Feb. 28, 1961 P. E. GELDHOF 2,972,876

SELF-CLEANING FILTER STRUCTURE

Filed May 20, 1957 4 Sheets-Sheet 1

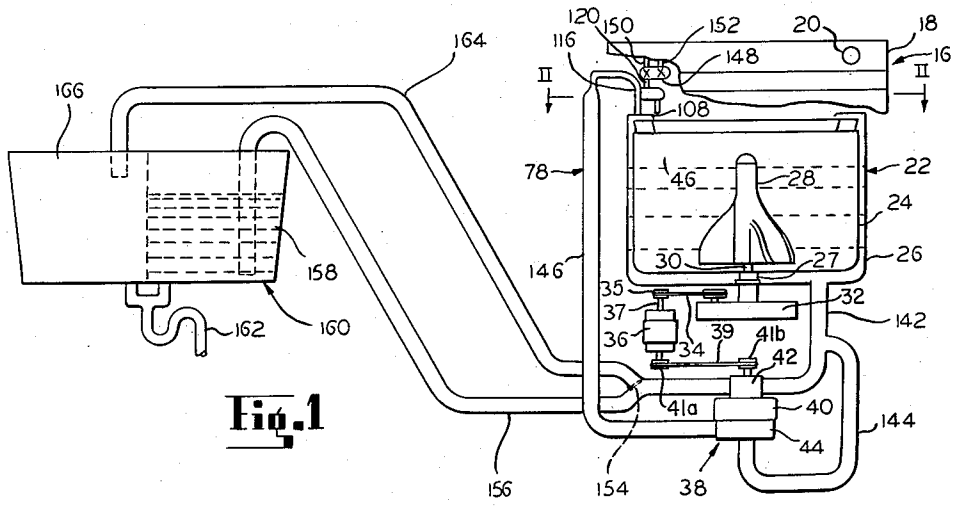


Fig. 1

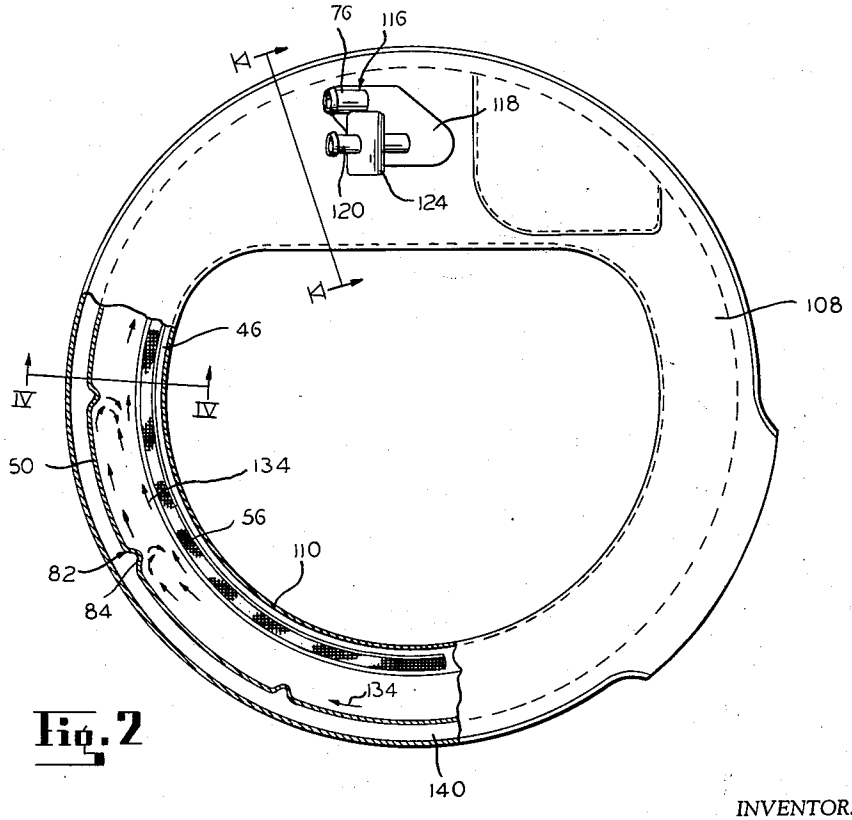


Fig. 2

INVENTOR.
PETER EDUARD GELDHOF

BY

Hill, Sherman, Meroni, Gross & Simpson

ATTORNEYS

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Filed May 20, 1957 4 Sheets-Sheet 2

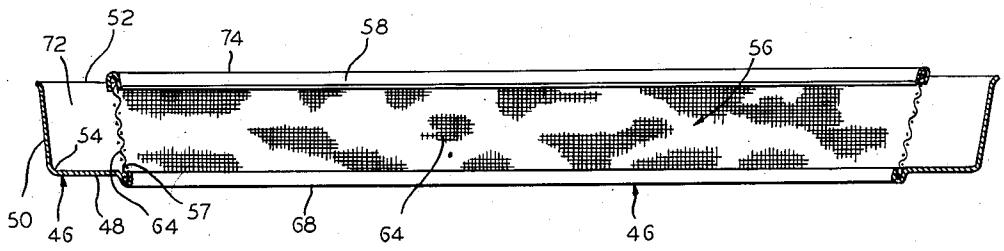


Fig. 3

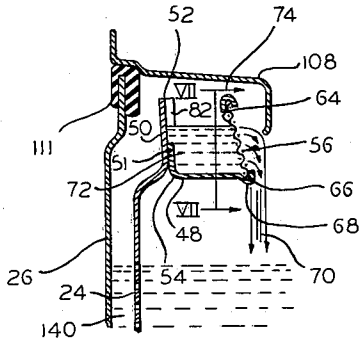


Fig. 4

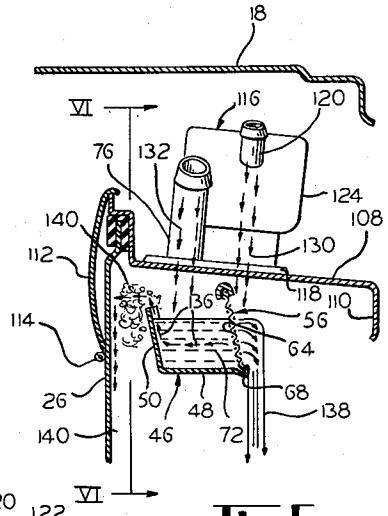


Fig. 5

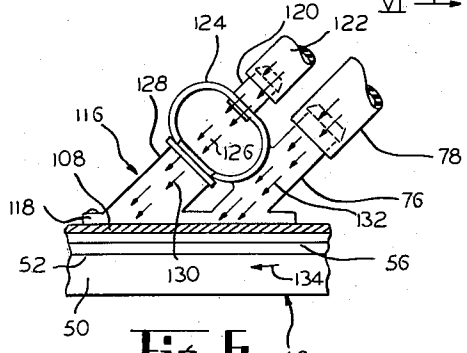


Fig. 6

INVENTOR.
PETER EDUARD GELDHOF

BY

Hill, Sherman, Meroni, Gross & Simpson

ATTORNEYS

Feb. 28, 1961 P. E. GELDHOF 2,972,876

SELF-CLEANING FILTER STRUCTURE

Filed May 20, 1957 4 Sheets-Sheet 3

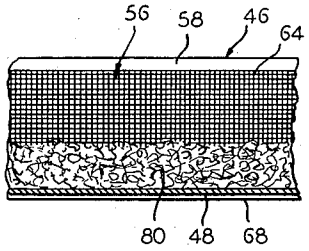


Fig. 7

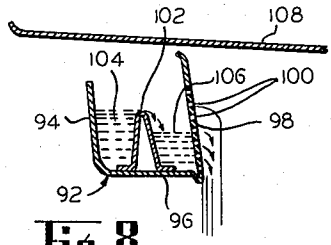


Fig. 8

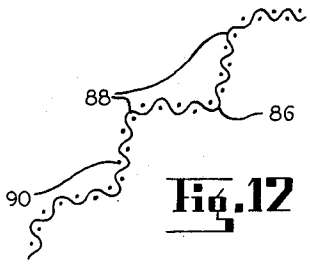


Fig. 12

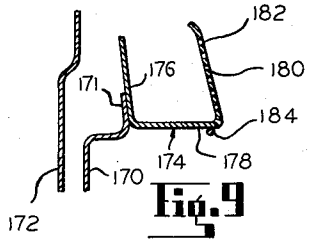


Fig. 9

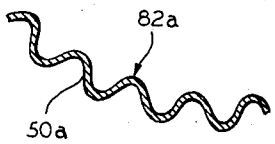


Fig. 13

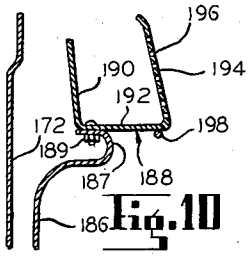


Fig. 10

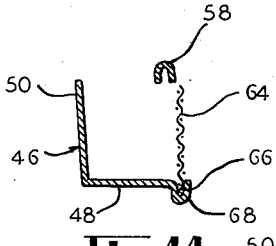


Fig. 14

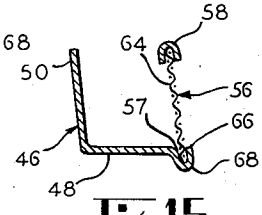


Fig. 15

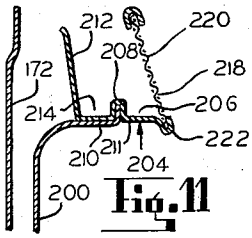


Fig. 11

INVENTOR.
PETER EDUARD GELDHOF

BY

Hill, Sherman, Meroni, Gross & Simpson
ATTORNEYS

Feb. 28, 1961 P. E. GELDHOF 2,972,876

SELF-CLEANING FILTER STRUCTURE

Filed May 20, 1957 4 Sheets-Sheet 4

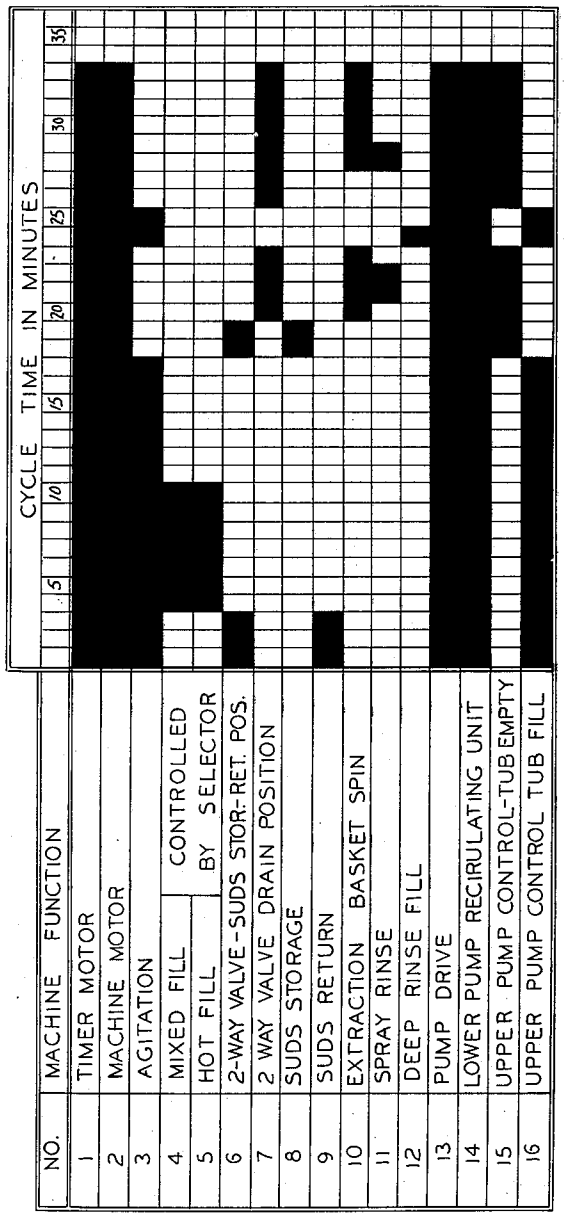


Fig. 16

INVENTOR.
PETER EDUARD GELDHOF

BY

Hill, Sherman, Meroni, Gross & Simpson
ATTORNEYS

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Patented Feb. 28, 1961

2,972,876

SELF-CLEANING FILTER STRUCTURE

Peter Eduard Geldhof, Benton Harbor, Mich., assignor to Whirlpool Corporation, a corporation of Delaware

Filed May 20, 1957, Ser. No. 660,309

5 Claims. (Cl. 68—18)

The present invention relates to improvements in clothes washing machines of the automatic home laundry type, and more specifically to improvements in devices for filtering washing fluid for use in laundering machines to remove lint and other foreign material.

In automatic home laundry machines, the clothes and fabrics to be washed are contained in a washing container wherein the fluid is agitated for the laundering operation. This agitation removes soils and foreign materials from the clothes and also removes particles of lint and the like which become suspended in the washing fluid. In many of these domestic washing machines, the container takes the form of the basket which may be rotated at high speed for centrifugal extraction of the fluid from the clothes at the end of the washing operation and at the end of rinsing operations. This will, of course, force the washing fluid through the clothes and the lint and foreign materials will frequently be strained from the fluid and remain on the surfaces of the clothes as the fluid is forced therefrom by the centrifugal extraction. This is objectionable and results in incomplete laundering of the clothes and having the garments covered with unsightly lint and threads.

Efforts have heretofore been made to obviate these conditions by filtering the washing fluid during the washing operation. Disadvantages have been encountered in that the filtering is not always effective, the filters are unhandy in that they take up valuable space in the laundry machine cabinet and frequently interfere with the operation of the laundry machine, and the filters become clogged and require manual attention for cleaning. The present invention contemplates providing a filtering apparatus for use in a filtering system which accomplishes an improved filtering operation, and which does not require manual attention for cleaning.

An important object of the invention is, therefore, the provision of a filter for use with a domestic type laundry machine, which is automatically cleaned in the cycle of operations and does not require manual attention.

Another object of the invention is to provide a filter and filtering system for an automatic washing machine which will continually remove lint and foreign particles from washing water during washing and rinsing operations, and which will perform an improved filtering of the fluid.

Another object of the invention is to provide an improved filter for an automatic washing machine wherein a portion of the clear rinse water is used for cleaning the filter, and wherein the rinse water will be centrifugally forced through the filter to reverse flush the filter openings, and will also flush the entire filter chamber with a complete and an improved cleaning action.

Another object of the invention is to provide an improved filter system for an automatic washing machine wherein the fluid within the machine will be continually filtered during both the washing and rinsing operations,

and wherein filtering will continue regardless of the amount of fluid in the washing chamber.

Another object of the invention is to provide a filter for a laundry machine employing a verticle filter wall supplied from an open filter chamber wherein a secondary filter is provided by the lint building up on the lower portion of the filter wall and wherein the filter can freely overflow to an outer tub when the filter becomes clogged.

Another object of the invention is to provide a filter wherein the filtering action can be readily observed by the operator and also wherein it can be observed when the filter becomes clogged.

A still further object of the invention is to provide an annular filter trough extending around the top of the basket in an automatic washing machine wherein the filter trough is rotated with the basket, and filter-cleaning fluid is forced through the vertical filter wall during rotation of the basket.

Another object of the invention is to provide an annular filter for an automatic washer wherein the centrifugal action on the fluid within the annular filter is reduced and the fluid is evenly and uniformly distributed around the annular filter for an improved filtering action.

Another object of the invention is to provide an improved automatic laundry structure and filter therefor, operating with an improved cycle of operations.

Other objects and advantages will become more apparent in the teaching of the principles of the invention in connection with the disclosure of the preferred embodiments thereof, in the specifications, claims and drawings, in which:

Figure 1 is a schematic elevational view shown partially in section and illustrating an automatic laundry machine combination employing a filtering structure and a method of the present invention;

Figure 2 is a plan view of the container assembly for an automatic washer with the cabinet removed and with portions of the container assembly broken away;

Figure 3 is an enlarged verticle sectional view taken through the annular filter ring;

Figure 4 is an enlarged verticle sectional view taken along line IV—IV of Figure 2 and illustrating the sectional construction of the ring filter;

Figure 5 is a vertical sectional view taken along line V—V of Figure 2, and illustrating the flow of fluid relative to the filter for the filtering action and the cleaning action;

Figure 6 is a sectional view taken along line VI—VI of Figure 5 and illustrating the conduits and apparatus for supplying fluid to the filter;

Figure 7 is a vertical sectional view taken from inside of the annular filter trough illustrating the appearance of the filter wall, the view being taken along line VII—VII of Figure 4;

Figure 8 is a vertical sectional view taken through an annular filter channel or trough having an alternate construction;

Figures 9, 10, and 11 are detailed sectional views illustrating alternative forms of the channel-shaped filter ring and the arrangement for mounting the ring on the laundry basket;

Figure 12 is a plan view illustrating one form of filter screen construction;

Figure 13 is a horizontal cross-sectional view of one form of outer wall.

Figures 14 and 15 are schematic sectional views illustrating the method of constructing the annular filter trough and attaching the filter screen; and

Figure 16 illustrates the cycle of operations and the time relationship of the operation of the various parts

of the laundry machine, showing such features on a graph.

While the drawings show a preferred form of the filter and a domestic type washing machine, it will be understood that the principles of the filter may be employed with automatic washing machines of varying types, and the filter construction may take varying forms within the confines of the principles of the invention. The forms shown illustrate preferred embodiments in which the features of the invention find particular utility and advantage.

As illustrated in the drawings, Figure 1 shows an automatic washer **16**, housed in a cabinet **18**. The mechanical elements of the washer are automatically controlled by a time cycle device, such as the type known to the art wherein a plurality of switches are operated by cams mounted on a cam shaft driven by an automatic timer. Control of the time cycle device may be accomplished through a control switch shown at **20**, which is representative of the time cycle control mechanism. The control **20**, or other controls, may also be provided for regulating other features, such as setting the temperature of the water used within the washer.

Within the cabinet is a laundry container assembly **22**, which is comprised of an inner basket **24**, and an outer tub **26**.

The basket is supported on a hub **27**, which will hold it stationary during certain laundry operations, and will spin it about its vertical axis at high speed rotation for centrifugally extracting the fluid from the clothes within the basket **24**. The basket may be provided with means for permitting the escape of fluid to the tub **26**, during centrifugal action, such as by openings at the top of the basket, or the basket may be perforated, as known in the present art.

Within the basket **24** is an agitator **28** for agitating the laundry water and clothes therein for performing the washing operation. The agitator is mounted on a shaft **30**, and the hub **27** for rotating the basket **24** and the shaft **30** for driving the agitator **28** are driven by means emanating from a gear casing **32**. The gear casing contains means for the conversion of power into the proper form and is operated from a drive belt **34**, driven by a pulley **35** secured to the drive shaft **37** of a motor **36**. The time cycle control mechanism **20** is suitably connected to the gear casing **32** and motor **36** to operate the agitator **28** and basket **24** to cause laundering and spinning operations at the proper period of time during the operation cycle. The timed cycle of operations is shown on the chart of Figure 16, as will be described later in detail.

The motor **36** also drives the uni-directional, dual-level pump **38** by means of a conventional drive belt **39** passing over a drive pulley **41***a* on the motor shaft **37** and over a driven pulley **41***b* on the drive shaft of the pump **38**. While this pump **38** may take various forms, it is preferably employed in the form of a uni-directional, dual-level pump having an upper or first unit **40** through which the flow is forced in either direction by a central valve means **42** contained in a suitable boss at the top of the pump. This pump control valve means is also connected to the time cycle control means **20**, and operates as shown in the chart of Figure 16. The pump means **38** also has a lower unit **44** which operates in a single direction and which continually recirculates the fluid in the container assembly **22** through the filter, as will be described.

The filter **46**, as is shown in Figure 1, and as is shown in greater detail in Figures 2 through 5, is arcuate in shape and preferably is in the form of an annular ring. The arcuate filter is mounted at the top of the basket **24** and is positioned to discharge into the basket. The filter **46** is channel or trough shaped, and as shown in Figure 4, may be formed of sheet metal or the like and has an imperforate floor **48**, which, if desired, may slope downwardly toward the center of the basket **24**. The filter channel also has an outer wall **50** which tapers outwardly so that an upper edge **52** is further from the center of the basket than a lower edge **54**.

Filtering of the fluid is done through an inner filter wall **56** of the filter ring **46**. The filter wall may be formed by merely having a vertical wall **98**, **130** or **194** integral with the floor **96**, **178** or **192**, respectively, as shown in Figures 8, 9 and 10, and providing perforations **100**, **182** or **196** in the wall.

The filter wall **56** is preferably in the form illustrated in Figures 2, 5 and 7, and 12 through 15. In the form illustrated, **56** indicates the filter wall as a whole and as shown in Figure 3, includes filter material **64** and a screen strengthening edge or ring **58** forms the top edge of the screen and crimped to the upper edge of the filter material.

The filter material **64** is preferably in the form of interwoven mesh screen with the wires of the mesh forming filter openings therebetween. The screen **64** extends around the annular filter ring **46** and with the strengthening ring **58** forms the inner filtering wall **56**.

In one manner of attaching the screen, Figs. 3 and 4, the base **66** of the screen is crimped in the bight **57** at the inner edge of the filter floor **48** of the channel-shaped filter ring. It is to be noted that crimping the metal at the inner edge of the floor **48** forms an annular downwardly extending drip flange **68** or drip lip. The drip flange **68** and the floor **48**, which tapers in a downward direction toward the inside of the basket **24**, insure that the water flowing through the inner filter wall **56** will run off of the flange **68**, as indicated by the arrows **70** in Figure 4. This causes a waterfall effect, which can be observed by the operator through the open top of the basket insuring that filtering is progressing satisfactorily. However, when the filter becomes clogged, this waterfall effect will stop, warning the operator that either the flow of recirculating fluid has stopped, or that the filter is clogged.

When the filter becomes clogged, the fluid in the interior **72** of the filter channel will rise and will flow over the upper edge **52** of the outer wall **50**, inasmuch as the upper edge **74** of the top of the inner filter wall **56** is higher than the edge **52** of the outer wall, Fig. 4.

A method of attaching the filter screen **64** to the annular filter ring **46** is illustrated in Figures 14 and 15.

The annular filter ring **46** is first formed, as shown in Figure 14 in an L-shape with an outer wall **50** and a floor **48**. The filter ring, which is channel-shaped, may be formed in a unit piece of metal, as illustrated in Figure 14, or may be formed in two sections, as illustrated in Figure 4, with the floor **48** formed of one section of metal and supported by turning up the outer lip **51** of the floor to secure it to the outer wall **50**, such as by welding.

In attaching the filter screen **64** to form the annular trough-shaped filter **46**, an annular screen **64** is positioned in the bight **57**, in the manner shown in Figure 14, at the inner edge of the floor **48** and the bight is crimped to form the drip flange **68**, catching the lower edge **66** of the screen therein. The filter screen **64** is next forced outwardly toward the outer wall **50** of the channel so as to taper outwardly away from the center of the basket **24** on which it is mounted. The strengthening ring **58** (shown uncrimped in Figure 14) is then crimped in place over the top of the screen as shown in Figure 15. Since the ring **58** has a larger diameter than the base **66** of the screen, the screen will continue to taper outwardly to form a tapered filter wall **56**.

As illustrated in Figures 5 and 6, the laundering fluid to be filtered flows into the filter from a nozzle end **76** of the recirculating conduit assembly with the fluid fed to the nozzle from a recirculating conduit **78**. The fluid flows around the annular filter ring **46** and flows outwardly through the filter screen **64**, which is part of the filter wall **56**.

As will be noted in Figure 7, the lint and other foreign materials in the washing fluid will settle toward the floor 48 of the filter ring and begin to first collect along the lower surface of the filter ring screen 64, and an area show at 80. The lint fibers lie across the interwoven wires of the screen 64, creating finer openings for the fluid to flow through. This, in effect, creates a secondary filter, which acts to remove finer materials from the fluid than would be possible with the filter screen 64. In other words, the openings in the filter screen 64 must be sufficiently large to permit a rapid flow of fluid therethrough, and particles which would pass though the filter screen 64 will collect due to the secondary filtering effect furnished by the area 80. This improves the filtering action and attains a cleaner laundering water and an improved laundering of the clothes in the machine. The secondary filter area 80 will build upwardly toward the top of the screen 64 as the finer materials gather, and the secondary filtering effect will continue until the entire screen is clogged. With the large amount of area available in the screen 64 extending completely around the annular filter ring 46, sufficient screen area is available to handle a complete washing of maximum quantity. The filter is cleaned for each successive washing operation in the manner which will later be described.

Thus, the filter wall 56, which is nearly vertical, accomplishes the secondary filtering effect, above referred to, and as will be later described, also functions in cooperation with the automatic screen filter cleaning means. As will be noted in Figures 4 and 5, the filter wall 56 tapers outwardly and the reason for this taper will be subsequently described. However, the filter wall will be herein referred to as being substantially vertical and it is to be understood that this is not a limiting description but refers to a wall that may vary in position from vertical to a wall which is tapered outwardly for the purposes described, as will be understood in connection with the self-cleaning feature of the invention.

The nozzle 76, which delivers the recirculating washing fluid to the annular filter 46, extends toward the filter at an angle with the vertical, the filter being in the horizontal position. This encourages the fluid to flow around the filter ring and distribute itself along the length of the filter wall 56. To improve the filtering action through the filter wall 56, to increase the speed of flow therethrough, and to achieve the secondary filtering effect described in connection with Figure 7, means are provided to increase the depth of the fluid shown at 72 within the channel of the filter 46. These means include the provision of spaced protuberances 82 (Figs. 2 and 4) projecting inwardly from the outer wall 50 of the filter ring 46. Also aiding in increasing the depth of the fluid is the use of the interwoven filter screen 64, the individual wires of which present projections which reduce the speed of flow around the filter ring.

An important function of these protuberances 82 is to reduce the speed of flow around the filter ring. It has been found that the fluid tends to create a high speed flow around the annular ring which centrifugally forces itself over the tapered outer wall 50, and forces the fluid away from the filtering wall 56. This, of course, is an undesirable effect, and the protuberances help break the speed of flow and the leading surfaces 84 of each of the protuberances tend to channel the water inwardly toward the filtering wall 56 whereby it will flow through the openings in the filter. The protuberances may be portions welded to the inner face of the wall 50, or may be formed by forcing inward vertical ribs in the wall at spaced locations as shown in Figure 2.

Another form of construction for increasing the effectiveness of the flow of washing fluid through the filter is shown in Figure 12. In Figure 12 the screen is shown at 86 having a plurality of vertical protuberances 88, which may be in the form of vertical ribs. These ribs provide surfaces 90, which face the flow of water around the filter ring 46 and present a surface extending somewhat laterally to the flow, whereby the fluid is forced through the openings in the screen 86. The vertical ribs 88 also reduce the speed of flow of fluid around the filter ring 46 to reduce the centrifugal effect which forces the fluid toward the outer wall 50.

Another construction of an outer wall for the filter is shown in Figure 13. The outer wall 58 is provided with corrugations or adjacent ribs 82*a* which reduce the flow speed around the filter ring, increase the depth of fluid in the ring; and improve flow through the filter wall 56.

Another form of filter ring is shown at 92 in Figure 8. The filter ring has an outer wall 94, which tapers outwardly and is integral with a floor 96 of the filter ring. The filter ring 92 also has an inner filter wall 98, which may be constructed the same as the filter wall 56 of the embodiment of Figures 2 through 5, but also may be integral with the floor 96 of the filter ring with the filter wall 98 having flow perforations 100 through the wall.

The annular filter ring 92 of Figure 8 has a central flow distributing wall 102, which projects upwardly from the floor 96 of the filter, but which is lower than either the outer wall 94 or the filter wall 98. The distributing wall 102 divides the filter channel into an outer distributing chamber 104 and an inner filtering chamber 106. The recirculated fluid to be filtered is discharged into the distributing chamber 104 and the fluid will flow over the top of the distributing wall 102 with a weir effect. The fluid thus distributes itself around the annular filter channel 92 in the distributing chamber 104, and flows evenly over the distributing wall 102 to provide the same amount of fluid to the entire annular length of the filtering wall 98.

Various arrangements are illustrated for mounting the annular filter ring on the top of the basket, concentric therewith and in a horizontal position. In the form shown in Figure 4, for example, the outer wall 50 of the filter ring is a continuation of the basket wall 24. The floor 48 is turned up at its outer edge in a flange 51 which is welded to the wall 50.

In Figures 9, 10 and 11, further forms of mounting the arcuate filter channel at the top of the basket wall are shown. In Figure 9, the basket is shown at 170 with the surrounding tub at 172. The filter channel is illustrated at 174 having an inner wall 180 with filter perforations 182. The filter channel has a floor 178 with an outer wall 176, the floor, inner wall, and outer wall being integral.

In this form, a separate screen is not used, but the inner wall 180 is perforated with the series of holes 182. In this form, the floor 178 does not taper downwardly but is horizontal. To achieve the waterfall effect, a bead 184 extends along the front edge of the filter to form a drip flange and it will be observed that as the filtered water flows through the openings 182, it will flow down the wall 180 to drip off bead 184 in a waterfall effect.

The filter channel 174 is mounted to the basket 170 by being welded to an upturned annular flange 171 at the top of the basket.

In the form of Figure 10, the basket is shown at 186 with the filter trough illustrated at 188. The trough has a floor 192, an outer wall 190, an inner wall 194 which is perforated with openings 196. A continuous drip bead 198 extends around the inner edge to achieve the waterfall effect. The channel is mounted at the top of a curled flange 187 that extends upwardly from the top of the basket 186. Bolts 189 connect the filter trough 188 to the flange 187.

In the form shown in Figure 11, the filter channel is shown at 204 with an outer wall 212 and an inner filter wall 220 carrying a screen 218. The screen is crimped in a drip flange 222. The floor 211 of the filter trough 204 is formed with a centrally raised ridge 208,

which forms a notch to receive the upturned flanged edge of the top 210 of the basket. This edge is crimped in the bight of the ridge 208. The ridge 208 forms a separation in the center of the filter channel forming an outer compartment 214 and an inner compartment 206. The upturned ridge 208 will retain fluid in the outer compartment 214 and distribute the fluid evenly to flow into the compartment 206 around the arc of the filter.

As may be seen in Figures 1, 2 and 5, the tub 26 carries an annular ring cover 108 which projects inwardly from the edge of the tub and has a downwardly turned flange 110 on its inner edge. This cover projects inwardly from the tub and is stationary and covers the annular filter ring 46 so that the operator sees only the inner surface of the filtering wall 56 and the waterfall effect of the filtered fluid running from the filtering flange 68.

The cover ring 108 is removably attached to the tub as by spring holding clips 112. The spring holding clips are pivotally attached at their base 114 to the wall of the tub 26 and may be swung outwardly for removing the cover 108 for purposes of assembly of the machine or for servicing.

The recirculating washing water to be filtered and the clean wash water and the rinse water are supplied to the filter ring 46 and the basket 24 through a fitting 116, which is mounted on the cover ring 108. The fitting 116 has a lower flange 118 which is attached to the cover ring 108. The fitting 116 is a unit casting carrying the recirculation nozzle 76, and a fresh rinse water filter wall cleaning nozzle 120. This nozzle connects to a fresh water line 122. A conventional open globe 124 is provided to furnish an air gap 126 to prevent the backing up of water or suds from the tub to the nozzle 120. The nozzle directs fresh water across the air gap 126 through the large diameter of the lower portion 128 of the fitting along the path indicated by the arrows 130. As may be noted in Figure 5, the arrows 130 indicate the path of flow of the fresh water, while the arrows 132 indicate the path of flow of the recirculated water to be filtered.

The recirculated water will tend to circle the filter 46. The protuberances 84, however, will counteract this tendency and will also cause the basket to turn slowly whereby the recirculated water will not be continually discharged in one location in the filter.

It will be noted in Figures 5 and 6 that the stream of water 130, upon entering the basket, engages the inner surface of the filter wall 56. This engagement is at an angle to the horizontal which extends in the direction of rotation of the basket and filter ring, as indicated by the arrow 134 in Figures 2 and 6.

The angle of engagement between the fresh water stream 130 and the filter wall 56 is also at an angle in the vertical direction, as shown clearly in Figure 5. This angular engagement between the fresh water stream 130 and the inner surface of the filter wall 56 enhances the reverse flushing action to clean the screen 64 of the filter.

Fresh water will engage the screen during the original filling of the tub, but since the location of the filter ring is stationary, only one location of the screen will be exposed to the stream of water. This location which is thoroughly cleaned, is changed for each fill since the basket will tend to stop in different locations with respect to the cleaning nozzle. During the rinsing periods when fresh water is injected into the tub, and the basket and filter ring 46 are rotating at high speeds for the extraction of fluid from the clothes, the fresh water stream 130 engages the surface of the filter wall 56 to cause a portion of the fluid to reverse flow through the wall in the path indicated by the dotted line arrows 136 in Figure 5. A portion of the fluid will bounce off the wall 56 and flow downwardly into the tub as indicated by the arrows 138, this being the major portion of the fluid. The portion that passes through the wall along the dotted line path 136 will wash off the upper surface of the floor 48 of the filter channel and pass upwardly along the tapered outer wall 50 of the channel. The fluid will climb the wall due to the centrifugal force acting on it by the spinning filter ring. This movement of the water will not only clean the screen, but will flush the removed materials across the floor and up the side of the filter channel to carry it out against the wall of the tub 26. An important feature of this screen cleaning action is the removal of the so called "suds lock." This "suds lock" forms a pocket of suds at the area 140 in the corner formed between the ring cover 108 and the wall of the tub 26. The suds lock will frequently extend down between the wall of the tub 26 and the wall of the basket 24. The suds are originally created during the washing operation when the operator accidentally places an excess of soap or foaming detergent into the washing fluid, as easily done if great care is not taken. It is imperative that this suds lock be broken, since it exerts a frictional drag on the rotation of the basket causing a slippage of a clutch drive means, which is frequently employed in the drive between the gear casing 32 and the hub 27, Figure 1, to rotate the basket 24 which results in poor water extraction.

The high speed spray of water passing through the filter wall 56 from the entering stream 130 of rinse water, will strike the concentration of the suds lock, breaking it and washing it down into the base of the tub, and this action occurs directly after the washing operation, when the first rinse water is injected into the basket.

Referring to Figure 1, it will be seen that the washing fluid leaves the tub through an emptying conduit 142. The recirculation fluid is taken off the emptying conduit 142 by a first section 144 of the recirculation conduit 78. The recirculated fluid enters the lower unit 44 of the pump 38, and is directed up to the filter through the second section 146 of the recirculation conduit 78. The fluid is then directed through the fitting 116 into the annular filter ring 46. The pump 38 operates all through the complete operation of the machine and, therefore, any fluid in the tub is continually filtered. This is important inasmuch as rinse water will tend to pick up lint from the clothing as well as wash water, and the present arrangement will remove the lint from the fluid at all times.

The fresh water which is used for washing, rinsing and cleaning the filter, enters through the control valve 148, which is provided with a hot water line 150 and a cold water line 152. The mixture of hot and cold is selected through a temperature selector arrangement, not shown, but which controls the operation of the valve 148.

During the washing operation, the control 42 for the upper unit 40 of the pump is set to prevent emptying of the tub. At the end of the washing operation, however, the control 42 is changed so that the upper unit 40 will draw fluid from the emptying conduit 142, through the upper unit 40 of the pump, and the two-way valve 154 will be set so that the soapy water discharged from the tub will be forced out through the suds storage conduit 156. This conduit leads to a storage chamber 158 in a laundry sink 160, which is provided with a regular drain connection 162.

As soon as the fluid is drained from the tub 26, the two-way valve 154 is switched to direct the fluid from the pump unit 40 through the drain conduit 164 to the drain compartment 166 of the laundry sink 160. At the same time the basket 24 begins to spin and the last soapy fluid from the clothes is directed to the drain rather than the storage compartment 158. The clothes within the basket 24 are subsequently subjected to succeeding rinses and with each injection of rinse water, which is accompanied by the spinning of the basket, the annular filter 46 is cleaned. The control 42 for the pump 38 is alternately changed so that the rinse water will remain in the

tub 26, or will be emptied to the drain, as is necessary to effect the rinse operations.

The operational cycles of the machine are illustrated in Figure 16. In the chart the various elements are shown under the heading "Machine Function" and the black line in the chart indicates when this machine function is occurring or machine element is in operation.

As a summary of operation, it will be noted from the chart of Figure 16, that the timer motor operates throughout the operation of the machine as well as the machine motor. The two-way valve may be set in any position in the intermediate periods, but must be set in the positions indicated during the suds storage and return and during drain period. The basket is first filled with clean water and the automatic washer 16 goes through its washing operation, during which time the agitator 28 is being oscillated and the basket 24 is stationary. During the washing operation, the washing fluid is continually recirculated by the lower unit 44 of the pump through the recirculation conduit 78 to be discharged into the annular channel-shaped filter 46. Fluid flows through the filter wall 56 and into the basket 24. At the end of the washing operation the soapy fluid is drained by the upper unit 40 of the pump and directed through the suds saver conduit 158 to the laundry sink 160. When the tub is drained, the basket 24 is spun to remove the remainder of the soapy water and the two-way valve 154 is switched to direct this portion of water through the drain conduit 164.

While the basket 24 is spinning, rinse water is admitted through the nozzle 120 to be directed at an angle to the moving filter wall 56. The fluid passes, in a reverse flush path, through the vertical filter wall and carries the material over the imperforate floor 48, over the upper edge of the outer filter wall 50 and down into the tub 26. The automatic washer 16 then automatically goes through its series of rinses and during the deep rinse period, the rinsing fluid is again continually recirculated through the filter 46 to remove the lint therefrom. Succeeding rinse operations again clean the filter and the machine completes its cycle of operations. For the next operation the sudsy water is returned to the machine for a succeeding operation and as soon as fluid enters the tub, the recirculation filter system starts to remove foreign materials from the washing water.

Thus, it will be seen that I have provided an improved self-cleaning filtering arrangement which meets the objectives and advantages hereinbefore set forth. The filter has an improved simplified structure, which does not encumber the operation of the remainder of the machine. Further, the filter provides an improved filtering action, thus improving the over-all laundry operation and functions of the machine. Furthermore, the filter is self-cleaning and will not require manual attention. In the self-cleaning action, fresh water is used and the centrifugal force which must be provided by centrifugal extraction is employed for forcible cleaning of the filter. This action also enables breaking of the suds lock and the overall operation is simple and effective and does not require manual adjustment or attention, and will not clog, corrode or wear throughout the use of the machine.

I have, in the drawings and specification, presented a detailed disclosure of the preferred embodiments of my invention, but it is to be understood that I do not intend to limit the invention to the specific forms disclosed, but intend to cover all modifications, changes and alternative constructions falling within the scope of the principles taught by my invention.

I claim as my invention:

1. A machine for the laundering of clothes or the like comprising in combination a cylindrically shaped laundry container having an open top for the insertion and removal of clothes and mounted for high speed rotation on a vertical axis for the centrifugal extraction of fluid from the clothes therein, an annular filter ring mounted at the top of the basket to rotate therewith, said filter ring being channel-shaped with an open top and having an imperforate bottom wall, imperforate outer side wall and an inner perforated filter side wall, said inner side wall being disposed relatively more closely to the vertical axis of said basket than said outer side wall, means for rotating the basket and the filter ring, fluid recirculation conduit means connected to receive fluid from the basket and discharge the fluid into the filter ring and operative to continually recirculate washing fluid during a washing operation, and a fresh water nozzle for supplying rinsing water to the basket positioned above the filter ring and directed toward the inner filter wall at an angle with the inner surface of the wall whereby a portion of the fluid entering the basket will pass through the filter wall in a direction reverse to the filtering direction and positioned at an angle in the direction of rotation of the filter ring whereby the fluid will engage the filter surface moving in the direction of the movement of the filter to attain improved cleaning engagement between the rinsing fluid and the filtering surface.

2. A machine for laundering clothes comprising in combination a laundry container for clothes to be laundered in a washing fluid, said container including a basket mounted for rotation about a vertical axis for the centrifugal extraction of fluid and having an open top for the insertion and removal of laundered clothes, and having a tub surrounding the basket in spaced relation therewith to receive the fluid extracted from the clothes, an annular trough-shaped filter ring extending horizontally and mounted at the top of the basket to rotate therewith, said trough-shaped filter having an imperforate floor, a perforated inner side filtering wall, and an imperforate outwardly tapered outer side wall, said inner side wall being disposed relatively more closely to the vertical axis of said basket than said outer side wall, recirculation conduit means connected to receive washing fluid and to discharge it into the filter whereby the fluid flows through the perforate filter wall into the basket, a fresh rinse water supply line, and a rinsing water discharge nozzle adapted for connection to the fresh water supply line and positioned to discharge the fluid at an angle to the perforate filter wall during the rotation of the filter with the basket whereby the portion of the rinsing fluid will flow into the basket and a portion will pass through the filtering wall and across the floor of the filtering ring and be centrifugally forced up the tapered outer wall of the filtering ring and into the tub through the space between said tub and basket to cleanse the filtering wall and the interior of the filtering ring during the admission of fresh water into the basket, as well as to remove any suds lock between said tub and basket.

3. A machine for laundering clothes or the like comprising in combination a laundry basket mounted for rotation about its vertical axis for the centrifugal extraction of laundering fluid from clothes, a tub enclosing the basket and positioned to retain fluid extracted from the clothes, an arcuate channel-shaped filter mounted at the top of the basket adjacent the inner surface of the tub and provided with an apertured inner vertical filter wall, said filter being further provided with an imperforate generally vertical outer wall positioned outwardly of said inner wall and relatively more closely to said tub than said inner wall, a cover ring for the tub mounted above the filter ring, means removably connecting the cover ring to the tub for access to the filter, circulating conduit means connected to said tub to receive laundering fluid from said tub and discharge it into the filter, and a nozzle connected to a fresh water supply source and positioned to discharge against the inner surface of the filter wall whereby foreign materials are reverse flushed from the filtering wall during rotation with the basket and the fluid passing through the filter in a reverse direction is thrown outwardly over said imperforate outer wall to break any suds lock between the tub and basket.

4. In combination with a laundry machine which includes a basket and surrounding tub forming an annular chamber therebetween and conduit means supported by the tub and discharging recirculating laundering fluid therein during the washing cycle; the improvement which comprises an annular trough-shaped filter carried by the basket to receive laundering fluid from the conduit means prior to discharge into the tub and basket, said filter having an outwardly inclined, vertically disposed inner filter wall, an imperforate bottom wall, and an imperforate outer wall arranged generally parallel to said inner wall and disposed relatively more closely to said tub than said filter wall; and second conduit means adjacent the first conduit means arranged to direct rinsing fluid against the filter wall at an angle thereto during the rinsing cycle to cleanse the filter.

5. In combination with a laundry machine which includes a basket and surrounding tub forming an annular chamber therebetween and conduit means supported by the tub and discharging recirculating laundering fluid therein during the washing cycle; the improvement which comprises an annular trough-shaped filter carried by the basket to receive laundering fluid from the conduit means prior to discharge into the tub and basket, said filter having an outwardly inclined, vertically disposed inner filter wall, an imperforate bottom wall, and an imperforate outer wall arranged generally parallel to said inner wall and of relatively lesser height than the inner wall, said outer wall being disposed relatively more closely to said tub than said inner wall; and second conduit means adjacent the first conduit means arranged to direct rinsing fluid against the filter wall at an angle thereto during the rinsing cycle to cleanse the filter, the inclination of the filter wall causing a portion of the rinsing fluid to be directed off said wall and downwardly into the tub and another portion to flow outwardly from said filter over the relatively lesser height outer wall of the filter and downwardly through the annular chamber between the tub and basket to break any suds lock in said chamber.

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