

[54] **SELF-CLEANING LINT FILTER FOR A CLOTHES WASHER**

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[51] Int. Cl. **D06f 29/00, B01d 35/16**

[58] Field of Search **68/18 F, 13 R;**
 210/409, 411, 355, 354, 369, 370, 371

[56] **References Cited**

UNITED STATES PATENTS

3,353,681	11/1967	Silva	210/355
3,455,456	7/1969	Wolters	68/18 F

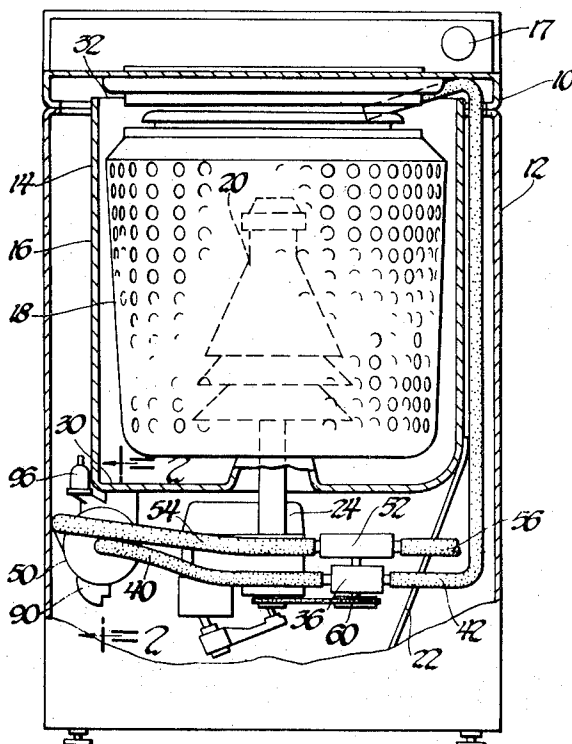
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[57] **ABSTRACT**

A self-cleaning lint filter for a domestic clothes washer is connected between a water container and a pair of reversible pumps. The lint filter includes a drum-shaped housing having an inlet and two outlets. A rotatable and axially shiftable disc in the housing is covered with pointed fingers projecting from one side thereof. When the first pump operates, the disc is axially shiftably drawn in one direction to place the finger points against a wall of the housing to form a maze surrounding one of the outlets for entrapping lint from liquid pumped from this outlet. In conjunction with operation of the second pump, the disc is axially shiftably planed in the opposite direction to space the finger points from the wall. A tangential arrangement of the other of said outlets and the inlet with respect to the housing facilitates rotation of the disc as an aid in planing the disc and in centrifuging entrapped lint from the fingers thereon.

4 Claims, 7 Drawing Figures



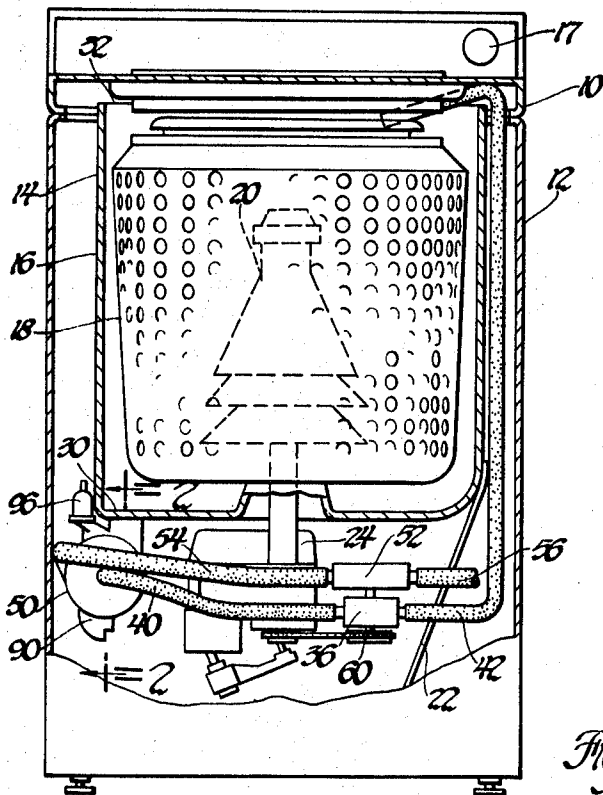


Fig. 1

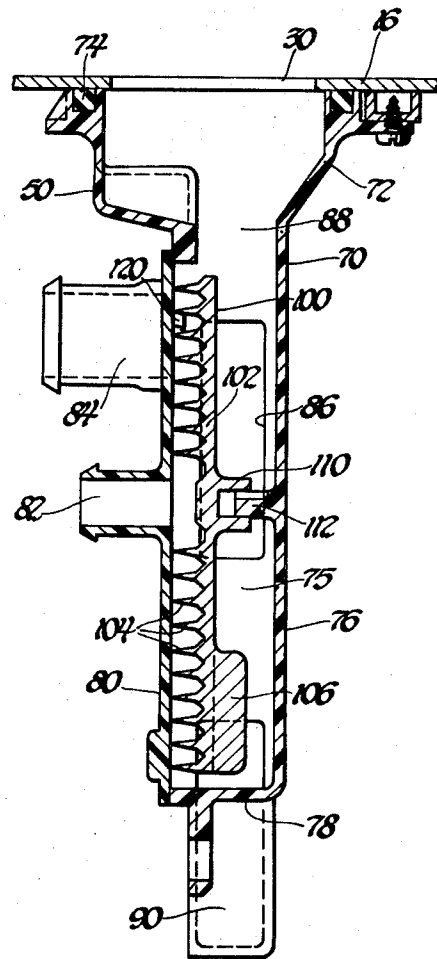


Fig. 2

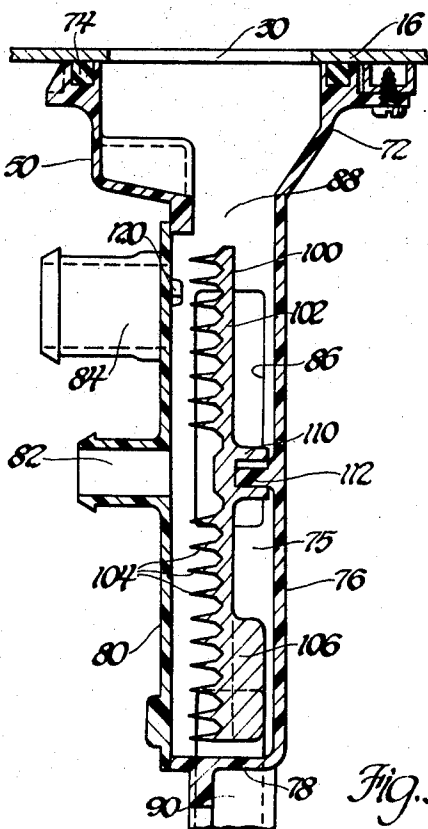


Fig. 3

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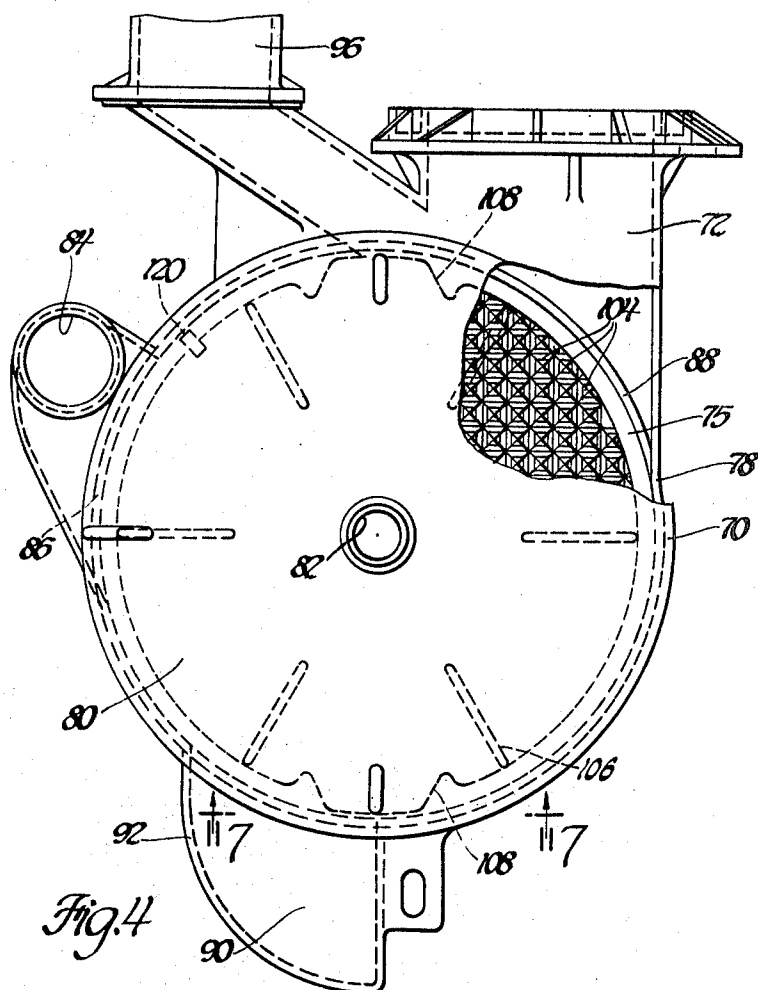


Fig. 4

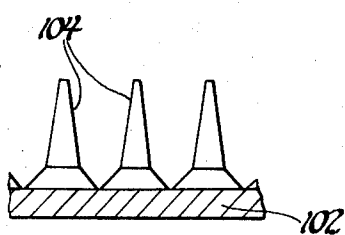


Fig. 5

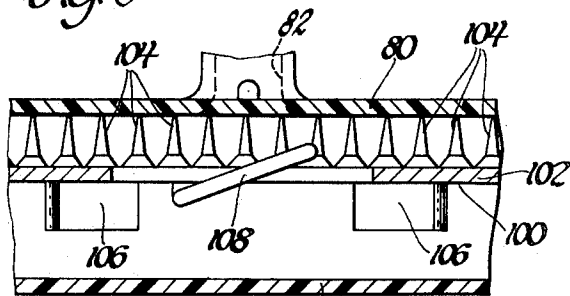


Fig. 7

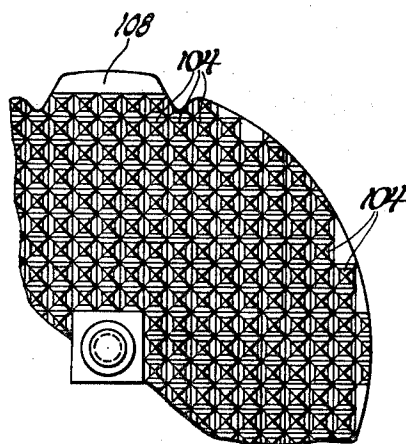


Fig. 6

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SELF-CLEANING LINT FILTER FOR A CLOTHES WASHER

This invention relates to a recirculating type domestic clothes washer and, more particularly, to an improved self-cleaning lint filter therefor.

Many automatic clothes washers with a recirculating system have a filter of some sort beneath the outlet of the recirculating water hose. This outlet is positioned above the tub to catch visible water borne particles such as lint resulting from the wash action and carried in the wash water from the garments being washed. Although a lint filter is a common feature on domestic clothes washers, there have been certain disadvantages with the prior art devices. For instance, lint filters frequently take up space in the access area for loading clothes; some must even be removed before clothes can be loaded; and some are removable for cleaning by the user — usually after each wash load to assure continued filtering efficiency. If removable and customer-handled, there is always the chance that the filter will be misplaced or broken. In most prior art filters, only the larger and more obvious foreign matter and lint is trapped in order to resist premature clogging. Moreover, prior art washers are designed to function satisfactorily even if the filter is clogged by providing an overflow into the tub.

A preferred lint filter is one that is concealed, efficient and automatically cleans itself during the clothes washing cycle. Prior art systems with this aim have used the following principle. Lint is entrapped by pumping the recirculating water in one direction over the filter and then pumping the drain water in the reverse direction to flush the entrapped lint to drain. But such prior art systems require at least one check valve in the water handling system and a reversing damper to change pumping direction. Thus, the filter must entrap lint in one flow direction and release it in the other — an arrangement which tends to limit filter efficiency. And a check valve is an undesirable restriction in the drain line. This invention is directed to a more efficient and therefore improved self-cleaning lint filter which overcomes these and other disadvantages.

A specific object of this invention is the provision of a self-cleaning lint filter which incorporates a generally free-floating flat disc with fingers projecting from one side thereof in a drum-shaped chamber having one inlet opening and two outlet openings, the disc in cooperation with the location of said openings being configured with vanes and planes to shift the fingers between a lint entrapping condition and a self-cleaning condition in accordance with liquid flow through one or the other of said outlet openings.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings wherein a preferred embodiment of the present invention is clearly shown.

In the drawings:

FIG. 1 is a schematic front elevational view of a domestic clothes washer with parts broken away to show the self-cleaning lint filter of this invention;

FIG. 2 is a side sectional view taken along line 2—2 in FIG. 1 partly in elevation and showing the self-cleaning lint filter in a lint entrapping filter condition;

FIG. 3 is a side sectional view similar to FIG. 2 with the lint filter in a self-cleaning condition;

FIG. 4 is a front elevational view of the lint filter with parts broken away to show the filter disc;

FIG. 5 is a fragmentary sectional view of the filter disc partly in elevation;

FIG. 6 is a fragmentary elevational view of the filter disc; and

FIG. 7 is a fragmentary sectional view taken along line 7—7 in FIG. 4.

With reference now to FIG. 1, the environment of this invention in a domestic clothes washer 10 will now be described. The clothes washer includes a cabinet 12 enclosing a tub assembly 14 and a timer 17 for controlling an automatic clothes washing cycle. The tub assembly includes an imperforate outer water container 16 and a perforate spin basket 18 therein. An agitator 20 is disposed within the spin basket 18 for agitating the clothes during a clothes washing cycle.

The tub assembly 14 is mounted on a suspension system shown generally at 22 and more fully taught in U. S. Pat. No. 3,493,118 granted Feb. 3, 1970. The agitator 20 and the spin basket 18 are connected to a drive mechanism shown generally at 24. The drive mechanism may be of a roller drive type taught more fully in U. S. Pat. No. 3,087,321 granted Apr. 30, 1963. In general, mechanism 24 may be operated in one manner to vertically reciprocate or oscillate the agitator 20 for washing clothes in the tub assembly. When the mechanism is operated in another manner, the spin basket 18 is rotated with respect to the water container 16 for centrifuging water from the clothes in the spin basket.

The water recirculation system will now be described. The water container 16 includes a bottom outlet 30 and an open top 32. A recirculating pump 36 withdraws washing water or liquid from the water container 16 through the bottom outlet 30 and by means of recirculating conduits or hoses 40 and 42 returns the washing liquid to the water container. The purpose of recirculation is to remove lint and other sediment from the recirculating washing liquid. For this purpose, a self-cleaning lint filter is included and shown generally at 50.

The drain system for the clothes washer includes a drain pump 52 for pumping washing liquid from the water container 16 through its bottom outlet 30 and by means of drain conduits or hoses 54 and 56 to a remote drain. Lint filtered from the washing liquid during the recirculation portion of an automatic wash cycle is flushed from the self-cleaning lint filter 50 and pumped to drain by drain pump 52 during the drain portion.

Both the recirculation pump 36 and the drain pump 52 are on a common reversible power shaft 60 which is driven by a belt takeoff from the drive mechanism 24. When the drive mechanism is operating in a manner to reciprocate the agitator 20, the power shaft 60 is rotated in a direction to cause the recirculation pump 36 to recirculate washing liquid. When the drive mechanism 24 is operating in a manner to rotate the spin basket in a centrifuging operation, the power shaft 60 is reversed to cause the drain pump 52 to pump the washing liquid to drain.

Turning now to FIG. 2, the self-cleaning lint filter 50 is comprised of a plastic filter housing 70 having an upper filter sump portion 72 adapted for attachment to the bottom of water container 16 and sealed around opening 30 as at 74. The housing defines rather a drum-shaped chamber 75 within a circular sidewall 76 and cylindrical peripheral wall 78. The chamber 75 is

closed at one side by a filter housing cover 80 which is spin welded in air tight fashion to the open side of filter housing 70. The cover includes an integral recirculation supply outlet opening 82 and a hose adapter 84 which is spin welded to the cover and in communication with a drain outlet opening 86. The drum-shaped chamber 75 receives washing liquid from the water container through an inlet opening 88 which places the chamber 75 in communication with the sump portion 72 of the lint filter housing.

A button and sediment trap 90 depends from the bottom of the lint filter housing along the peripheral wall 78 and is open to chamber 75. The trap 90 is in the form of a sector-shaped pocket with a curved surface 92 along one side thereof (FIG. 4). In addition to facilitating the molding operation, the curved surface also aids in sweeping the collected sediment from the trap as will be described more fully hereinafter.

The upper sump portion 72 may include a pressure bell 96 for connection with a liquid level control of the pressure switch type (not shown) to regulate the level of liquid in the water container 16.

Within the lint filtering chamber 75 is a lint filter disc 100. The lint filter disc 100 is comprised of a flat support plate 102 having a plurality of pointed fingers or teeth 104 projecting from one side thereof. Six equally spaced radial vanes 106 project from the other side of the plate. At diametrically opposite points on the outer edge of the flat plate 102 are canted planes 108 (FIG. 7). The plate 102 includes a socket 110 which fits over a boss 112 projecting as a spindle from the housing wall 76 for rotatably supporting filter disc 100. The socket 110 is sufficiently deep with respect to the spindle 112 so that the filter disc can axially shift between a fixed lint entrapping position against the filter housing cover 80 (FIG. 2) and a self-cleaning condition with the points of the fingers 104 spaced from the filter housing cover (FIG. 3) and the disc rotating. The number of fingers 104 on the disc is sufficient to trap lint without unduly restricting the flow of recirculating liquid. About three hundred seventy fingers or teeth 0.360 inch long on a 5.60 inch diameter disc provide satisfactory operation.

With reference now to FIGS. 1, 2 and 3, the operation of the self-cleaning lint filter of this invention will now be described. A washing cycle may be controlled automatically by timer 17. Water or other washing liquid is supplied to the water container 16 and spin basket 18. The drive mechanism 24 is energized to reciprocate the agitator 20 in the wash portion of the cycle while rotating the power shaft 60 to operate the recirculation pump 36. Washing liquid is recirculated from the bottom outlet 30 of the water container and returned by means of the recirculation hose 42 to the water container. During recirculation, pump 36 draws liquid from the filter chamber 75 through outlet opening 82. The flow of liquid from the chamber inlet opening 88 to the outlet opening 82 causes the filter disc 100 to axially shift leftwardly (FIG. 2) to place the point of fingers 104 against the cover or chamber wall 80 around the outlet opening 82. Thus, a filtering maze is formed which entraps lint on the fingers as liquid flows around the fingers on the way to outlet opening 82. Stop 120 on the cover engages one of the fingers on the filter disc to prevent the filter disc from rotating during recirculation.

After agitation and during the drain portion of the cycle, the drive mechanism 24 is adapted to rotate the spin basket 18 and reverse the rotation of the power shaft 60. This causes the drain pump 52 to withdraw washing liquid from the bottom outlet 30 of the water container 16 through the lint filter. At the start of drain, recirculation pump 36 is caused to pump toward the chamber 75 thereby providing an initial push of one or two seconds against the filter disc 100 to start the disc shifting rightwardly. As soon as fingers 104 clear stop 120, the swirl of liquid flow through the chamber from tangential inlet opening 88 to outlet opening 86 acts against vanes 106 to rotate the filter disc 100. Rotation of the disc in conjunction with planes 108 quickly completes the shift of the filter disc to the self-cleaning condition of FIG. 3. As the disc rotates rapidly, the entrapped lint is centrifugally flung from the fingers thereof. The lint removed is then pumped to drain by pump 52 along with the soiled washing liquid. Lint is thus entrapped and removed at least twice during the wash cycle—once during the wash portion of the cycle and again during the rinse portion of the cycle.

Another facet of this invention is the collection and removal of sediment from the trap 90. As viewed in FIG. 4, the swirling liquid through chamber 75 during a drain cycle causes the filter disc to rotate clockwise. Radial vanes 106 therefore sweep past the open top of trap 90. This sweeping action of the vanes in conjunction with the curved surface 92 of the trap and the turbulence of the swirling liquid act to lift sand and sediment out of the trap where it is entrained in the washing liquid along with the lint and carried to drain.

While the embodiment of the present invention as herein disclosed constitutes a preferred form, it is to be understood that other forms might be adopted.

What is claimed is:

1. In an automatic clothes washing machine having an imperforate tub with top inlet and a bottom outlet, a first pump associated with said inlet and said outlet and operable for recirculating liquid to said tub, and a second pump associated with said outlet and operable for pumping liquid from said tub to a drain, the improvement comprising a self-cleaning filter assembly for removing solid contaminants from the recirculating liquid comprising a housing having first and second circular wall means spaced by peripheral wall means to form a drum-shaped chamber therebetween, said drum-shaped chamber having an inlet port and a drain port thereto in said peripheral wall means and a recirculation supply port thereto in said first circular wall means, a circular planar lint filter disc rotatably mounted in said chamber in generally parallel spaced relationship between said first and second circular wall means, said lint filter disc having a plurality of pointed fingers projecting perpendicularly therefrom toward the portion of said first circular wall means surrounding said recirculation supply port and rotatable with said disc, means for axially shiftably mounting said lint filter disc on said second circular wall means for movement between a first position with the finger points against said first circular wall means around said recirculation supply port to form a lint entrapping maze between said inlet port and said recirculation supply port when said first pump is operating to recirculate liquid from said inlet port to said recirculation supply port and a second position with said finger points spaced from said first

circular wall means for facilitating the cleaning of the entrapped lint from said teeth when said second pump is operating to pump liquid from said inlet port to drain, first conduit means connecting the recirculation supply port to the inlet of said first pump whereby the suction of said first pump in operating to recirculate liquid from said inlet port to said recirculation supply port moves said lint filter disc to said first position, second conduit means connecting the bottom outlet of said tub to the inlet port of said drum-shaped chamber on a tangent whereby to facilitate the swirl of liquid entering said chamber when said second pump is operating to pump liquid to drain, means on said lint filter disc responsive to said swirl of liquid to move said disc to said second position and to rotate said disc for flinging the entrapped lint from said fingers so that said lint can be pumped to drain along with said liquid, and means for operating selectively said first and second pumps.

2. The self-cleaning filter assembly of claim 1 in an automatic clothes washing machine wherein said first pump is reversible when said second pump is operating to pump liquid to drain, the reversal of said first pump forcing liquid from said first conduit means into said chamber through said recirculation supply port to initiate the movement of said disc to said second position.

3. In an automatic clothes washing machine having an imperforate tub with top inlet and a bottom outlet, a first pump associated with said inlet and said outlet and operable for recirculating liquid to said tub, and a second pump associated with said outlet and operable for pumping liquid from said tub to a drain, the improvement comprising a self-cleaning filter assembly for removing solid contaminants from a recirculating liquid comprising a housing having first and second circular wall means spaced by peripheral wall means to form a drum-shaped chamber therebetween, said drum-shaped chamber having an inlet port and a drain port thereto in said peripheral wall means and a recirculation supply port thereto in said first circular wall means, a lint filter disc rotatably mounted in said chamber in generally parallel spaced relationship between said first and second circular wall means, said lint filter disc comprising a circular flat plate having a plurality of pointed fingers thereon projecting perpendicularly therefrom toward the portion of said first circular wall means surrounding said recirculation supply port and rotatable with said disc, means for axially shiftably mounting said lint filter disc relative to said second circular wall means for movement between a first position with the finger points against said first circular wall means around said recirculation supply port to form a lint entrapping maze between said inlet port and said recirculation supply port when said first pump is operating to recirculate liquid from said inlet port to said recirculation supply port and a second position with said finger points spaced from said first circular wall means for facilitating the cleaning of the entrapped lint from said teeth when said second pump is operating to pump liquid from said inlet port to drain, first conduit means connecting the recirculation supply port to the inlet of said first pump whereby the suction of said first pump in operating to recirculate liquid from said inlet port to said recirculation supply port moves said lint filter disc to said first position, second conduit means connecting the bottom outlet of said tub to the inlet port of said drum-shaped chamber on a tangent whereby to facilitate the swirl of liquid entering said

chamber when said second pump is operating to pump liquid to drain, means on said lint filter disc responsive to said swirl of liquid to move said disc to said second position and to rotate said disc for flinging the entrapped lint from said fingers so that said lint can be pumped to drain along with said liquid, said means including planes on the periphery of said plate slightly twisted relative thereto to move said disc to said second position and radial fins on the periphery of said disc perpendicular thereto to rotate said disc, and means for operating selectively said first and second pumps.

4. In an automatic clothes washing machine having an imperforate tub with top inlet and a bottom outlet, a first pump associated with said inlet and said outlet and operable for recirculating liquid to said tub, and a second pump associated with said outlet and operable for pumping liquid from said tub to a drain, the improvement comprising a self-cleaning filter assembly for removing solid contaminants from the recirculating liquid comprising a housing having vertical first and second circular wall means spaced by peripheral wall means to form a drum-shaped chamber therebetween, said drum-shaped chamber having an inlet port and a drain port thereto in said peripheral wall means and a recirculation supply port thereto in said first circular wall means, said drum-shaped chamber having a sector-shaped pocket in said peripheral wall means below said inlet port and drain port to trap sediment, a circular planar lint filter disc rotatably mounted in said chamber in generally parallel spaced relationship between said first and second circular wall means, said lint filter disc having a plurality of pointed fingers projecting perpendicularly therefrom toward the portion of said first circular wall means surrounding said recirculation supply port and rotatable with said disc, means for axially shiftably mounting said lint filter disc on said second circular wall means for movement between a first position with the finger points against said first circular wall means around said recirculation supply port to form a lint entrapping maze between said inlet port and said recirculation supply port when said first pump is operating to recirculate liquid from said inlet port to said recirculation supply port and a second position with said finger points spaced from said first circular wall means for facilitating the cleaning of the entrapped lint from said teeth when said second pump is operating to pump liquid from said inlet port to drain, first conduit means connecting the recirculation supply port to the inlet of said first pump whereby the suction of said first pump in operating to recirculate liquid from said inlet port to said recirculation supply port moves said lint filter disc to said first position, second conduit means connecting the bottom outlet of said tub to the inlet port of said drum-shaped chamber on a tangent whereby to facilitate the swirl of liquid entering said chamber when said second pump is operating to pump liquid to drain, means on said lint filter disc responsive to said swirl of liquid to move said disc to said second position and to rotate said disc for flinging the entrapped lints from said fingers so that said lint can be pumped to drain along with said liquid, said means including radial fins on the periphery of said disc perpendicular thereto to rotate said disc, said radial fins during rotation of said disc moving past said sector-shaped pocket in the direction of the curve of said sector shape to sweep from said pocket to said drain port the sediment trapped therein, and means for operating selectively said first and second pumps.

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,738,126 Dated June 12, 1973

Inventor(s) Roy R. Smith

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 1

line 10, "was" should read -- wash --.

Column 2

line 29, " 6 " should read -- 16 --.

Column 5

line 33, " a " should read -- the --.

Column 6

line 57, "swir' " should read -- swirl --;

line 59, "lints" " " -- lint --

(1st occurrence).

Signed and sealed this 19th day of February 1974.

(SEAL)
Attest:

EDWARD M. FLETCHER, JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents