner, sucking in a full charge on the suction stroke

and delivering a full charge on the discharge stroke, the negative and positive pressures exerted on the diaphragm for operating the diaphragm pump are not sufficient to discharge from the diaphragm pump under the same pressure as supplied by the main pump.

This would make it impossible, in the absence of compensating factors, to force the discharge of the diaphragm pump into the discharge of the main pump, in another part of the machine.

The two washers 14 and 23 provide a compensating factor insofar as they restrict the port areas of the intake and the outlet of the main pump, and thereby increase the pressures on the diaphragm.

Just how much restriction is necessary to produce desired results can best be ascertained empirically by trying out different washers with different port openings.

It will be noted that the general valve structure selected for the purpose of the present invention is particularly suited for exchange of one washer for another.

And it will also be noted that the introduction of the restricting washer is a simple expedient adapted to various types of structure.

I claim:

1. In combination, a liquid pump comprising a pump chamber having intake and delivery passages with intake and delivery valves therein and having a plunger reciprocable in the pump chamber, a second pump comprising a housing having a pump chamber with intake and delivery valves and a movable element for producing pumping action, a conduit connection between the two pumps whereby the pressures of the first pump are made effective on the movable element of the second pump for moving the movable element of the second pump in response to the plunger movements of the first pump, and a removable and replaceable member mounted in one of the pump passages for restricting passage of liquid through the first pump for increasing pressures on the movable element of the second pump.

2. In combination, a liquid pump comprising a pump chamber having intake and delivery passages with intake and delivery valves therein and having a plunger reciprocable in the pump chamber, a second pump comprising a housing having a pump chamber with intake and delivery valves and a movable element for producing pump action, a conduit connection between the two pumps whereby the pressures of the first pump are made effective on the movable element of the second pump for moving the movable element of the second pump in response to the plunger movements of the first pump, and a removable and replaceable member mounted in one of the pump passages for restricting passage of liquid through the first pump for increasing pressures on the movable element of the second pump for substantially equalizing the pressures in the two pumps.

3. In combination, a liquid pump comprising a pump chamber having intake and delivery passages with intake and delivery valves therein and having a plunger reciprocable in the pump chamber, a second pump comprising a housing having a pump chamber with intake and delivery valves and a movable element for producing pumping action, a conduit connection between the two pumps whereby the pressures of the first pump are made effective on the movable element of the second pump for moving the movable element of the second pump in response to the plunger

5

movements of the first pump, and a washer removably mounted in one of the pump passages and having a restricted opening for reducing the flow of liquid through the first pump and for increasing the pressures on the movable element in the second pump whereby the pressures in the two pumps are substantially equalized.

4. In combination, a liquid pump comprising a pump chamber having intake and delivery passages with intake and delivery valves therein and having a plunger reciprocable in the pump chamber, a second pump comprising a housing having a pump chamber with intake and delivery valves and a movable element for producing pumping action, a conduit connection between the two pumps whereby the pressures of the first pump are made effective on the movable element of the second pump for moving the movable element of the second pump in response to the plunger movements of the first pump, and washers removably mounted in the passages of the first pump and having restricted openings for reducing the flow of liquid through the first pump and for increasing the pressures on the movable element of the second pump whereby the pressures in the two pumps are substantially equalized.

5. In combination, a liquid pump comprising a pump chamber having intake and delivery passages with intake and delivery valves therein and having a plunger reciprocable in the pump chamber, a second pump comprising a housing having a pump chamber with intake and delivery valves and a diaphragm forming a wall of the pump chamber, a conduit connection between the two pumps, whereby the pressures of the first pump are made effective on the diaphragm for moving the same in response to plunger movements, and a removable and replaceable member mounted in one of the pump passages for restricting passage of liquid through the first pump for increasing pressures on the diaphragm.

6. In combination, a liquid pump comprising a pump chamber having intake and delivery passages with intake and delivery valves therein and having a plunger reciprocable in the pump chamber, a second pump comprising a housing having a pump chamber with intake and delivery valves and a diaphragm forming a wall of the pump chamber, a conduit connection between the two pumps whereby the pressures of the first pump are made effective on the diaphragm for moving the same in response to plunger movements, and a removable and replaceable member mounted in one of the pump passages for restricting pas-

6

sage of liquid through the first pump for increasing pressures on the diaphragm, to substantially correspond to those of the first pump.

7. In combination, a liquid pump comprising a pump chamber having intake and delivery passages with intake and delivery valves therein and having a plunger reciprocable in the pump chamber, a second pump comprising a housing having a pump chamber with intake and delivery valves and a diaphragm forming a wall of the pump chamber, a conduit connection between the two pumps whereby the pressures of the first pump are made effective on the diaphragm for moving the same in response to plunger movements, and a washer removably mounted in one of the pump passages and having a restricted opening for reducing the flow of the liquid through the first pump and for increasing pressures operative on the diaphragm whereby the pressures in the two pumps are substantially equalized.

8. In combination, a liquid pump comprising a pump chamber having intake and delivery passages with intake and delivery valves therein and having a plunger reciprocable in the pump chamber, a second pump comprising a housing having a pump chamber with intake and delivery valves and a diaphragm forming a wall of the pump chamber, a conduit connection between the two pumps whereby the pressures of the first pump are made effective on the diaphragm for moving the same in response to plunger movements, and washers removably mounted in the passages of the first pump and having restricted opening for reducing the flow of liquid through the first pump and for increasing the pressures on the diaphragm, whereby the pressures in the two pumps are substantially equalized.

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