

July 30, 1968

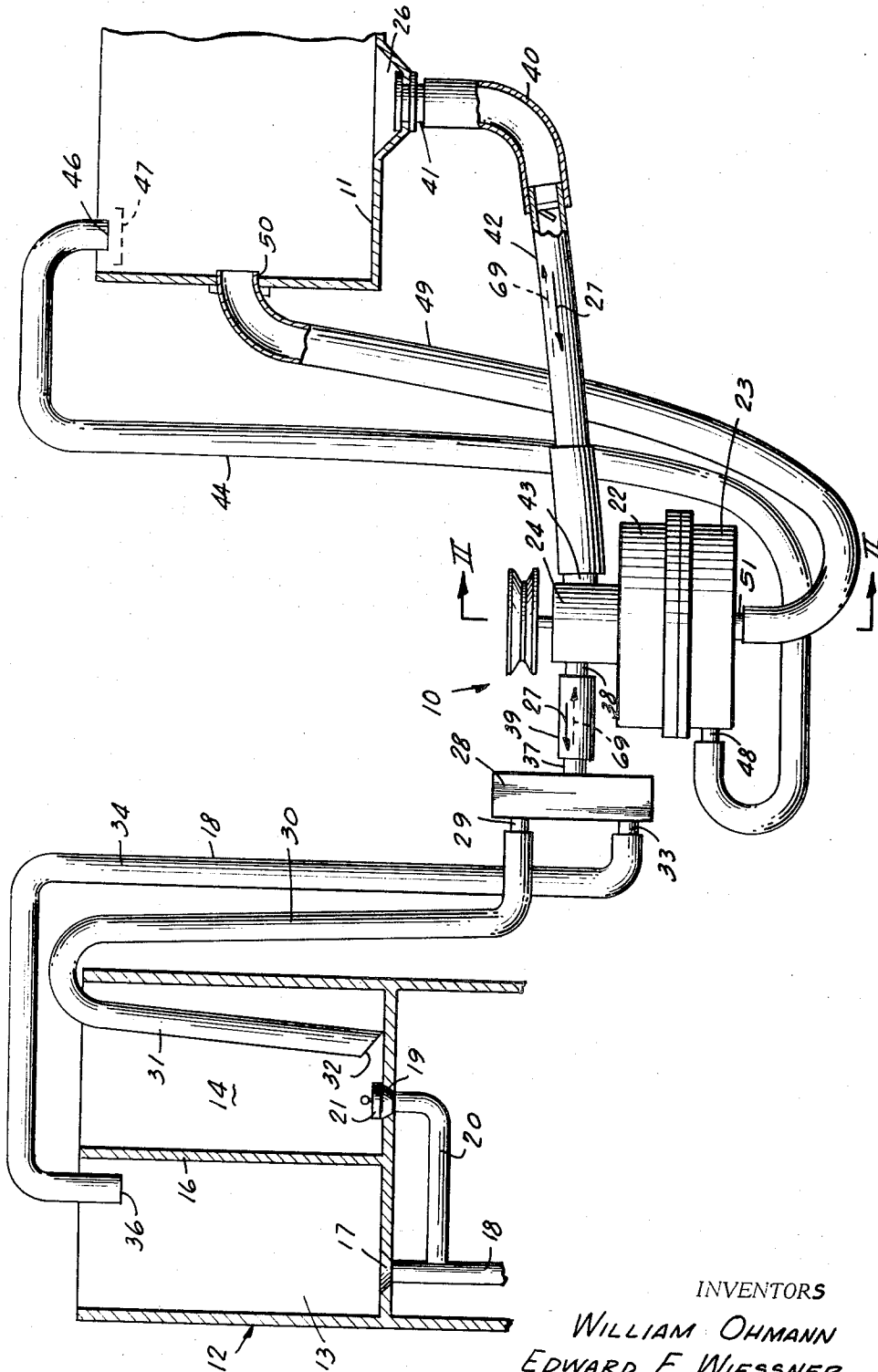
W. OHMANN ET AL
DOUBLE CAVITY PUMP FOR LAUNDRY EQUIPMENT HAVING
INTEGRAL SEALING MEANS

3,394,660

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3 Sheets-Sheet 1

Fig. 1



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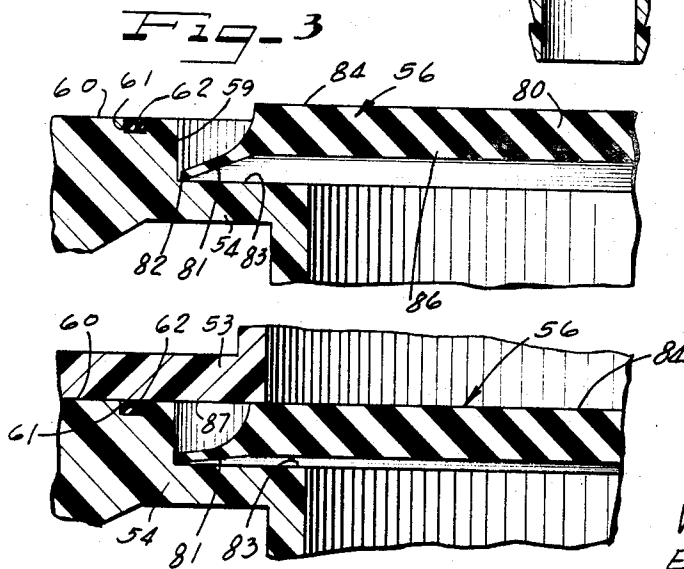
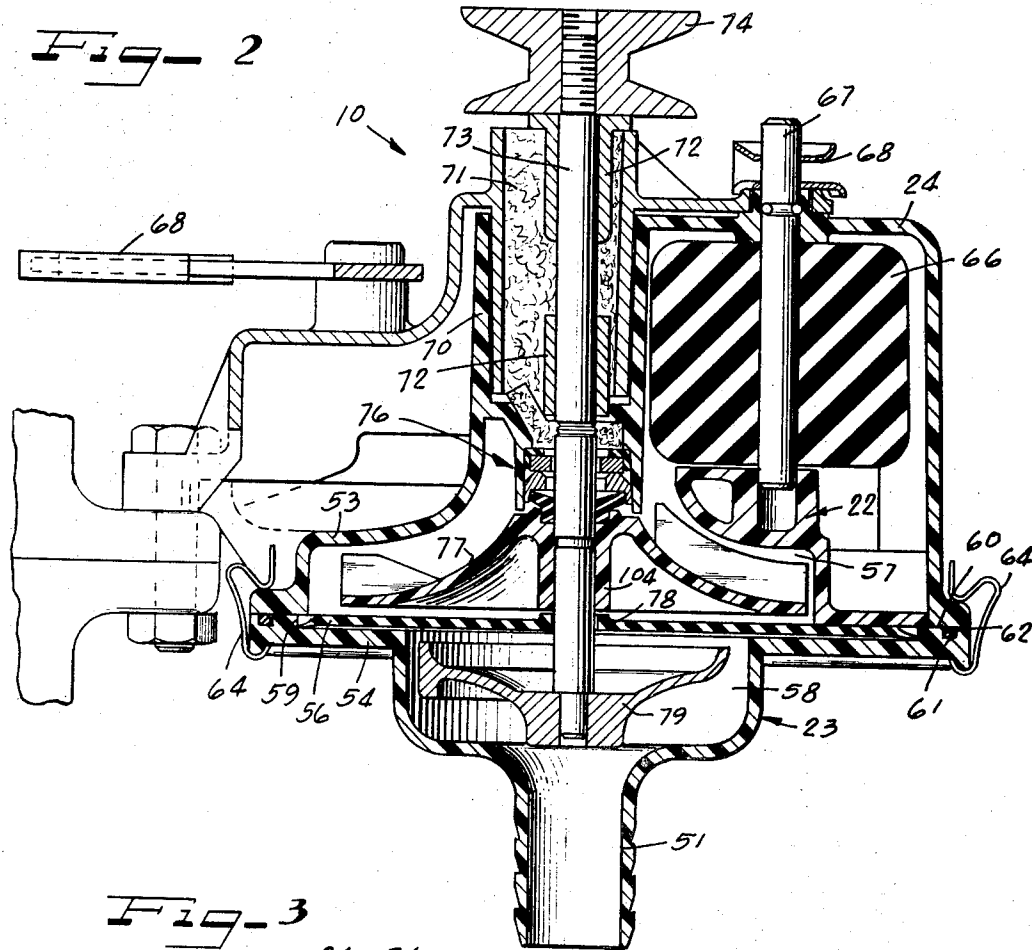


Fig- 4

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Fig. 5

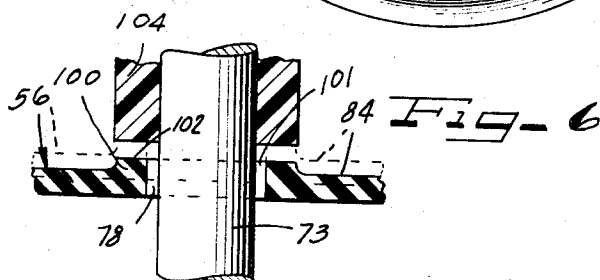
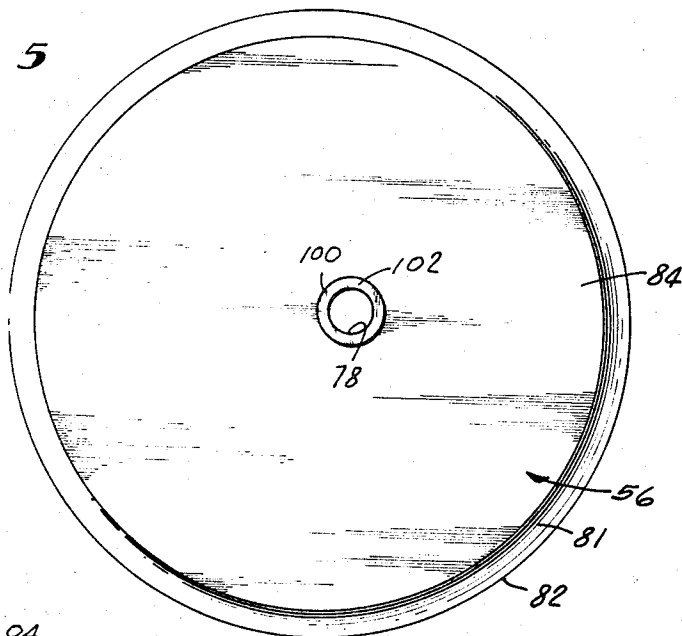


Fig. 6

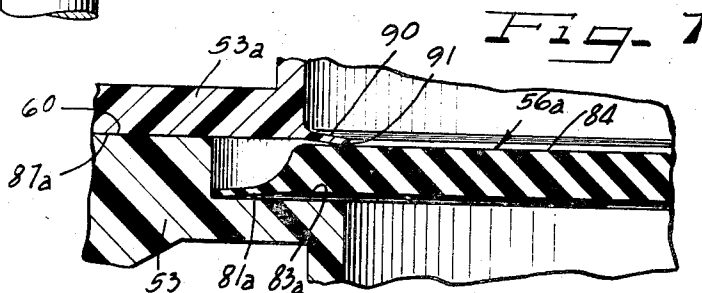
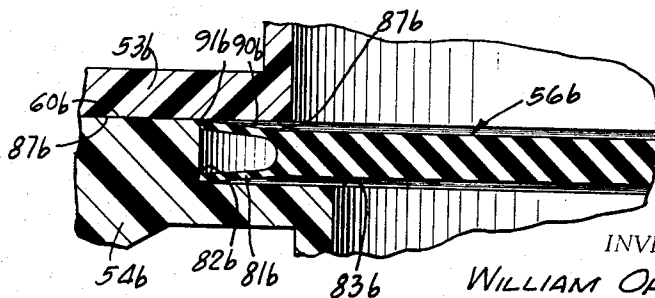


Fig. 7

Fig. 8



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DOUBLE CAVITY PUMP FOR LAUNDRY EQUIPMENT HAVING INTEGRAL SEALING MEANS

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ABSTRACT OF THE DISCLOSURE

A double cavity pump having a divider plate separating the two pump cavities and having an integral sealing lip molded into its periphery. The divider plate is flexible and has an aperture allowing automatic priming of the second pump cavity with fluid from the first pump cavity until the operation of a pump impeller in the second cavity creates sufficient fluid pressure therein to automatically close the aperture by movement of the divider plate.

A pump for laundry apparatus having a dividing plate provided with its own integral peripheral sealing lip thereby effectively separating two distinct pumping chambers, each having its own impeller means therein. The dividing plate also cooperates with the impeller means to form a pressure responsive priming means, thereby admitting laundry liquid from one pumping chamber into the other for priming the pumping unit in the other pumping chamber and automatically closing the priming passage in response to pump-generated pressure.

The integral flexible sealing lip arrangement of the present invention may take several forms. For example, multiple lips may engage adjoining pump body surfaces, thereby eliminating separate ring and groove sealing or gasketing. The lip seal can also be used to isolate port areas.

It is an object of the invention to provide improved means for effecting a seal about the periphery of a divider plate in a double cavity pump.

A further object of the invention is to provide an improved means for priming one of the chambers of the double cavity pump.

Other objects and advantages of the invention will become manifest to those versed in the art upon making reference to the following description and drawings in which an exemplary embodiment of the present invention is shown and described.

On the drawings:

FIGURE 1 is a plumbing diagram showing an automatic washer in schematic form and embodying a double cavity pump in accordance with the principles of the present invention.

FIGURE 2 is a vertical cross section of the double cavity pump taken on line II-II of FIGURE 1.

FIGURE 3 is an enlarged fragmentary cross-sectional view showing additional details of the peripheral sealing means incorporated in the dividing plate of the present invention.

FIGURE 4 is a view similar to FIGURE 3 but illustrating the parts in assembled loaded condition.

FIGURE 5 is a plan elevational view of the dividing plate provided in accordance with the principles of the present invention.

FIGURE 6 is an enlarged fragmentary cross-sectional view showing additional details of the priming means of the present invention.

FIGURE 7 is a view similar to FIGURES 3 and 4 but showing an alternative sealing arrangement.

FIGURE 8 is a view similar to FIGURES 3 and 4

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but showing yet another form of sealing arrangement as contemplated by the present invention.

As shown on the drawings:

While the principles of the present invention are generally applicable to other environments, a particularly useful application is made to a double cavity pump of the type used in laundry equipment. Accordingly, to illustrate the principles of the invention, there is shown in FIGURE 1 a double cavity pump 10 embodying the principles of the present invention.

Referring, first of all, to the plumbing diagram of FIGURE 1, there is shown schematically a double cavity pump identified generally by the reference numeral 10 which embodies the principles of the present invention and which has various liquid connections to a tub 11 of an automatic washer and to a wash stand shown generally at 12 including a drain compartment 13 and a suds saving compartment 14, the compartments 13 and 14 being separated by an internal partition 16. The drain compartment 13 has a drain opening 17 in the bottom wall thereof connected to a drain conduit 18. The suds storage compartment 14 also has a drain opening 19 formed therein and a branch conduit 20 runs from the drain opening 19 to the drain conduit 18 and may be selectively closed by a stopper 21.

More specifically, the pump 10 has dual pumping cavities which may be referred to as an upper or first cavity 22 and a lower or second cavity 23. The upper pumping unit 22 may conveniently comprise the so-called bidirectional form of pump including bidirectional valving means 24 to thereby selectively direct the flow through the plumbing conduit to a selected direction, for example, from a sump 26 formed in the bottom of the tub 11 to a two-way valve 28 in the direction of a solid arrow 27. The two-way valve 28 determines whether the laundry liquid will pass to the storage compartment 14 or to the drain compartment 13. In this regard, the two-way valve 28 has a first outlet 29 connected to a conduit 30 having a depending leg 31 extending into the storage compartment 14 and provided on its end with an opening 32 near the bottom of the compartment 14. The two-way valve 28 has a second outlet 33 connected to a conduit 34 having a discharge portion 36 for directing laundry liquid into the drain compartment 13.

An inlet fitting 37 is formed on the two-way valve 28 and is connected to a fitting 38 formed on the valve mechanism 24 by means of a conduit 39.

A conduit 40 is connected to the sump 26 as at 41 and has an extension portion 42 connected to the valving device 24 as at 43.

A recirculation conduit 44 has a discharge opening 46 directing liquid into a filtering device 47 adjacent the top of the tub 11, while the other end of the recirculation conduit 44 is connected to a port 48 provided for the lower pump unit 23.

A conduit 49 has one end connected to the tub 11, as at 50 and the other end thereof is connected to the pump unit 23 via a port 51.

Referring now more specifically to FIGURE 2, additional details of construction of the pump 10 are shown. Thus, it will be noted the pump 10 is characterized by a casing which includes a first housing body 53 cooperating with a cover member or second housing body 54, thereby to form a hollow housing or a casing providing a cavity. The interior of the housing or the cavity is partitioned by means of the dividing plate of the present invention shown generally at 56 and operating to divide the interior of the casing into a first pumping chamber 57 for the upper pump unit 22 and a second pumping chamber 58 for the pumping unit 23.

In the form of the invention shown in FIGURE 2, the cover 54 has a notched recess 59 in which the dividing

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plate 56 is received and outwardly thereof is a flat wall portion 60 formed with an annular recess 61 in which is positioned an "O" ring sealing member 62 for engaging an adjoining abutment surface of the main body 53 of the casing. Resilient snap-on clamping means 64 are provided for connecting the cover 54 to the body 53, thereby retaining the housing components in firm assembly with one another.

The body 53 of the casing is formed with a valve chamber housing the valve means previously referred to at 24 and it will be noted upon inspecting FIGURE 2 that a valve 66 is carried on a pivot shaft 67 having an outwardly projecting end connected to an actuator 68 by means of which flow through the upper pump unit 22 may be selectively reversed from the direction of the full line arrows 27 to a reverse direction shown by dotted line arrows 69, as seen in FIGURE 1.

The casing body 53 also includes a bearing housing 70 in which is received lubricating wick material 71 and bearing means 72 for journaling a shaft 73. One end of the shaft 73 projects outwardly of the pump housing and has connected thereto a pulley wheel 74 by means of which the pump may be rotatably driven. The shaft extends through a sealing mechanism shown generally at 76 and has connected thereto a first impeller means 77 which is rotatable within the pumping chamber 57.

The shaft 73 extends through the divider plate 56 at a centrally disposed opening 78 and projects into the pumping chamber 58 where it is connected to a second impeller means 79 which is rotatable in the pumping chamber 58.

Referring now to FIGURE 3 and FIGURE 4 in conjunction with FIGURE 2, additional details of the divider plate 56 are illustrated.

The divider plate is preferably made of a plastic material such as polypropylene and is substantially flat in overall configuration and is of sufficient thickness, as indicated by the thickness dimension 80 to be fairly rigid, i.e., relatively stable, but still of sufficient flexibility to be yieldable in accordance with the principles of the present invention.

At the outer periphery of the divider plate 56, there is formed an integral reduced section providing a relatively thin annular lip 81. The lip 81 projects radially outwardly and slopes somewhat downwardly so that when the divider plate 56 is in its relaxed, unsealed position, as seen in FIGURE 3, the outer edge extremity 82 of the lip 81 will engage the bottom wall 83 of the recess 59 and will position the top surface 84 of the divider plate 56 above the level of the cover represented by the flat surface 60. In other words, the total dimension indicated at 86 is greater than the depth of the recess 59.

When the cover 54 is assembled to the casing body 53, the upper surface 84 of the divider plate 56 will engage the flat adjoining surface of the body 53 as indicated at 87 and the divider plate 56 will be clamped between the confronting surfaces so that the lip 81 will flex or bend because of the deformation characteristics of the plastic material such as polypropylene.

In selecting a plastic material such as polypropylene, it is desirable that a material be used which has a memory characteristic similar to that exhibited by polypropylene since the material of the lip 81 causes a seal to be effected between the two pumping cavities 57 and 58, thereby eliminating the need for any additional gaskets or seals in association with the divider plate.

In the embodiment shown in FIGURE 4, the divider plate 56 effects a seal between the two pumping chambers 57 and 58 and a separate sealing means 62 is provided for sealing the line of juncture between the first housing body 53 and the cover 54. If desired, the divider plate 56 can be constructed in the alternative forms of FIGURES 7 and 8, in which event the necessity of grooving the cover or lower housing 54, as at 61, for receiving a separate O ring 62 would also be eliminated without loss of function. Thus, in FIGURE 7, there is shown an ar-

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angement wherein the divider plate is identified at 56a and the body 53a of the pump is characterized by the formation of a radially inwardly extending flexible lip 90 having an outermost edge 91 which engages against the top surface 84 of the divider plate 56a. The divider plate 56a has, as previously described, a lip 81a with an outer edge 82a engaging the surface 83a of the cover or lower housing 54a. Thus, the lips 81a and 90 not only effect a seal between the respective pumping cavities but also provide an effective seal between the line of juncture of the casing parts along the surface shown at 60a and 87a.

In FIGURE 8 an alternative construction is illustrated wherein the divider plate is shown at 56b. At the outermost periphery of the plate 56b, there are two separate lips provided including the lip 81b, which is similar in placement and location to the lips 81 and 81a described in connection with FIGURES 3, 4 and 7 and the second lip is formed integral with the divider plate 56b, as shown at 90b. Thus, the lip 81b has an outer edge 82b and the lip 90b has an outer edge 91b. The lip 81b engages the surface 83b of the cover member shown at 54b, while the lip 90b engages the surface 87b of the casing body 53b. Thus the divider plate 56b effects a seal between the pumping cavities and also effects a seal between the line of juncture of the abutting surfaces shown in FIGURE 8 at 60b and 87b.

Referring now to FIGURES 5 and 6, additional details of construction of the divider plate 56 are shown. For the purpose of accomplishing the automatic priming of the lower pump, the dividing plate 56 forms a pressure responsive valving means for regulating the flow of priming fluid through a priming passage as a function of a pressure differential.

At the edges of the opening 78, there is provided a boss or a hub 100 through which the opening 78 extends, the opening 78 being made of a sufficiently large diameter to pass the shaft 73 with clearance shown at 101.

The boss 100 has a flat upper surface 102 which is spaced from the adjoining end surface 103 on a hub 104 of the impeller means 77.

Thus, the surface 103, in effect, forms a valve seat, while the boss 100 forms a valve head with a valve head seating surface 102. Because of the flexibility of the divider plate 56, the boss 100 is flexibly movable from the full line position shown in FIGURE 6 to a dotted line position in response to a pressure differential acting on the divider plate 56.

With respect to the priming operation, it will be appreciated that the two-way valve 28 determines whether laundry liquid will pass to the storage sump 14 or to the drain compartment 13. Thus, whenever there is liquid present in the tub 11, liquid will also be present in the upper pumping cavity 57 because the two-way shut-off valve 28 is downstream of the upper pumping unit 22.

The lower pumping unit 23, on the other hand, is used for circulating laundry liquid and since the impeller means 79 constitutes a unidirectional centrifugal-type pump, liquid will not normally be present in the pumping cavity 58 when the pumping unit 23 is required to begin operation and priming of the lower pump unit 23 is thus desirable.

In prior art devices, priming of a dual cavity pump was sometimes accomplished by allowing liquid in the upper cavity to run into the lower cavity through an opening in the face of the divider wall, however, in such prior art devices there was no way to seal off such opening once priming had been accomplished.

In accordance with the principles of the present invention, a valving action is automatically accomplished to shut off the priming passage extending through the opening or clearance 101 and the space between the confronting surfaces 102 and 103. When the lower impeller means 79 is not recirculating liquid through the hoses or conduits 44 and 49, the priming passage is open. Thus, when the two-way valve 28 is closed and the tub 11 of the

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washer is filling, water within the upper pumping cavity 57 will pass into the lower pumping cavity 58 through the priming passage for priming purposes. Once the tub 11 is filled and recirculation takes place, the pressure in the lower pumping cavity 58 will exceed the pressure present in the upper pumping cavity 57 by virtue of the capacity of the impeller means 79 and such pressure differential, in combination with the flexibility of the divider plate 56 will permit the dividing plate 56 to move or deflect upwardly to the dotted line position shown in FIGURE 6, whereupon the surface 102 will engage the surface 103 in a manner similar to a valve seating action, thereby closing the priming passage.

When the lower impeller means 79 stops recirculation, the divider plate 56 will return to its original full line position and will therefore condition the priming passage to allow the lower pump unit 23 to be primed through the priming passage as described.

It will be readily apparent that if the automatic valving feature is not desired, the boss 100 may be removed from the top surface 84 of the divider plate wherein priming of the lower pumping chamber will be accomplished through the opening 78 as described above with the exception that the opening 78 will be continuously open and will not be automatically sealed off as it was in the embodiment shown in FIGURES 5 and 6.

Although minor modifications might be suggested by those versed in the art, it should be understood that we wish to embody within the scope of the patent warranted hereon, all such modifications as reasonably and properly come within the scope of our contribution to the art.

We claim:

1. An apparatus for pumping liquid comprising:
 - a casing having a cavity formed therein,
 - wall means extending across said cavity for dividing said cavity into first and second chambers;
 - said casing having separate inlets and outlets formed therein for said first chamber and for said second chamber;
 - first and second rotatable impeller means in corresponding chambers for pumping liquid between the corresponding inlet and outlet;
 - said wall means having passage means extending therethrough interconnecting said first and second chambers for admitting limited liquid flow from said first chamber into said second chamber to prime said second chamber and including means responsive to liquid pressure within said second chamber for closing said passage means after initiation of liquid flow through said second chamber.
2. An apparatus for pumping liquid comprising:
 - hollow casing means,
 - wall means partitioning the hollow interior of said casing means into first and second pumping chambers,
 - said wall means having an integral peripheral resilient sealing lip engaging said casing in a sealing relationship between said first and second pump chambers;
 - said casing means having separate inlets and outlets formed therein for said first chamber and for said second chamber; and
 - first and second impeller members respectively positioned in said first and second chambers for pumping liquid between the corresponding inlet and outlet, and a common driving means for said first and second impellers extending axially through said hollow interior of said casing means and passing through said wall means for connection to said impeller members on respectively opposite sides of said wall means, whereby said lip effectively separates the pumping chambers.
3. An apparatus for pumping liquid comprising:
 - hollow casing means,

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wall means partitioning the hollow interior of said casing means into first and second pumping chambers, said wall means having an integral peripheral resilient sealing lip engaging said casing in a sealing relationship between said first and second pump chambers;

said casing means having separate inlets and outlets formed therein for said first chamber and for said second chamber; and

first and second impeller members respectively positioned in said first and second chambers for pumping liquid between the corresponding inlet and outlet,

said wall means having a priming passage formed therein for accommodating limited fluid flow from said first chamber to said second chamber to prime said second chamber with liquid from said first chamber,

and said wall means being movable in response to pressure in said second chamber to close said priming passage.

4. In a pump,
a casing,
a divider plate in said casing partitioning the interior of said casing into first and second pumping chambers each having its own inlet and outlet,
and separate impeller means in said pumping chamber to pump fluid between the corresponding inlet and outlet,

said divider plate being particularly characterized by having formed thereon an integral flexible peripheral lip for sealingly engaging an adjoining surface of said casing,

thereby to sealingly separate the pumping chambers, said divider plate being movable in an axial direction in response to pressure in one of said chambers, and means forming a priming passage controlled by movement of said plate.

5. In a pump,
a casing,
a divider plate in said casing partitioning the interior of said casing into first and second pumping chambers each having its own inlet and outlet,
and separate impeller means in said pumping chamber to pump fluid between the corresponding inlet and outlet,

said divider plate being particularly characterized by having formed thereon an integral flexible peripheral lip for sealingly engaging an adjoining surface of said casing,

thereby to sealingly separate the pumping chambers, said casing having first and second housing bodies, each housing body having a flat abutment surface together with one another forming a joint when said housing parts are in assembled relation, clamping means for retaining said housing bodies connected together,

said integral flexible peripheral lip sealingly engaging one of said housing bodies, and an inwardly extending sealing lip on the other of said housing bodies engaging said divider plate to seal said joint.

6. In a pump,
a casing,
a divider plate in said casing partitioning the interior of said casing into first and second pumping chambers each having its own inlet and outlet,
and separate impeller means in said pumping chamber to pump fluid between the corresponding inlet and outlet,

said divider plate being particularly characterized by having formed thereon an integral flexible peripheral lip for sealingly engaging an adjoining surface of said casing,

thereby to sealingly separate the pumping chambers, said casing having first and second housing bodies, each

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housing body having a flat abutment surface together with one another forming a joint when said housing bodies are in assembled relation, clamping means for retaining said housing bodies connected together,

said integral flexible peripheral lip sealingly engaging one of said housing bodies, said divider plate having a second lip for sealingly engaging against said other housing body.

7. In a pump,

a casing,

a divider plate in said casing partitioning the interior of said casing into first and second pumping chambers each having its own inlet and outlet,

and separate impeller means in said pumping chamber to pump fluid between the corresponding inlet and outlet,

said divider plate being particularly characterized by having formed thereon an integral flexible peripheral lip for sealingly engaging an adjoining surface of said casing,

thereby to sealingly separate the pumping chambers,

said divider plate having an opening extending therethrough,

said separate impeller means having a common shaft projecting through said opening with sufficient clearance to form a priming passage between said chambers,

and a valving surface circumjacent said opening for engaging an adjoining surface of one of said impeller means in response to movement of said divider plate when acted upon by fluid pressure generated within one of said chambers,

thereby closing said priming passage automatically.

8. In a pump,

a casing having wall surface defining an interior cavity, a dividing plate dividing said interior cavity into first and second pumping chambers,

said plate having an integral flexible and resiliently elastic peripheral sealing lip projecting radially and axially away from said divider plate to engage said wall surface,

and a priming passage formed in said plate and extending between said chambers.

said plate having a valving surface circumjacent said passage,

and means forming a valve seat adjacent said valving surface and engaged thereby to close said priming passage when said plate is moved in response to pump-generated pressure in one of said chambers.

9. A pump comprising

a casing including a first housing body and a cover forming a second housing body,

clamping means retaining said first and second housing bodies in firm assembly with one another, one of said housing bodies having an annular recess formed therein,

a divider plate made of plastic material received in said annular recess and partitioning the interior of said casing into first and second pumping chambers defined by the cooperation of said divider plate with said first and second housing bodies respectively,

said divider plate having an integral reduced section peripheral sealing lip extending radially outwardly and having axial extent,

said sealing lip having an outermost edge engaging said annular recess,

thereby to position said divider plate outside of said recess when in a relaxed position,

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means defining separate inlets and outlets in said casing for each of said chambers, and separate impeller means in said pumping chambers for pumping fluid between separate inlets and outlets formed in said casing,

whereby said divider plate sealingly separates said first and second pumping chambers.

10. A pump as defined in claim 9 and further characterized by said divider plate having a priming passage formed therein and extending between said first and second chambers.

11. A pump as defined in claim 9 and further characterized by said divider plate having a priming passage formed therein and extending between said first and second chambers,

said divider plate having a boss surrounding said priming passage and forming a valve seat on said boss, and means adjacent said boss providing a valve seat for engaging said valve surface on said boss to close said priming passage when said divider plate is moved in response to fluid pressure generated within one of said chambers.

12. A pump comprising

a casing including a first housing body and a cover forming a second housing body,

clamping means retaining said first and second housing bodies in firm assembly with one another,

one of said housing bodies having an annular recess formed therein,

a divider plate made of plastic material received in said annular recess and partitioning the interior of said casing into first and second pumping chambers defined by the cooperation of said divider plate with said first and second housing bodies respectively

said divider plate having an integral reduced section peripheral sealing lip extending radially outwardly and having axial extent,

said sealing lip having an outermost edge engaging said annular recess,

thereby to position said divider plate outside of said recess when in a relaxed position,

means defining separate inlets and outlets in said casing for each of said chambers,

and separate impeller means in said pumping chambers for pumping fluid between separate inlets and outlets formed in said casing,

whereby said divider plate sealingly separates said first and second pumping chambers,

said divider plate having a second lip projecting radially outwardly and having axial extent in an opposite direction from said first lip,

said second lip sealingly engaging against the other of said housing bodies,

thereby to seal the joint between said body housing and said cover.

References Cited

UNITED STATES PATENTS

2,210,723	8/1940	Kosatka	103—111
2,924,959	2/1960	Israel	103—3
2,936,715	5/1960	Southam et al.	103—111
2,997,958	8/1961	Heinicke	103—111
3,213,976	10/1965	Yost et al.	103—111
3,301,188	1/1967	Belonger	103—104

FOREIGN PATENTS

413,573	7/1934	Great Britain.
923,098	4/1963	Great Britain.

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