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Wiltshire

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[54] **POSITIVE INTERLOCK FOR A MULTIPORT VALVE**

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[73] Assignee: **Pacific Fabrication, Inc.,** Chardon, Ohio

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[52] **U.S. Cl.**.... **137/624.27,** 137/625.29, 137/625.46

[51] **Int. Cl.**..... **F16k 11/02**

[58] **Field of Search**..... 137/624.27, 625.29, 625.11, 137/625.31, 625.46

[56] **References Cited**

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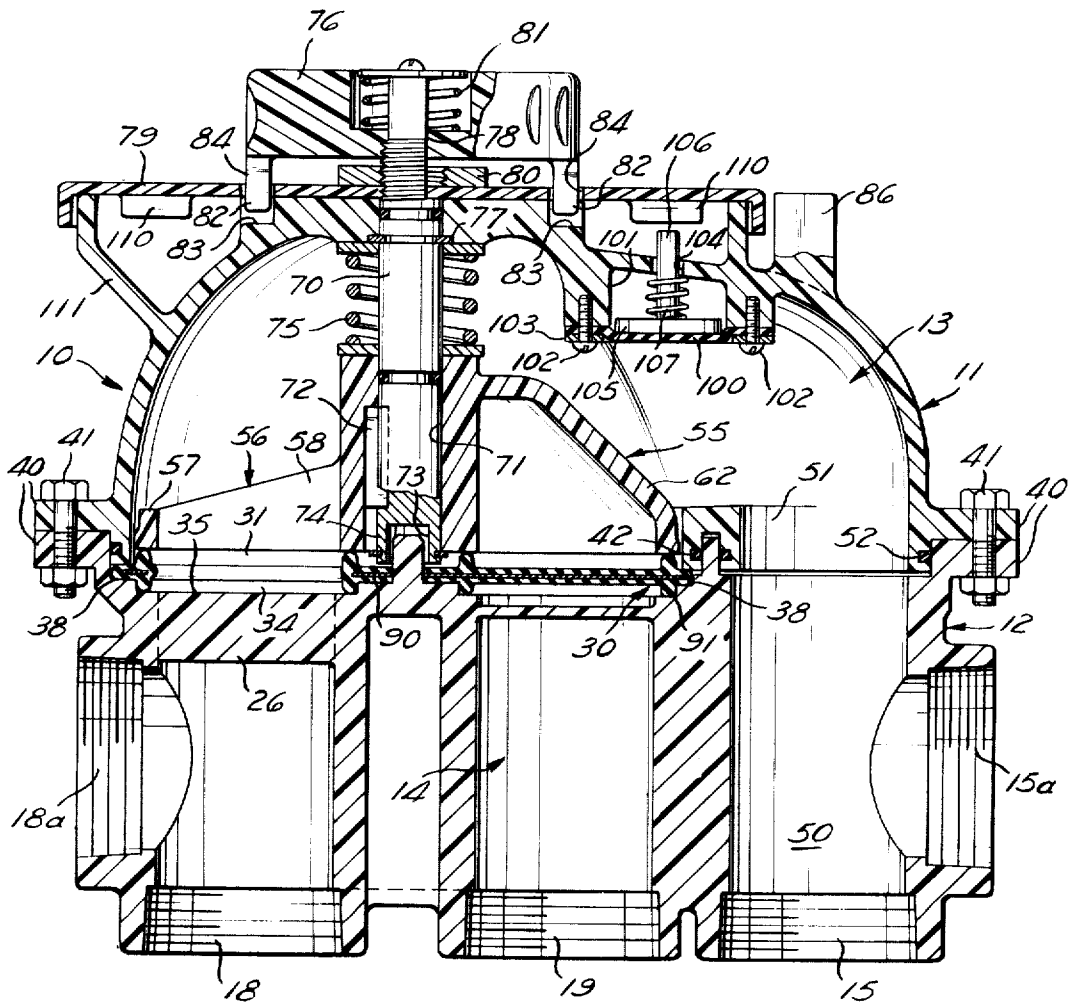
Primary Examiner—Alan Cohan

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[57] **ABSTRACT**

A multiport valve having an inlet port and a plurality of outlet ports. The inlet port communicates with a main pressure chamber, and that chamber is separated from the outlet ports by a valving arrangement which includes a selector plate having an aperture therein for providing selective communication between the main pressure chamber and one of the outlet ports. A handle is provided to move the selector plate, and a detent, responsive to fluid pressure in the pressure chamber, is provided to lock the handle and the selector plate against movement when the chamber is pressurized. Thus, it is necessary to shut off a fluid supply pump prior to movement of the selector plate, and this feature minimizes the adverse effects of high velocity fluid across port gaskets as the selector plate is moved.

4 Claims, 4 Drawing Figures



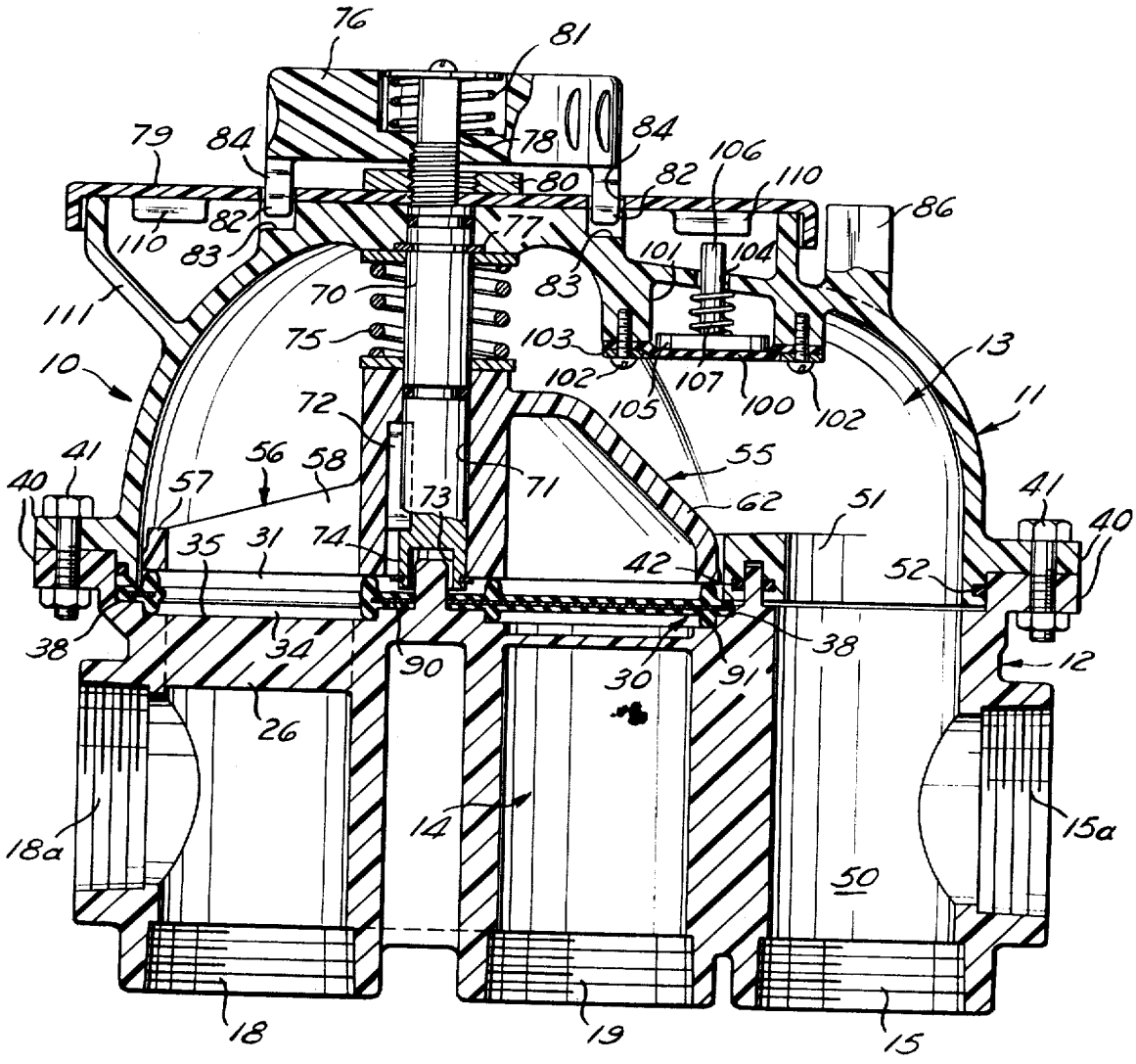
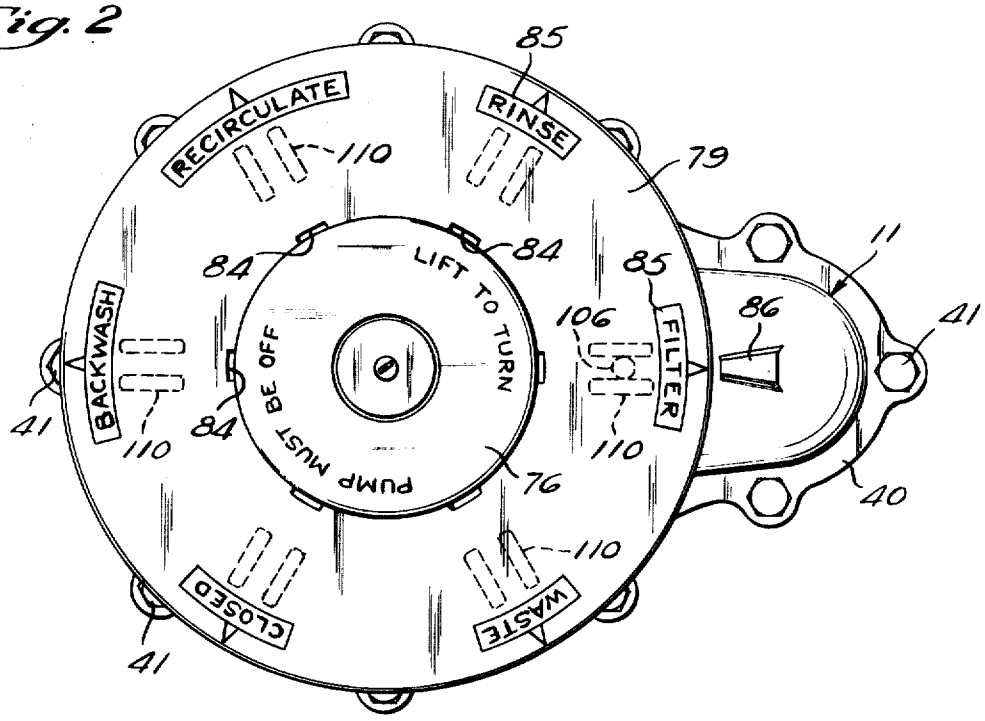

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35
31
74
42
52
38
34
90
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91
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12
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18a
14
15a
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Fig. 1

Fig. 2


RECIRCULATE
RINSE
BACKWASH
FILTER
CLOSED
WASTE
LIFT TO TURN
PUMP MUST BE OFF
85
79
11
41
40
84
106
86
110
76

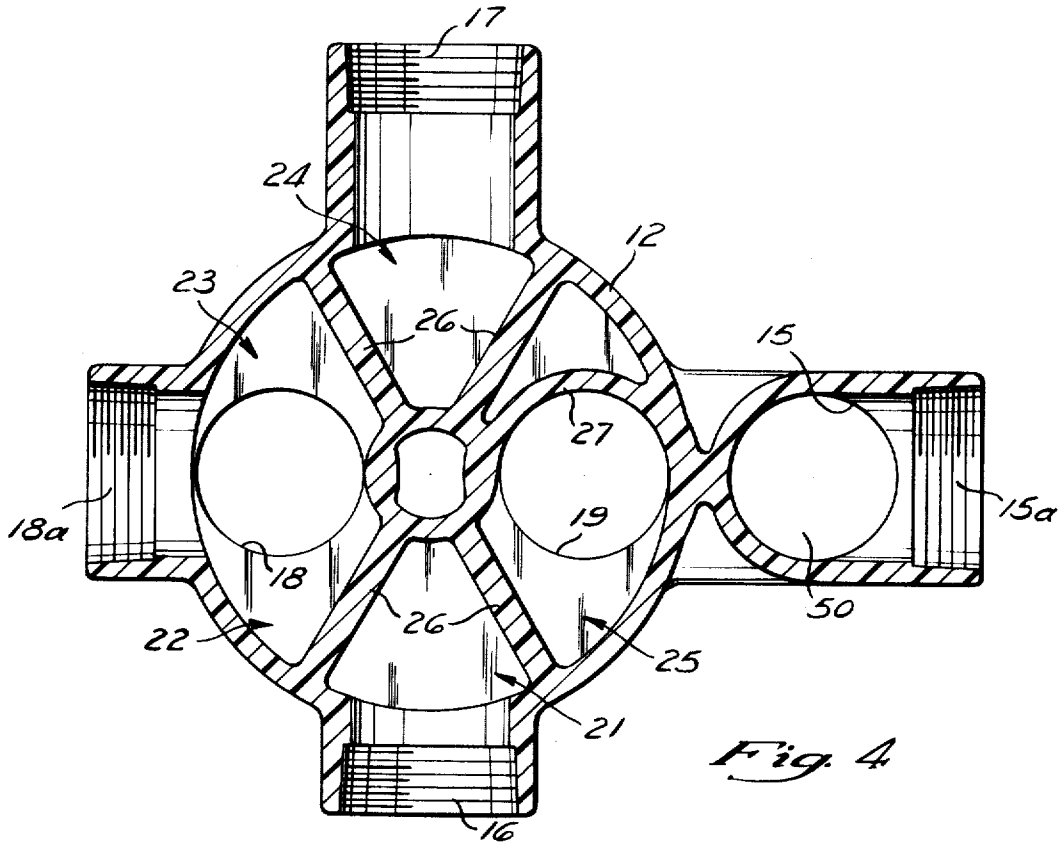

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18a
15a
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Fig. 4

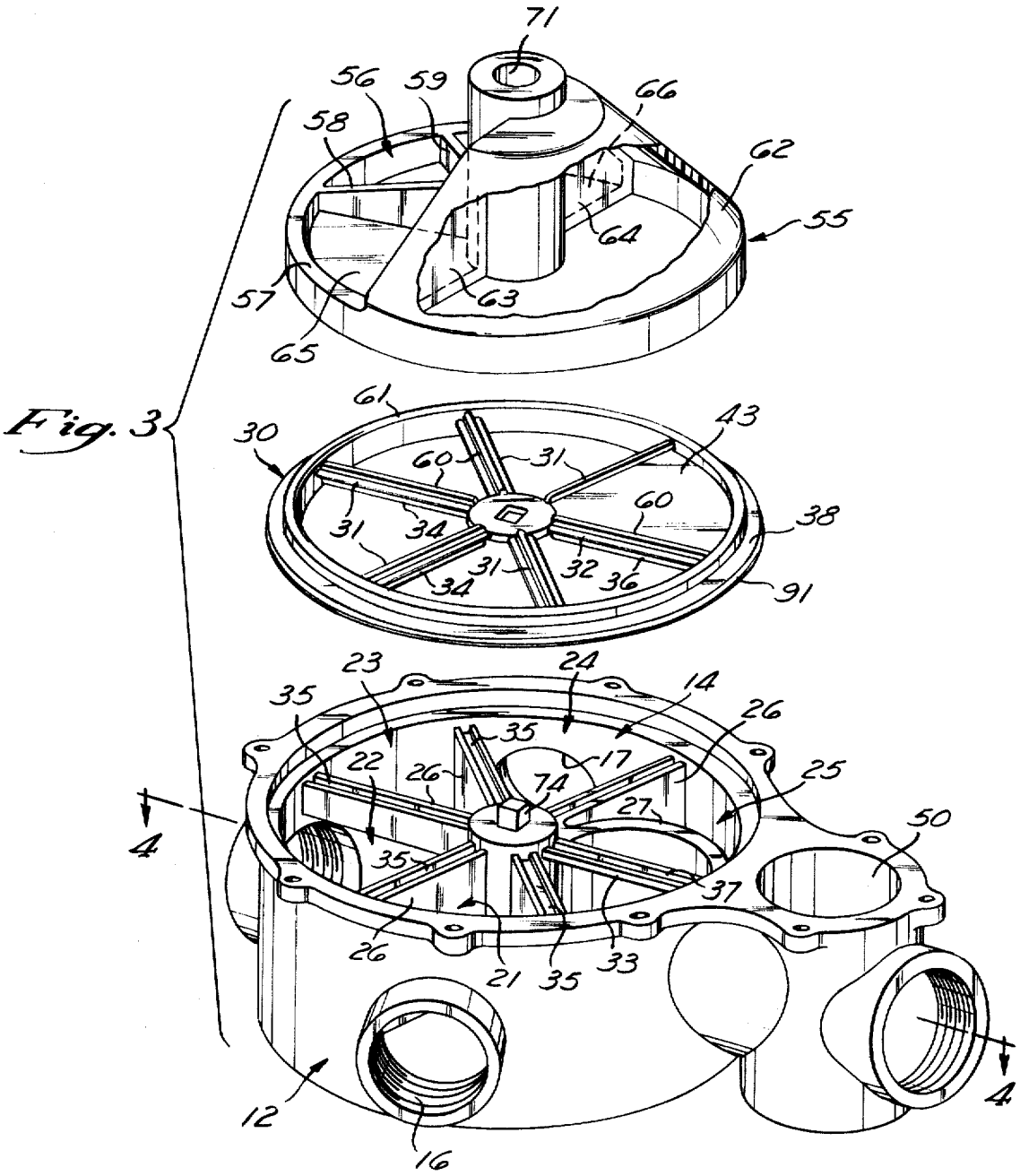

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74
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33
12
16
4

Fig. 3

POSITIVE INTERLOCK FOR A MULTIPORT VALVE

BACKGROUND OF THE INVENTION

This invention relates to multiport valves and, more particularly, to multiport valves having a positive interlock which required a fluid supply pump to be turned off prior to movement of a selector plate across outlet ports. Multiport valves having an inlet port, a plurality of outlet ports, and a selector plate for connecting the inlet port ot one of the outlet ports are widely used, particularly in swimming pool filter systems. Such valves are intended to sequentially direct fluid pumped from the pool to the inlet end of a filter for normal filtering operations; to the outlet end of the filter for backwashing operations; direct fluid, after a backwashing operation, from the outlet end of the filter to a drain to perform a rinsing operation; to direct the water to a waste line without passing through the filter in order to drain the pool; to block flow from the pump at the valve; and to direct water directly to the pool, by bypassing the filter, so that the filter may be serviced. Such valves generally include a valve casing having an inlet port leading to a high pressure chamber. A plurality of outlet ports are separated from the high pressure chamber by a selector plate having an aperture therein which engages a flat gasket surrounding the outlet ports. By turning a handle connected to the selector plate, the aperture therein selectively communicates with one of the outlet ports so that fluid is directed to that particular port. Other ports may be blocked or connected by the selector plate.

One such multiport valve arrangement is shown in U.S. Pat. No. 3,640,310 to Erlich. In the Erlich patent, there is disclosed a multiport valve having a selector plate which engages a sealing gasket and which is adapted to selectively communicate an inlet port with one of a plurality of outlet ports. The selector plate is switched from outlet port to outlet port by raising the selector plate from the gasket and then turning the plate to a preselected rotated position. When this position is attained, the selector plate is lowered into engagement with the gasket. Although this arrangement permits the pump to be operated and eliminates sliding frictional engagement between the gasket and the selector plate, frequently debris, such as insects or leaves, is trapped between the selector plate and the gasket when the selector plate is seated. This may cause leakage between the selector plate and an inlet port, and cause improper operation of the valve.

It is belived to be more desirable to maintain engagement the selector plate and the gasket during rotation of the plate to prevent the entrapment of debris between those members. However, such an arrangement presents a significant problem if the selector plate is rotated with the pump operating, since as an outlet port is closed, increasingly high pressure differentials are created across the gasket and in the direction of fluid flow. These high pressure differentials tend to erode and sweep away the gasket from its seat.

It is therefore desirable to shut off the pump prior to moving the selector plate, but many users of such valves ignore this advice, particularly if the pump is not located near the valve.

SUMMARY OF THE INVENTION

This invention overcomes many of the prior art problems by providing a multiport valve having a selector plate which slides on its gasket to prevent entrapment of debris between the selector plate and the gasket. The valve also includes an interlock which prevents movement of the selector plate when the valve chamber is pressurized by the pump, thus necessitating the pump to be shut off to disengage the interlock.

According to the invention, the multiport valve includes a valve casing having an inlet port and a plurality of outlet ports. The inlet port communicates with a main pressure chamber, and that chamber is separated from the outlet ports by a valving arrangement which includes a selector plate having an aperture therein for providing selective communication between the main pressure chamber and one of the outlet ports. The selector plate is rotated relative to a gasket for the outlet ports by a handling which projects form the valve casing. A flexible diaphragm is provided in the valve casing which has one surface exposed to the pressure in the main pressure chamber and another surface exposed to atmospheric pressure. A detent rod is driven by the diaphragm and is engageable with one of a plurality of detents associated with the selector plate handle. When the main pressure chamber is pressurized by the pump, the rod engages one of such detents on the handle to lock the valve in position and to prevent rotation of the selector plate until the pump is shut off.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a cross sectional view of a multiport valve in accordance with the teachings of this invention;

FIG. **2** is a plan view of the valve illustrated in FIG. **1**;

FIG. **3** is a perspective, exploded view of a selector plate, and a separable body portion; and

FIG. **4** is a cross sectional view, the plane of the section being indicated by the line **4–4** in FIG. **3.**

DETAILED DESCRIPTION OF THE INVENTION

Referring now to the drawings, there is illustrated a multiport valve **10** for selectively connecting a plurality of valve ports to one another. The valve **10** is particularly useful in swimming pool applications where the valve connects an inlet port of a filter to a pump for filtering the pool water and then may connect the outlet port of the filter to the pump for a backwashing operation. The valve **10** has separable body sections **11** and **12** defining first and second chambers **13** and **14**, respectively. The body section **12**, which defines the second chamber, is provided with a plurality of inlet and outlet ports **15, 16, 17, 18,** and **19.** The ports **15–19** are adapted to be respectively connected to conduits communicating with a pump, the swimming pool, a waste drain, the inlet end of a filter, and the outlet end of the filter, respectively. It may be noted that auxiliary ports **18***a* and **15***a* respectively communicate with the ports **18** and **15,** and thus comprise auxiliary ports for alternate filter and pump connections, depending upon the plumbing layout of the system. Depending upon the connection, the unused auxiliary or main port may be blocked by a suitable plug.

The second chamber **14** is separated into a plurality of segmented chambers **21, 22, 23, 24,** and **25** by radially extending partitions **26** and, with respect to the chambers **24** and **25,** by a partition **26** and a curved partition **27.** It may be noted that the partition **26** which separates the segmented chambers **22** and **23**

terminates at the port 18*a* so that the chambers 22 and 23 are in communication with the ports 18 and 18*a* at all times.

A sealing gasket 30 is provided between the separable body sections 11 and 12, and has a plurality of radially extending spokes 31 which are seated on the upper surface of each partition 26. The gasket 30 also includes a spoke 32 which is seated on a web 33 which extends across the segmented chamber 25. A depending portion 34 of each spoke 31 is received within a slot 35 in each partition 26 and a depending portion 36 of the spoke 32 is received within a slot 37 in the web 33.

A peripheral edge portion 38 of the gasket 30 is clamped between the body sections 11 and 12, as is indicated most clearly in FIG. 1. To effect the connection of the body sections 11 and 12, each section is provided with a flange 40 through which a plurality of bolts 41 extends. Although the clamped portion 38 of the gasket 30 provides an adequate seal between the body sections 11 and 12, and O-ring 42 may be provided between those sections to further ensure that there will be no leakage. For reasons which will hereinafter become apparent, a web 43 is provided between one of the spokes 31 and the spoke 32 to cover the portion of the chamber 25 having the partition 27 therein.

Fluid is admitted to the first chamber 13 from the port 15 (or the port 15*a*), which is connected to a swimming pool pump (not shown). As may be seen most clearly in FIG. 1, a portion of the body section 12 defines a passageway 50 which communicates with a passageway 51 defined by the body section 11. A seal between these passageways is provided by an O-ring 52 in the body section 11.

Flow from the chamber 13 is selectively directed to one of the segmented chambers by a rotatable selector plate 55, which also provides for the blockage of flow between the chamber 13 and the chamber 14, and for cross-porting between at least two segmented chambers. To this end, the selector plate 55 is provided with an aperture 56 therein defined by a rim portion 57 and by radially extending partitions 58 and 59 of the selector plate 55. The partitions 58 and 59, and the arcuate extent of the rim portion 57 between those partitions are dimensioned to form a seal on projecting ribs 60 of the spokes 31 and 32, and with a projecting lip 61 of the gasket 30. The selector plate 55 is also provided with a hood 62 which extends between the rim 57 and radially extending and diametrically aligned walls 63 and 64. The walls 63 and 64 are adapted to seal against diametrically aligned ribs 60 of the gasket 30. Areas of the switch plate between the wall 63 and the partition 58, and between the wall 64 and the partition 59, are blocked by web portions 65 and 66, respectively.

By rotating the selector plate 55 relative to the gasket 30, one of a plurality of the segmented chambers may be connected to the chamber 13, or all of those chambers may be blocked from communication with the chamber 13.

The selector plate 55 may be rotated relative to the gasket 30, and therefore the segmented chambers 21 and 25, by a handle assembly which includes a shaft 70 which extends through an aperture 71 in the selector plate 55, and which is restrained against rotation relative thereto by a key 72. One end of the shaft 70 has a circular aperture 73 therein which is adapted to rotatably mate with a projecting portion 74 of the body section 12. A compression spring 75 extends between the selector plate 55 and the body section 11 to firmly press the selector plate against the gasket 30. The shaft 70 is restrained against axial movement relative to the body section 11 by a ring 77 and the shaft 70 has a handle 76 slidably positioned thereon. It may be noted that the shaft 70 is provided with a flattened portion 78, and that the handle 76 is provided with an aperture which slidably receives the shaft 70 but which restrains the handle and the shaft against relative rotation. An indicator plate 79 is also carried by the flattened portion 78 of the shaft 70, and is thereby restrained from rotation relative to the shaft and is also restrained against axial movement by a nut 80. There is provided a spring 81 which biases the handle 76 in the position illustrated in FIG. 1, so that a plurality of teeth 82 is biased into engagement with a corresponding plurality of notches 83 provided in the body section 11. To permit entry of the teeth 82 in the notches 83, a plurality of apertures 84 is provided in the plate 79. The notches 83 are disposed so that the aperture 56 properly communicates with a segmented chamber 21–25, or is blocked by the web 43. By moving the handle 76 upwardly against the bias of the spring 81, the teeth 82 are disengaged from their notches, and the shaft 70, the selector plate 55, and the plate 79 may be rotated as a unit until the desired valving condition is attained. The valving condition is indicated when a desired indicia 85 is aligned with an indicator 86, which is molded into the body section 11. It may be noted that the illustrated position of the valve connects the pump to the inlet end of a filter for normal filtering operations.

The compression spring 75 biases the selector plate 55 into firm seating engagement with the gasket 30. The seating engagement is also aided by the pump pressure in the chamber 13. It may be noted in FIG. 1 that the gasket 30 has a relatively incompressible core 90, which may be a flat, apertured steel plate. The gasket 30 also comprises a relatively compressible case 91 which may be made from rubber. It may be noted that the relatively compressible case 91 has relatively thick portions positioned between the selector plate and the partitions 26, and has relatively thin portions clamped between the separable body sections 11 and 12. This arrangement provides a proper seal around the segmented chambers, and provides a rim portion between the separable body sections which may be strongly compressed without excessive extrusion by the body sections.

As was previously indicated, the selector plate 55 may be placed in a number of valving positions. With the aperture 56 positioned over the segmented chamber 23, water flows from the pump to the inlet port of a filter (not shown) through the port 18 (or 18*a*). The outlet port of the filter is connected to the port 19 so that the filtered water enters the segmented chamber 25 and is conducted to the port 16 by the hood 62 of the selector plate 55, which bridges the segmented chambers 21 and 25. The port 16 is connected to the pool by a suitable conduit.

The filter may be backwashed by rotating the selector plate until the aperture 56 communicates with the segmented chamber 25 and with the hood portion 62 bridging and providing fluid communication among the chambers 22, 23, and 24. With the selector plate 55 in this position, the pump is placed in fluid communication with the port 19, and therefore the outlet port of the filter. The filter is backwashed and fluid flows from

the filter to the port **18** (or **18***a*) and is directed by the hood **62** to the waste port **17.**

After backwashing the filter, it may be necessary to clear the conduit leading from the port **19** to the filter outlet. To perform this operation, the selector plate **55** is rotated so that its aperture **56** communicates with the segmented chamber **22** and the chambers **24** and **25** are bridged by the hood **62** of the selector plate **55.** With the selector plate in this position, the pump is connected to the filter inlet port and the flow from the filter outlet port through the port **19** is conducted to the waste port **17.** When the filter outlet conduit is flushed in this manner, the selector plate may be returned to its normal filtering condition noted above.

In order to service the filter, the filter may be bypassed by positioning the aperture **56** over the segmented chamber **21** so that water is fed directly to the pool through the port **16.** The pool may be drained and the filter bypassed by positioning the aperture **56** over the segmented chamber **24.** Water is pumped from the pool to the waste port **17.**

It may also be desirable to block the flow from the pump to all the ports **16–19.** This may be accomplished by positioning the aperture **56** over the web **43** in the gasket **30.**

All of the foregoing operations are necessarily accomplished without lifting the selector plate **55** from the gasket **30,** since the valve is designed so that the selector plate **55** slides on the gasket. This eliminates the possibility of trapping debris between the selector plate **55** and its gasket. However, if the pump is operating during selector plate movement, a high pressure differential will be created between the high pressure chamber **13** and one of the outlet ports as an outlet port is closed. This high pressure differential may be strong enough to displace the gasket **30** and cause fluid erosion of that gasket. The invention therefore provides a fail-safe locking device to prevent rotation of the selector plate when the pump is operating.

This aspect of the invention is illustrated in FIG. **1,** and includes a flexible diaphram **100** which spans a counterbore **101** in the casing **11.** The diaphragm **100** is fixed to the facing at its periphery by a plurality of screws **102,** and is sealed thereto by a sealing ring **103.** The counterbore **101** communicates with the atmosphere through a bore **104** so that there exists atmospheric pressure on one side of the diaphragm **100** and the pressure of the chamber **13** on the other side of the diaphragm. Within the counterbore **101** is loosely mounted a piston **105** having a piston rod **106** which projects through the bore **104.** A compression spring **107** biases the piston rod away from the plate **79** and, with substantially equal pressure in the chamber **13** and in the counterbore **101** into the retracted position illustrated in FIG. **1.** Thus, when there exists an absence of pump pressure in the chamber **13,** the selector plate **55** may be rotated in the previously described manner. However, if pump pressure exists in the chamber **13,** the piston rod **106** is driven between a pair of detents **110** located on the lower surface of the plate **79.** Therefore, in order to move the selector plate **55,** the pump must be turned off.

In order to render the rod **106** tamperproof, a cylindrical fence **111** is molded into the body section **11.**

Although a preferred embodiment of this invention is illustrated, it is to be understood that various modifications and rearrangements of parts may be resorted to without departing from the scope of the invention.

What is claimed is:

1. In a mulitport valve for selectively connecting a plurality of valve ports, comprising a valve body, a main pressure chamber defined by said body, inlet port means and a plurality of outlet port means in said valve body, and communicating with said chamber, valving means comprising a selector plate covering said outlet port means and having an aperture therein for providing selective fluid communication between said chamber and one of said outlet ports, and means for rotating said selector plate to provide said selective fluid communication, in combination therewith the improvement comprising pressure-responsive means fixed to said valve body and responsive to pressure in said chamber, and means responsive to said pressure-responsive means to lock said selector plate in a selected position and against movement in either direction when the pressure in said chamber is above a preselected value and to unlock said selector plate from its selected position when the pressure in said chamber is below said preselected value.

2. The improvement according to claim **1,** wherein said pressure-responsive means includes a flexible diaphragm having one surface exposed to the pressure in said chamber and another surface exposed to atmospheric pressure.

3. In a multiport valve for selectively connecting a plurality of valve ports, comprising a valve body, a main pressure chamber defined by said valve body, inlet port means and a plurality of outlet port means in said valve body and communicating with said chamber, valving means comprising a selector plate covering said outlet port means and having an aperture therein for providing selective fluid communication between said chamber and one of said outlet ports, and means for rotating said selector plate to provide said selective fluid communication, in combination therewith the improvement comprising pressure-responsive means fixed to said valve body and including a flexible diaphragm having one surface exposed to the pressure in said chamber and another surface exposed to atmospheric pressure, a rod mounted on said body adapted to be driven axially by said diaphragm in response to preselected pressure values in said chamber, a selector handle fixed to said selector plate rotating means, an indicator plate fixed to said selector plate rotating means, and indicator plate fixed to said selector plate rotating means, and detent means on said indicator plate engageable by said rod at said pressure values to prevent rotation of said selector plate in either direction when said pressure values obtain and to permit rotation when said values do not obtain.

4. The improvement according to claim **3,** wherein said rod is biased toward a retracted position out of engagement with said detent means.

* * * * *