

[54] INTEGRAL SELF-CLEANING FILTER AND SIDE CHECK VALVE FOR AUTOMATIC WASHER

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[22] Filed: Mar. 28, 1972

[21] Appl. No.: 238,890

[52] U.S. Cl. 68/18 F, 68/208, 210/136, 210/167, 210/407

[51] Int. Cl. D06f 39/10

[58] Field of Search 68/18 F, 208; 210/136, 167, 407

[56] References Cited

UNITED STATES PATENTS

3,282,427 11/1966 Mandarino et al. 210/108

3,332,259	7/1967	Zylstra.....	68/18 F
3,455,456	7/1969	Wolters.....	210/167 X
3,681,947	8/1972	Cowan.....	210/167 X

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Assistant Examiner—Philip R. Coe

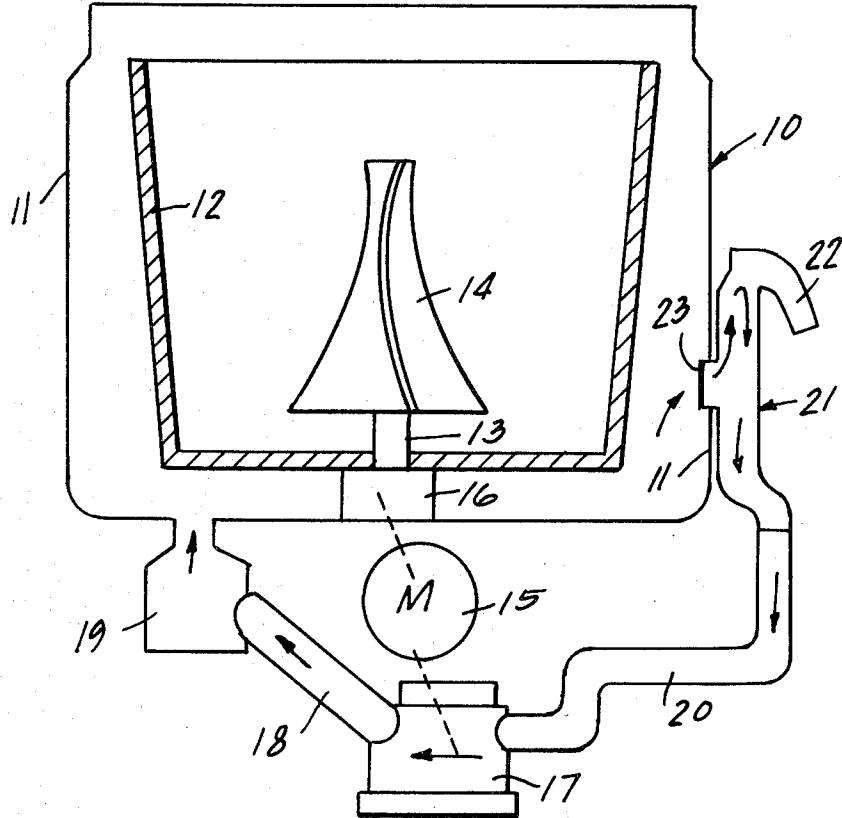
Attorney—James S. Nettleton

[57]

ABSTRACT

A diaphragm self-cleaning filter for a domestic appliance uses the non-filtering side of the diaphragm as a valve member and provides an integral check valve during flushing of the filter. Fluid pressure acts on the back side of the diaphragm to provide a biasing force.

7 Claims, 7 Drawing Figures



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Fig. 1

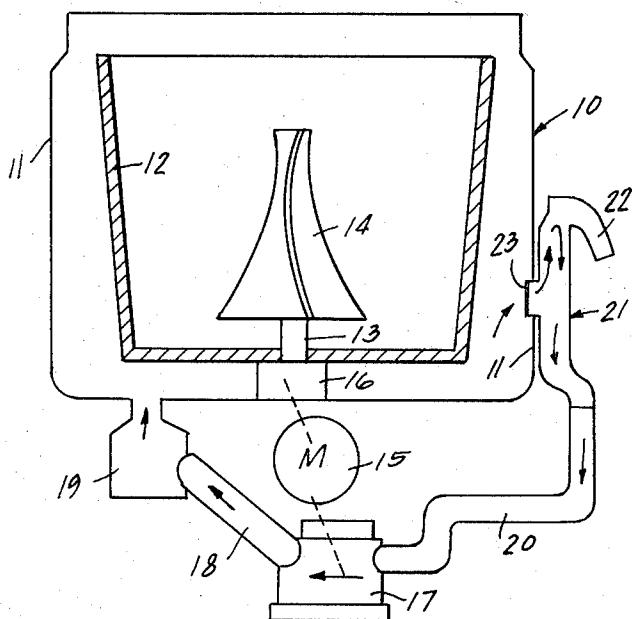


Fig. 3

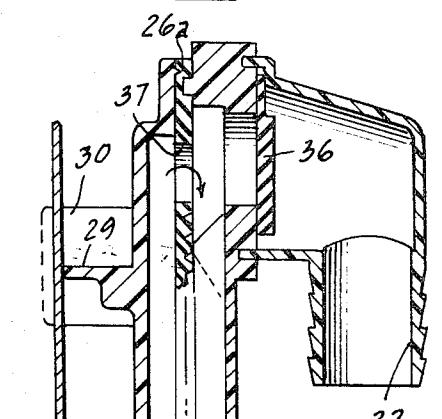
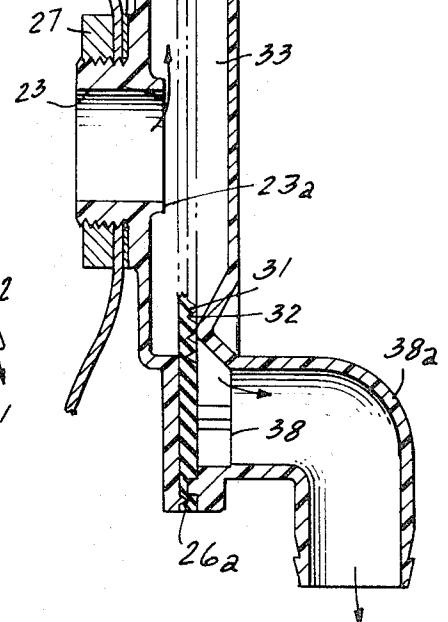
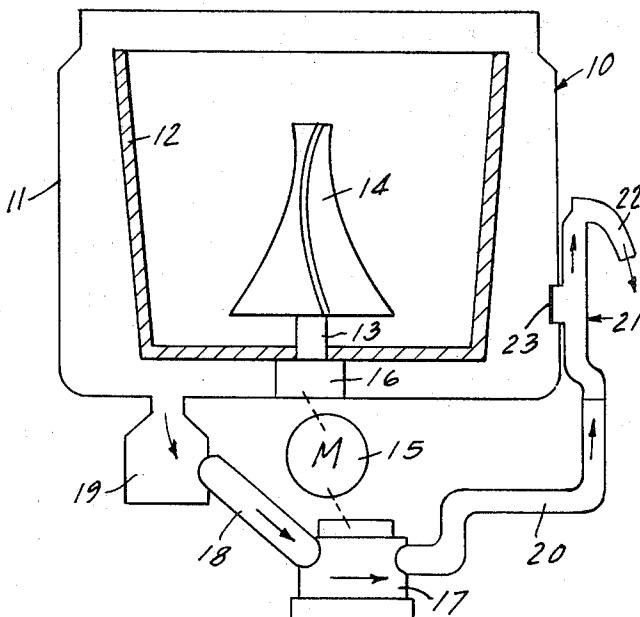


Fig. 2



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Fig. 4

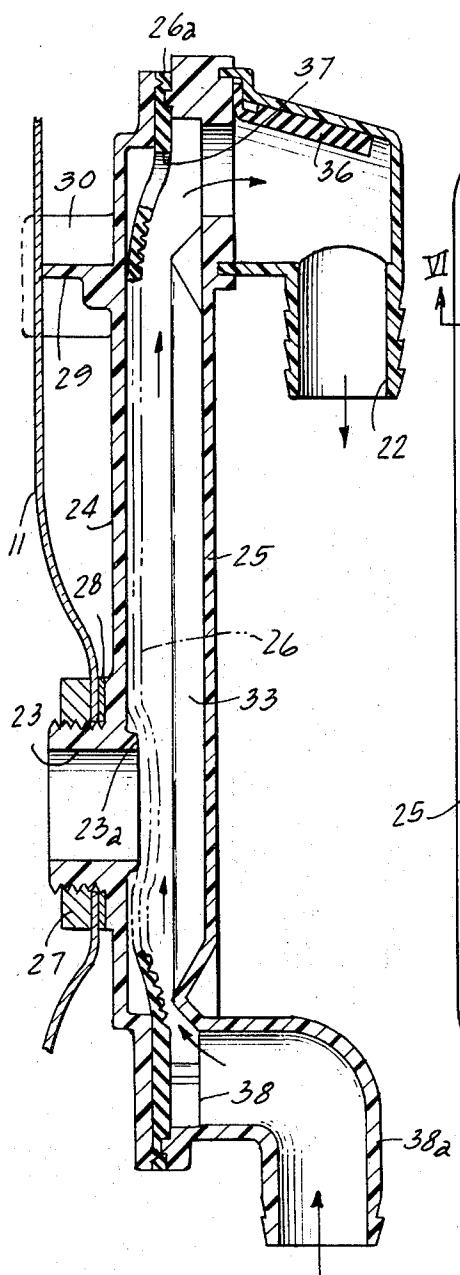
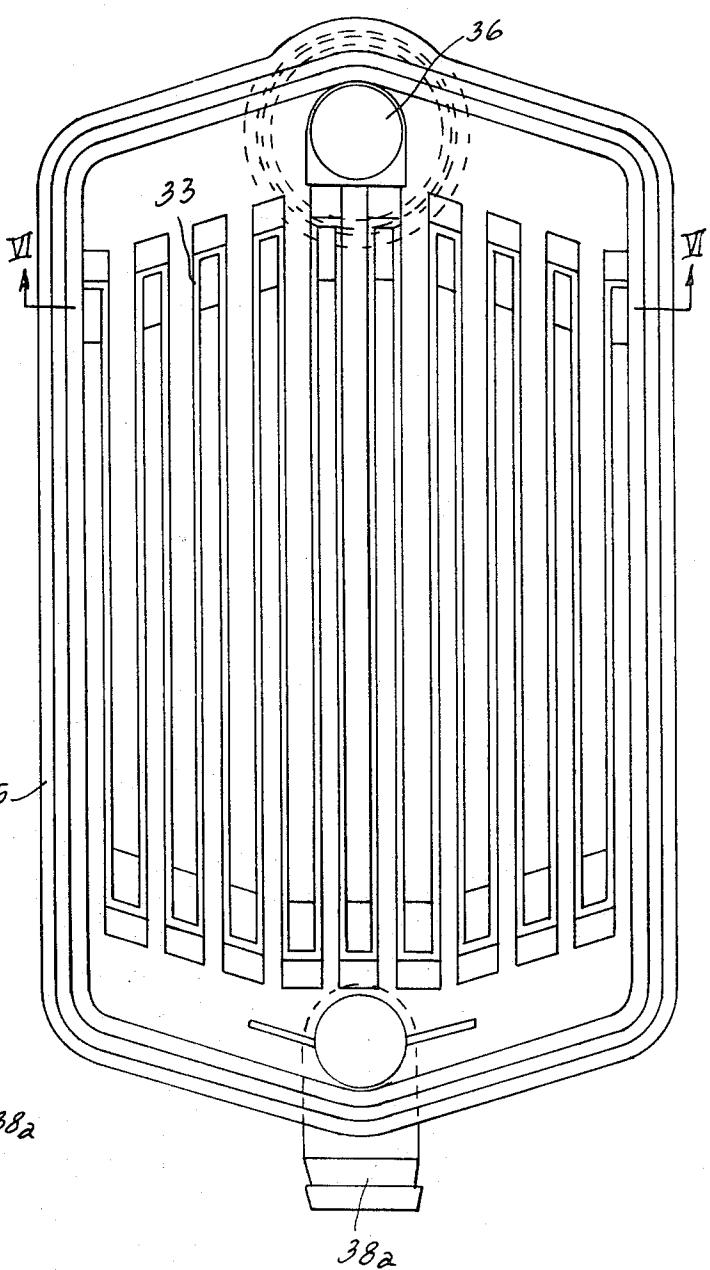


Fig. 5



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FIG-6

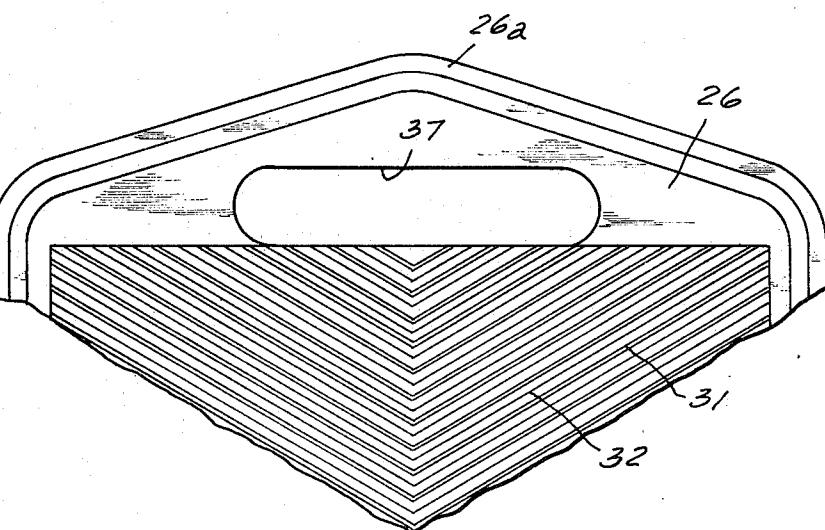
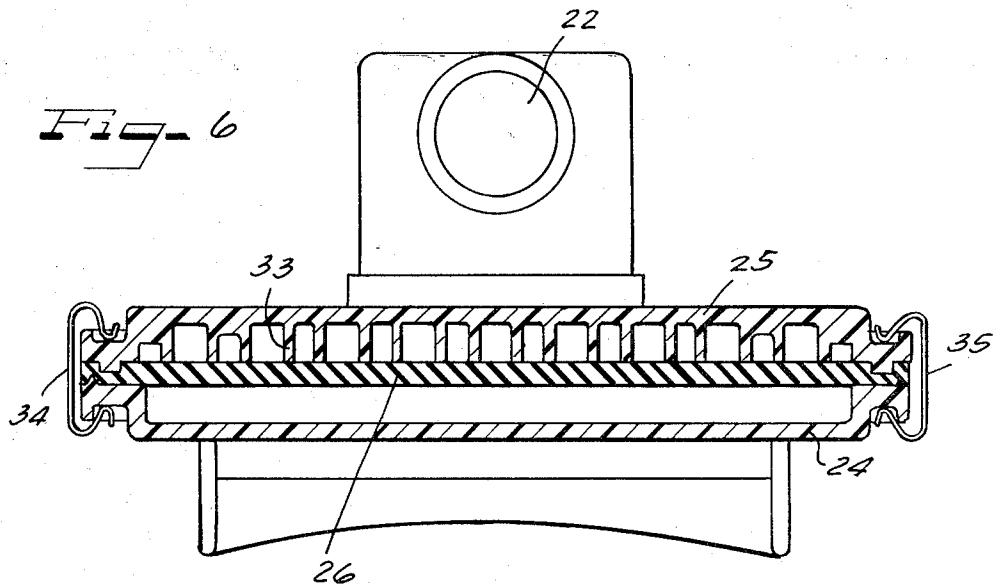


FIG-7

INTEGRAL SELF-CLEANING FILTER AND SIDE CHECK VALVE FOR AUTOMATIC WASHER

BACKGROUND OF THE INVENTION

1. Field of the Invention This invention is in the field of self-cleaning filters for automatic washing machines and is directed primarily to a novel diaphragm assembly which provides both a filtering action and acts as a check valve during succeeding portions of the complete washing cycle.

2. DESCRIPTION OF THE PRIOR ART

In Mandarino, et al., U.S. Pat. No. 3,282,427, owned by the assignee of the present application there is described a self-cleaning expandable diaphragm type filter which is located on the suction side of the washing machine pump during the washing operation and on the pressure side of the pump during an extracting and draining operation. As described in that patent, the filter may include a resilient, flexible diaphragm which has a contoured irregular surface on the inner face thereof which cooperates with a rigid wall member also having an irregular surface to thereby form a filter maze. When laundry liquid is circulated through this maze, any foreign matter carried by the liquid is entrapped in the orifices of the maze and eventually separated from the liquid. During the extracting and draining operation, when the filter is connected to the discharge side of the pump, the flexible diaphragm is urged away from the rigid wall member, thereby opening up the maze and allowing the laundry liquid to flow over the irregular surfaces and thereby clean and flush the filter.

U.S. Pat. No. 3,332,259, issued to Zylstra and also assigned to the assignee of the present application, describes a combination valve and filter assembly employing a movable flexible wall member which is movable between a first position to create a filter maze and a second position where the filter maze is opened. Two valves utilizing portions of the flexible wall member are operated by a mechanical linkage so as to be capable of movement independent of the flexible wall member.

SUMMARY OF THE INVENTION

The present invention is directed to a self-cleaning filter for automatic washing machine which includes a liquid impervious hollow housing member having an inlet in liquid communication with the laundry washing zone, and having a wall which has a port in liquid communication with the pump. A drain outlet permits fluid flow into the drain during the discharge portion of the cycle. Included within the housing member is a filtering member composed of a flexible diaphragm having a contoured surface on one side thereof facing the aforementioned wall so that when a negative pressure is applied at the opening by the pump the diaphragm abuts the wall forming a filtering maze for laundry liquid circulating therethrough. A valve seat is formed at the inlet in the housing on the non-filtering side. During the pump-out cycle, a positive pressure is applied by the pump causing the flexible diaphragm to distend into sealing relation against the valve seat, thereby opening up the maze so that wash liquid passing therethrough can pick up foreign particles which have been deposited during the filtering operation and flush them out through a drain. The diaphragm has the dual function of cooperating with a stationary wall member in forming the filtering maze and acting as a valve member to cooperate with the valve seat, thereby acting as a check

valve by allowing flow in one direction when a negative pressure is placed on the port and stopping flow when a positive pressure is placed on the port.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic view of an automatic washing assembly, illustrating the water flow path through the filter and pump during the filtering operation;

FIG. 2 is a view similar to FIG. 1 but illustrating the water flow path through the filter and pump during the pump-out portion of the wash cycle;

FIG. 3 is a fragmentary cross-sectional view of the filter assembly showing the elements thereof during the filtering operation;

FIG. 4 is a view similar to FIG. 3 but illustrating the condition existing during pump-out;

FIG. 5 is a view in elevation of the wall structure which cooperates with the flexible diaphragm to provide the filtering maze;

FIG. 6 is a cross-sectional view taken substantially along the line VI—VI of FIG. 5 and further illustrating a positioning support and a pair of spring clips which hold the elements of the filter assembly together; and

FIG. 7 is a fragmentary view of the upper portion of the flexible diaphragm more particularly illustrating the contoured surface thereof.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

30 In FIGS. 1 and 2, reference numeral 10 indicates generally an automatic washing machine of the vertical axis type, including an imperforate outer tub 11 and an inner rotatable basket 12 in which the laundry is positioned. A shaft 13 supports an agitator 14 for oscillatory motion, the shaft 13 being driven by means of a motor 15 through a transmission 16.

The motor 15 also drives a pump 17 connected by means of a conduit 18 to a button trap 19, the button trap 19 being in direct fluid communication with the interior of the tub 11.

In accordance with this invention, a conduit 20 connects the pump 17 to a filter generally indicated at reference numeral 21 which is mounted on the side of the tub 11 for purposes which will be evident as the description proceeds. The filter has a drain outlet 22 and an inlet 23 in direct fluid communication with the interior of the tub 11.

During the filtering portion of the washing cycle, as shown in FIG. 1, water is drawn by pump 17 out of the tub 11 through the filter 21, the conduit 20 to the pump 17 where it is pumped out through the conduit 18, button trap 19 and back into the tub 11. During the pump-out cycle as shown in FIG. 2, the wash water is drawn by the pump 17 out of the tub 11 through the button trap 19, the conduit 18, through the pump 17 and is then pumped through conduit 20 into the filter 21 and out of the filter into the drain outlet 22.

The structure of the filtering element of the present invention is best illustrated in FIGS. 3 to 7 of the drawings. The filter includes a housing composed of a pair of mating molded body members 24 and 25, both of which may be composed of a liquid impermeable plastic material. A flexible diaphragm member 26 is confined between the body members 24 and 25 by having its marginal end portion 26a clamped between the confronting marginal edges of the body members 24 and 25 as best illustrated in FIG. 3 of the drawings. The

body member 24 is secured to the tub 11 by means of a nut 27 and a sealing spacer 28.

The inlet 23 formed in the body member 24 has a collar portion 23a extending into the filtering chamber and forming a valve seat engagable with the flexible diaphragm 26 for purposes of developing a valving function in the control of flow through the inlet 23.

Body member 24 is further provided with braces 29 and 30 to align and support the filter assembly on the side of the tub 11.

As best seen in FIG. 7, the diaphragm 26 has spaced ribs 31 with grooves 32 extending therebetween, the ribs being angularly disposed so that they provide a tortuous path for the liquid being filtered during the filtering operation.

The ribs 31 are arranged to cooperate with baffles 33 formed in the body member 25 as best illustrated in FIGS. 5 and 6 of the drawings. As also illustrated in FIG. 6, the body members 24 and 25 may be releasably clamped together to confine the diaphragm 26 therebetween, by means of a plurality of spring clips 34 and 35.

The body member 25 also carries a flapper type rubber check valve 36 which controls discharge into the drain outlet 22.

During the filtering operation, as illustrated in FIG. 3 of the drawings, the suction from the pump draws the wash water from tub 11 through the inlet 23 into the filter unit. Water then flows up behind the diaphragm 26, through a slot 37 provided in the diaphragm 26 and then through the filtering maze resulting from the engagement of the ribs 31 of the diaphragm with the baffles 33 in the body member 25. The filters wash water is then passed through a port 38 and fitting 38a into the conduit 20 and to the pump 17. The water is then pumped through the conduit 18 through the button trap 19 and back into the tub 11. The check valve 36 is held closed by the suction of the pump acting on the valve during this filtering cycle. The diaphragm 26 is held against baffles 33 during the filtering cycle by the negative pressure created by suction from the pump acting on the ribbed side of the diaphragm 26 and also by the water pressure from the tub 11 acting on the other side of the diaphragm through opening 23.

During the pump-out operation, best illustrated in FIG. 4 of the drawings, the pump 17 draws wash water from the tub 11 through the button trap 19 and pumps it into the filter through the port 38 creating a positive pressure on the filter side of diaphragm 26. The positive pressure on the diaphragm 26 disengages the diaphragm from the baffles 33 and distends the flexible diaphragm 26 to sealingly engage the inlet 23 at the annular shoulder 23a. The closing of the inlet 23 by the valve action of the diaphragm 26 prevents from being pumped back into the tub 11. The stream of water circulating against the ribbed face of the diaphragm 26 flushes off and carries away any particles which had been trapped by the filtering operation. The check valve 36 is open during this portion of the cycle, so that the wash water with the trapped particles of lint is flushed directly into the drain opening 22. The diaphragm 26 thus cooperates with the baffles 33 during the filtering operation to provide a filtering maze when a suction is applied from the pump and acts as a check valve when positive pressure is applied from the pump, thereby obviating the necessity of incorporating a separate valve in the circuit.

5 The improved filter system of the present invention thus provides an inexpensive but reliable self-cleaning filter system which can be incorporated very readily on existing washing machines. The new system makes a separate side check valve unnecessary and therefore eliminates some hose connections and provides fewer possibilities for leaks. Inasmuch as the water pressure from the tub acts on the back side of the diaphragm member, no springs are needed in order to keep the diaphragm against the baffles, thereby eliminating further parts as compared to the prior art.

10 It should be understood that I wish to embody within the scope of the patent warranted hereon all such modifications as reasonably and properly come within the 15 scope of my contribution to the art.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

20 1. In an automatic washing machine, means forming a hydraulic circuit, a treatment zone and a pump in said hydraulic circuit for circulating liquid from said treatment zone through said circuit and back to said treatment zone in a first direction and for pumping liquid from said treatment zone through said circuit to a drain in an opposite direction,

25 a self-cleaning filter mounted in said circuit comprising a liquid impervious hollow housing member defining an inlet forming a valve seat and being in liquid communication with said treatment zone, a port in liquid communication with said pump, and a drain outlet, said drain outlet having valve means for allowing fluid flow in one direction only,

30 a filtering member disposed within said housing member

and movable to a first position when said pump circulates liquid in said first direction to form a filter maze with said housing member for entrapping foreign particles from the liquid,

35 and movable to a second position when said pump pumps liquid in said opposite direction to sealingly engage said valve seat for closing said inlet to liquid flow while disengaging said filter maze to release foreign particles into the liquid for flow with the liquid through said valve means through said drain outlet,

40 said movement of said filter member being effected by variation in hydraulic pressure within said filter as said port is alternately in communication with the suction and discharge side of said pump.

45 2. The washing machine of claim 1 wherein said housing member comprises a first wall member and second wall member

50 said first wall member having said inlet and said second wall member having said port and said drain outlet

55 and said filtering member comprises a flexible diaphragm with means forming an opening for the passage of liquid through said diaphragm sandwiched between said first wall member and said second wall member.

60 65 3. The washing machine of claim 2 wherein said flexible diaphragm has a textured surface on one side for cooperating with said second wall member in said first position, and an essentially smooth surface on another

side for engaging said valve seat when said diaphragm is in said second position.

4. The washing machine of claim 3 wherein said second wall member has baffles arranged between said port and said drain outlet facing said textured surface on the diaphragm.

5. The washing machine of claim 4 wherein said baffles comprise rib members on said second wall member forming channels in open communication with said diaphragm, said channels having end wall means transversely interconnecting said rib members at the ends of the channels to close some of said channels to said port, and to close the remaining of said channels to said

drain outlet.

6. The washing machine of claim 5 wherein said textured surface on one side of said diaphragm comprises a plurality of lands and grooves arranged transversely to said rib members and said means forming an opening in said diaphragm is disposed opposite said drain outlet.

7. The washing machine of claim 1 wherein said treatment zone is encompassed by a tub having a bottom wall and a circumferential side wall forming a top opening, and said self-cleaning filter is mounted on said circumferential side wall outwardly of said treatment zone.

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