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[54] **BASKET FILTER FOR AUTOMATIC WASHING MACHINES**

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[73] Assignee: **Whirlpool Corporation,** Benton Harbor, Mich.

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[52] **U.S. Cl.** ..... **68/18 F;** 68/53; 68/184

[51] **Int. Cl.²** **D06F 13/02;** D06F 39/10

[58] **Field of Search** ..... 68/18 F, 18 R, 134, 53, 68/184

[56] **References Cited**

UNITED STATES PATENTS

3,352,130 11/1967 Landwier ..... 68/18 F

Primary Examiner—Peter Feldman
Assistant Examiner—Philip R. Coe
Attorney, Agent, or Firm—Hill, Gross, Simpson, Van Santen, Steadman, Chiara & Simpson

[57] **ABSTRACT**

A washing liquid filter apparatus for a washing machine characterized by a filter element received in an opening of a bottom portion of a basket which is mounted in the tub and forms a chamber therewith and spiral-shaped pumping vanes on a portion of the agitator which vanes create a pulsating flow from the chamber through the filter element into the basket. During oscillating movement of the agitator, the spiral configuration of the pumping vanes causes pumping of the liquid through the filter into the basket during one direction of oscillation of the agitator and a slight backflow through the filter to dislodge particles separated thereby during oscillation in the opposite direction. The pulsating flow causes the particles to be placed in suspension in the chamber adjacent to the filter for subsequent removal during the draining of the washing liquid from the tub.

13 Claims, 4 Drawing Figures

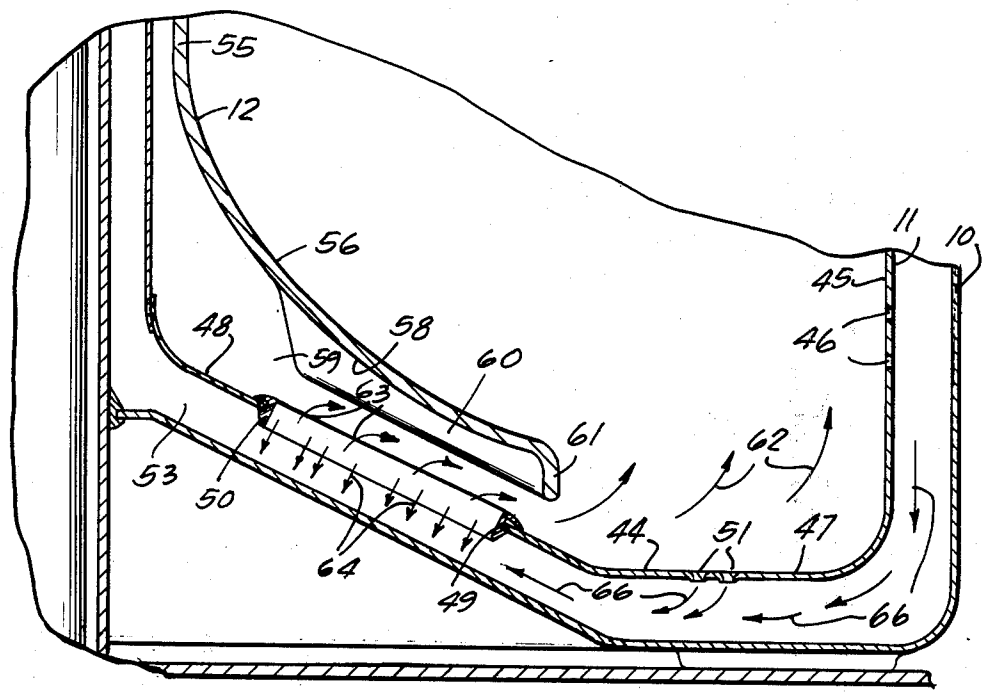


Fig. 1

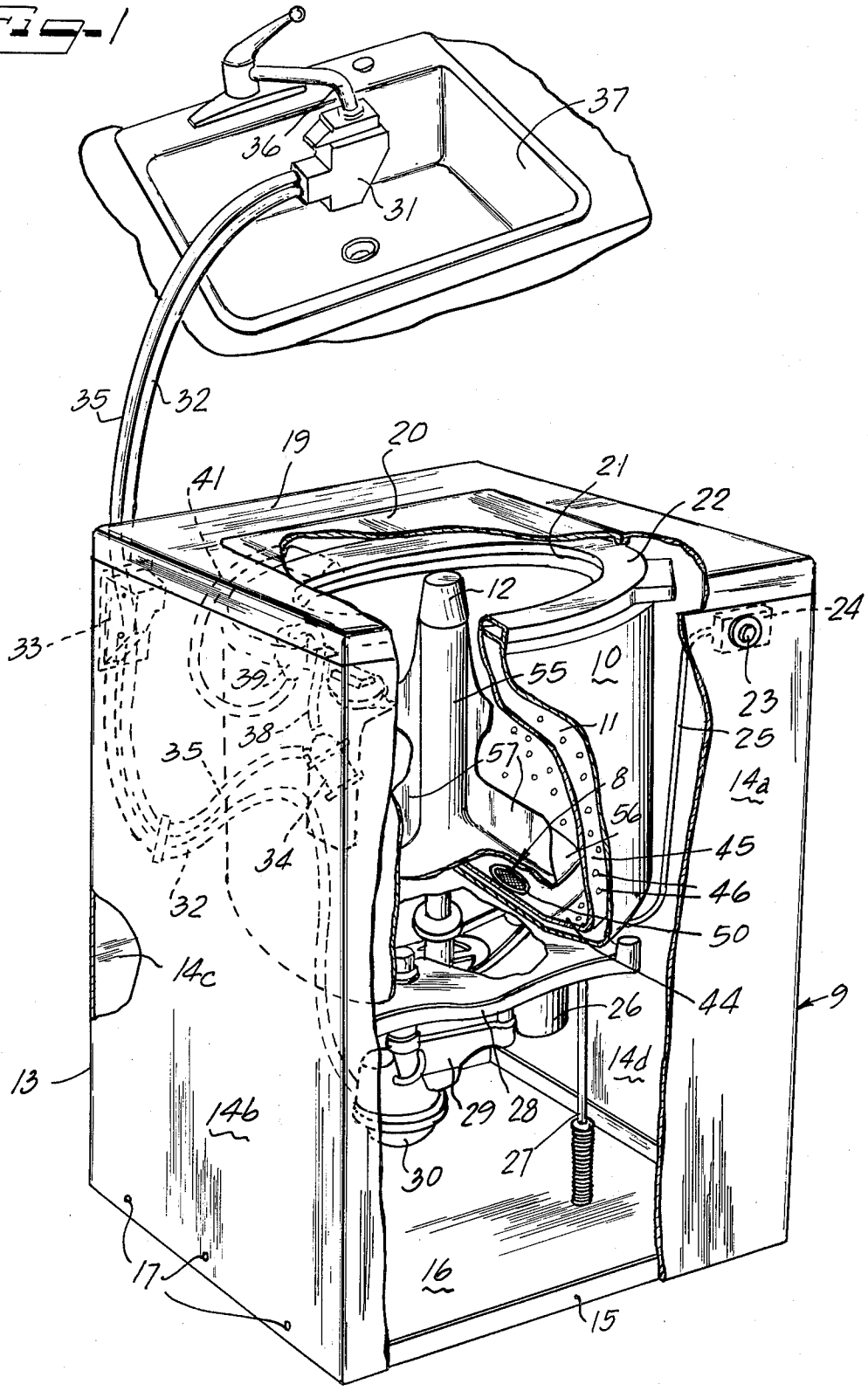

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Fig. 2

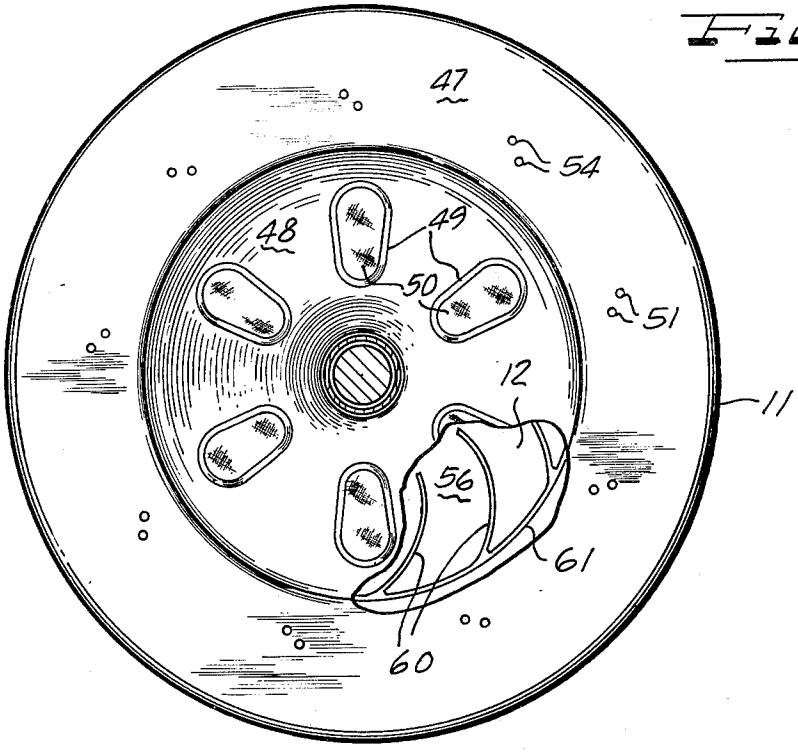


Fig. 3

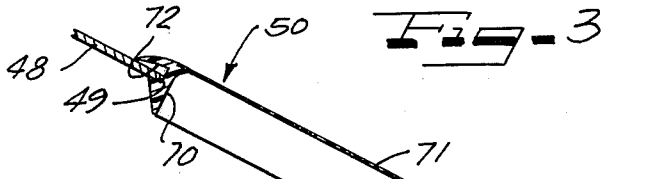
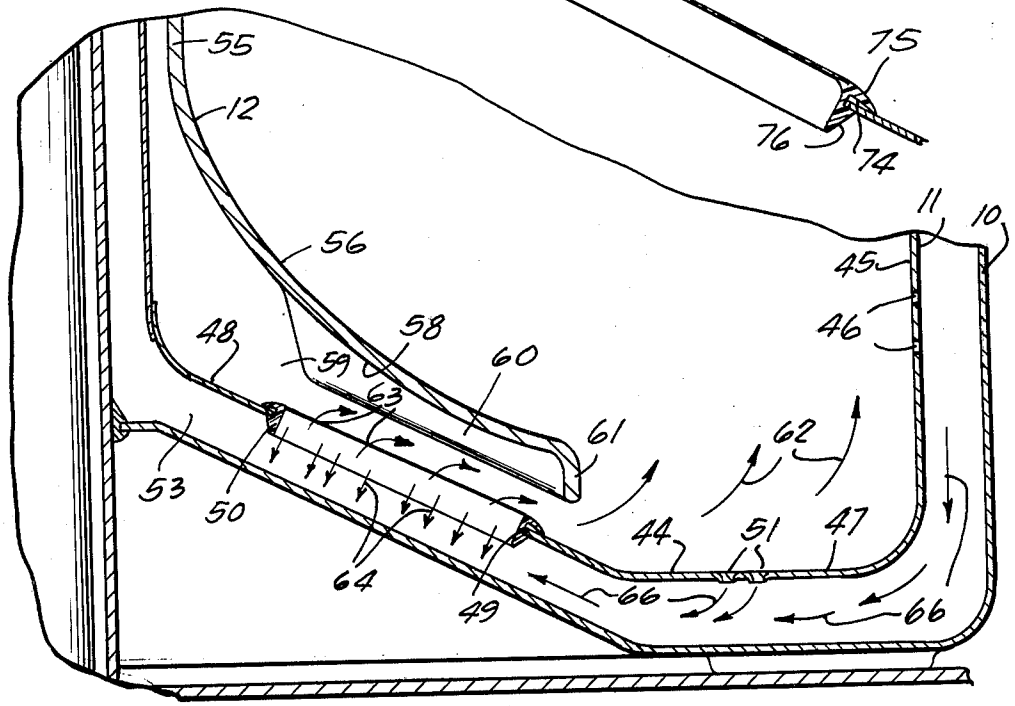


Fig. 4



BASKET FILTER FOR AUTOMATIC WASHING MACHINES

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention is directed to a self-cleaning washing liquid filter apparatus for filtering lint and other particles from the washing liquid in a washing machine during the washing and/or rinsing cycle.

2. Prior Art

In laundry machines, such as automatic home laundry devices or washing machines, it is desirable to remove lint from the washing and/or rinsing water so that the lint is not deposited on the clothes being cleaned. Various types of filters or lint traps have been suggested. One type of structure for removing lint is the provision of a pump to withdraw a portion of the washing liquid from the tub and then reintroduce the liquid through a filter such as a filter basket arranged on an agitator. An example of this type of structure is illustrated in U.S. Pat. No. **3,266,274,** which issued to J. A. Schwing on Aug. **16, 1966.**

Another type of a lint filter or trap for a washing machine is a lint trap which is mounted on an agitator of the washing machine and receives a flow. The lint trap filters a flow of washing liquid which is directed through the filter by movement of the agitator in the tub of the machine. Examples of this type of lint trap are found in U.S. Pat. No. **3,027,742,** which issued to J. M. Nowicki on Apr. **3, 1962,** and U.S. Pat. No. **3,091,954,** which issued to N. J. Bullock et al. on June **4, 1963.** In each of the above-mentioned examples, a rather bulky lint trap of filter is utilized and has the disadvantages of obstructing entry to the basket of the washing machine and of requiring a large amount of space in the washing basket. Furthermore, each of the above examples of lint traps must be cleaned manually either while in place or after removed from the washing machine.

To provide a filter which does not occupy a large amount of space and which is self-cleaning, it has bee suggested to provide a filter element in the base portion of the basket adjacent the agitator and pumping vanes on the agitator to continually pump liquid through the filter to remove lint and other particles from the washing liquid. An example of this type of structure is illustrated in U.S. Pat. No. **3,352,130,** which issued to W. G. Landwier on Nov. **14, 1967.** In the device illustrated in the patent, the withdrawal of the washing liquid from the tub during the draining following the washing cycle produces a reverse flow through the filter element to remove the lint and other particles entrapped thereon. However, due to the high efficiency of this filter for removing lint and other particles from the washing fluid, it may become clogged during the washing cycle and thus becomes inoperative.

In all filtering devices, problems have existed with cleaning a filter of the material which it removes from a flow of liquid without requiring the shutting down of the system. Various attempts in the filter art have been suggested for cleaning a filter without shutting the filter system down. One example of filter cleaner is a nozzle which is passed across the filter medium to remove particles therefrom and this system and method is disclosed in U.S. Pat. No. **2,066,479,** which issued to V. W. MacIsaac on Jan. **5, 1973.** Another method provides a device for applying a counter pressure through

the filter for the purposes of dislodging particles removed by the filter without interrupting the fluid flow through the filter. An example of this type of structure is disclosed in U.S. Pat. No. **3,585,133,** which issued to P. R. Honan et al. on June **15, 1971.**

However, none of the filtering devices particularly those suggested for automatic washers have satisfied the problem of providing a continuously self-cleaning filter which is reliable and which is simple in construction and therefore inexpensive to manufacture.

SUMMARY OF THE INVENTION

The present invention is directed to a washing machine having a washing liquid or fluid filter apparatus which is self-cleaning during the filtering process without interrupting the flow of the washing liquid or fluid into the basket of the machine. To accomplish this feature, the washing liquid or fluid filtering apparatus utilizes a basket which has a wall portion and a base portion with each portion having at least one opening therein, and which basket is supported in the tub of the washing machine to form a chamber between the outside of the basket and the inside of the tub, means for creating a pulsating flow from the chamber into the basket through the opening in the base portion of the basket, which means creates a flow out of the basket through the opening in the wall protion into and through the chamber, and filtering means disposed across each opening in the base portion of the basket for preventing the passage of particles contained in the washing fluid into the basket through the openings in the base portion of the basket, whereby the pulsating flow through the filter means continually flushes the filter means. Preferably, the means for creating the pulsating flow is a pump means located in the basket which pump means is formed by outwardly extending spiral-shaped vanes or fins on a portion of the agitator which fins during oscillation of the agitator create a flow from the chamber through the filter as the agitator moves in one direction and during movement of the agitator in the opposite direction provide a slight counter flow back through the filter to clean or flush the filter means. While the filter means can cover more than one opening, preferably, the filter means is a plurality of filter elements which are detachably mounted in each of the openings in the base portion of the basket.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** illustrates a portable automatic washing machine with portions broken away for purposes of illustration which washing machine is an example of a washing machine for which the washing fluid filter means of the present invention is particularly adapted;

FIG. **2** is a bottom view of a basket of the washing machine with portions broken away to illustrate the position and contour of the pumping vanes or fins;

FIG. **3** is a cross section through a filter element of the present invention; and

FIG. **4** is a partial cross section with portions in elevation for purposes of illustration illustrating the pulsating flow created by the pump means of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The principles of the present invention are particularly useful for providing a washing fluid filtering appa-

ratus or device generally indicated at 8 for a washing machine generally indicated at 9 and diagramatically shown in FIG. 1. The washing machine 9 is illustrated as a portable automatic washing machine and is an illustrative example of one of the many types of washing machines on which the washing fluid filtering device and apparatus 8 of the present invention can be utilized.

The automatic washing machine 9 has a tub 10 which receives a clothes container or spin basket 11. An agitator 12 is disposed in the spin basket 11 and mounted for oscillating movement with respect thereto and for spinning movement with the basket upon the extraction of water from the clothes in the basket. The tub 10, the spin basket 11 and the agitator 12 and the drive mechanism therefore are enclosed in a cabinet 13.

The cabinet 13 is shown as being generally rectangular in form having a front wall 14*a*, a pair of side walls 14*b*, and 14*d*, and a back wall 14*c*, which walls are detachably mounted on an upright flange 15 of a base 16 as by screws 17. The screws 17 may be self-tapping screws of conventional form and extend through walls 14*b*, 14*c* and 14*d* and flange 15 to detachably secure the cabinet 13 to the base 16. The cabinet 13 also includes a top 19 having a hinged lid 20 openable to afford access to the clothes receiving opening 21 in a tub ring 22 extending about the tub and over a corresponding opening in the spin basket 11. The cabinet 13 has a timer dial 23 connected to a timer 24 mounted on a front wall 14*a* of the top of the cabinet beneath the top 19. Suitable wiring 25 connects the timer 24 to a motor 26 and other electrically operated devices of the machine. The timer dial 23 and timer 24 may be in any desired location and are shown in this present location for illustrative purposes only.

Supported above the cabinet base 16 on vibration dampening spring and rod assemblies 27 is a base plate 28 forming a support for the tub 10, basket 11 and agitator 12 in a conventional manner. The base plate 28 may be suitably supported on any vibrational dampening springs assembly which provide support for the base plate 28 from the cabinet base 16 and which absorbs vibrations during spinning movement of the spin basket 11. The base plate 28 also forms a support for the motor 26 and a drive control mechanism or transmission generally indicated by reference 29 which may also include a clutch and control mechanism, as well as a drive mechanism for oscillatably driving the agitator 12 or spinning the spin basket 11 and releasing the agitator to freely spin with the spin basket.

A pump 30 for removing wash or rinse water from the tub 10 at the termination of a washing or rinsing operation is also supported to depend from the base plate 28 and is connected to an adapter or coupler 31 by a drain hose 32 which extends out of an opening 33 in the back wall 14*c* of the cabinet 13. The adapter or coupler 31 is provided with a drain outlet which is not shown. It should be understood that the motor 26, drive control mechanism 29 and pump 30 can be mounted in any convenient manner between the cabinet base 16 and the base plate 28 and need not necessarily depend from the base plate 28 as shown.

The cabinet 13 also includes means mounting a suitable water inlet valve 34 of a conventional construction which valve supplies the tub 10 with water received by hose 35 which extends through the opening 33 to the adapter 31 which in turn is illustrated as connected to a source of water such as the faucet 36 of a sink 37. The water inlet valve 34 is connected through a hose 38 that extends to a conventional anti-siphoning device 39 which is mounted within the cabinet 13 and discharges into an outlet hose 41 which terminates adjacent to the tub ring 22 to discharge into the tub 10.

The basket 11 has a base portion 44 and a continuous wall portion 45. The wall portion 45 is a continuous cylindrical wall and is provided with one or more openings such as 46. As best illustrated in FIG. 4, the base portion 44 of the basket 11 has an annular flat portion 47 adjacent the wall portion 45 and a conical portion 48 adjacent the center of the basket 11. The conical portion 48 has at least one opening 49 and preferably as illustrated in FIG. 2 has six circumferentially spaced openings 49. Each of the openings 49 is covered with filter means which are illustrated as an individual filter element 50 which is detachably received or mounted in each of the openings 49. The flat portion 47 of the base portion is also provided with a plurality of openings 51 which provide drain means. The openings 51 are arranged in nine equally spaced pairs around the annular flat circumference portion 47 with the arcuate spacing between adjacent pairs being approximately 40°.

As best illustrated in FIG. 4, the basket 11 is mounted in the tub 10 which contains the washing liquid or fluid in a spaced relationship to provide a chamber 53 which is defined by the outer surface of the basket 11 and the inner surface of the tub 10.

As best illustrated in FIG. 1, the agitator 12, which is coaxially mounted in the basket 11, has an axially extending center portion 55 which has a base portion or outwardly extending conical flange 56. To create the agitation of the washing liquids during the oscillating movement of the agitator 12, a plurality of fins or vanes such as 57 extend outwardly from the base portion 56 and the center portion 55 of the agitator 12.

As best illustrated in FIG. 4, the base portion 56 of the agitator 12 has a conical configuration substantially matching the conical portion 48 of the basket 11. The agitator is mounted in the basket 11 with a bottom surface 58 of the base portion or conical flange 56 spaced from the conical portion 48 of the basket 11 to form a second or pumping chamber 59 therebetween.

To provide means for creating a pulsating flow of the washing fluid in the first chamber 53 through the filter elements 50 and into the interior of the basket 11, the base portion 56 of the agitator 12 is provided with a plurality of spiral-shaped vanes or fins 60 which extend from the surface 58 and into the second chamber 59. As illustrated in FIG. 2, the spiral-shaped vanes 60 extend radially from the axis of the agitator 12 along a spiral path to terminate in a circular lip or flange 61. As illustrated in both FIGS. 2 and 4, each of the vanes or fins 60 has a portion which is radially positioned on the bottom surface 58 of the agitator 56 so that during oscillation of the agitator, the portion moves over the filter element 50 which filters the flow through the openings such as 49. Due to the spiral configuration of the vanes or fins 60, the oscillating movement of the agitator 12 in one direction causes pumping of the fluid in the chamber 59 radially outward as indicated by the arrows 62 to create a suction in the chamber 53 to cause first or main flow, as indicated by the arrows 63, through the filter element 50. With movement in the opposite direction during oscillation in the agitator 12, the curved or spiral configuration of the pumping vanes

59 causes a partial counter flow, as indicated by the arrows 64, from the chamber 59 into the chamber 53. This partial counter flow in the direction of the arrows 64 provides a counter flow through the filter element 50 which flushes the filter element and dislodges any lint or other particles which were separated from the flow indicated by the arrows 63 during the forward pulse or flow.

Due to the counter flow indicated by the arrows 64, any particles of lint or other particles separated by the filter element 50 from the flow of water indicated by the arrows 63 is retained in a suspension in the chambers 53 adjacent the filter element 50. This suspension of the particles in the liquid is subsequently removed from the tub 10 during draining of the washing fluid therefrom.

In addition to creating the pulsating flow which includes the first or main flow indicated by the arrows 62, 63 and the counter flow by the arrow 64, the pumping vanes 60 also cause circulation of the fluid from the basket 11 through openings 51 and the openings 46 into and through the chamber 53 as indicated by arrows 66. Thus, the pumping vanes 60, cause a flow from the basket 11 through the openings 46 and 51, along the outer surface of the basket 11 to the filter elements 50.

While the filter means is illustrated as an element 50, it should be remembered that a single layer of filter material can be disposed adjacent the conical portion 48 to cover each and all of the openings such as 49. Preferably, the filter means is provided by a plurality of filter elements 50 which have an oblong or oval shape (FIG. 2). Each element 50 (FIG. 3) has a frame 70 of polyethylene or the like with the filter material such as a polyester mesh cloth 71 welded or attached to a top surface thereof. To provide means for forming a detachable connection or mounting of each of the filter elements 50 in the openings 49, the frame 70 is provided with a groove 72 which is defined by a side wall 74 and a somewhat resilient side wall 75. As illustrated, the side wall 74 is straight and the side wall 75 is provided by a curved flange. The curved flange biases the filter element 50 so that the peripheral edge of the opening 49 engages the side wall 74. To facilitate insertion of the filter element 50 into the openings 49, the frame adjacent the side wall 74 is provided with a tapered surface 76.

Due to the pulsating character of the flow through the filter element additional i.e. coaction of the main flow indicated by the arrows 62 and 63 and the counter flow 64, particles prevented from passing through the filter element 50 are held in a suspension 53 until disposed of during draining of the washing fluid from the tub 10. Thus, the filter elements 50 do not become clogged and inoperative even when a large amount of lint and other particles are present in the washing liquid or fluid. In addition, the position of the filter elements 50 and the provision of the pumping means formed by the pumping vanes 60 does not effect the utilizable space of the spin basket 11 during the washing operation. The filtering apparatus 8 of the present invention provides a satisfactory filtering of the washing liquid or fluid without requiring addditional conduits and pumps to remove fluid from the tub 10 and then reintroducing the removed fluid through a filter element disposed either outside of the tub 10 or above the tub.

Although various minor modifications might be suggested by those versed in the art, it should be understood that I wish to include within the scope of the patent granted hereon all such modifications as reasonably and properly come within the 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:

1. In a washing machine having a tub for containing washing fluid, a washing fluid filtering apparatus comprising:

a basket supported within the tub to form a chamber between the outside of said basket and the inside of said tub, said basket having a base portion and a wall portion, each portion having at least one opening which openings communicate the chamber with the interior of the basket;

means for creating a pulsating flow including a main flow and a partial counter flow of the fluid between the chamber and the basket through the opening in the base portion of said basket, said means for creating a pulsating flow causing a circulation of the fluid from said basket through the opening in the wall portion into and through the chamber; and

filter means disposed across each opening in the base portion of the basket for preventing the passage of particles contained in the washing fluid into the basket through the opening in the base portion of the basket whereby the partial counter flow through the filter means flushes particles from the filter means.

2. In a washing machine according to claim 1, wherein the means for creating a pulsating flow is disposed in the basket adjacent to the openings in the bottom portion thereof.

3. In a washing machine according to claim 1, wherein the washing machine includes an agitator having a base portion coaxially mounted in the basket for oscillating movement around an axis of the agitator with the base portion of the agitator being spaced from the base portion of the basket, and means for applying an oscillating movement to the agitator, and wherein said means for creating a pulsating flow comprises pump means disposed on the agitator for creating the main flow through the filter means during movement of the agitator in one direction and the counter flow through the filter means during movement of the agitator in the opposite direction.

4. In a washing machine according to claim 3, wherein the pump means comprise a plurality of pumping fins disposed on the base portion of the agitator to extend towards the base portion of the basket, each of said pumping fins having a spiral configuration so that during oscillating movement of the agitator, the pumping fins create a pulsating flow which includes flow in both directions through the filter means.

5. In a washing machine having a tub for containing a washing fluid, a basket mounted for rotation in said tub in spaced relation thereto to define a chamber between the exterior surfaces of the basket and the interior surfaces of the tub, said basket having a base portion provided with at least one opening and a wall portion provided with at least one opening with the openings of the base and wall portion communicating the interior of the basket with said chamber, an agitator coaxially mounted in said basket for oscillating move-

ment, means for selectively applying an oscillating movement to the agitator, and filter means removing particles from the washing fluid, the improvement comprising said filter means comprising:

filter material arranged to prevent passage of particles in the washing fluid from passing through the opening in the base portion of the basket; and

pumping means for creating a pulsating flow including a main flow in one direction of the washing fluid in the chamber through the filter material and into the basket and a partial counter flow in the opposite direction through the filter material, said pumping means causing circulation of the washing fluid in the basket through the opening in the wall portion of the basket into and through the chamber so that the partial counter flow through the filter material prevents clogging of the filter material by the particles filtered from the washing fluid.

6. In a washing machine according to claim **5,** wherein the agitator has a base portion overlying the opening provided with the filter material, and wherein the pumping means comprises pumping fins having a spiral configuration disposed on a lower surface of the base portion of the agitator to extend towards the opening provided with the filter material.

7. In a washing machine according to claim **6,** wherein the filter material is provided as a filter element detachably mounted in each of the openings of the base portion of the basket.

8. A washing machine comprising:

a tub for containing a washing fluid,

a basket mounted for rotation in spaced relationship in said tub to define a first chamber between the outer surface of the basket and the inner surface of the tub, said basket having a wall portion having at least one opening for communicating the chamber to the interior of the basket and having a base portion with at least one opening adjacent the axis thereof,

an agitator coaxially mounted in said basket for oscillating movement therein, said agitator having a base portion overlying said opening in the base portion of the basket and in spaced relationship to provide a pumping chamber, pumping means disposed in the pumping chamber for creating a pulsating flow including a main flow and a partial counter flow of fluid through the opening in the base portion of the basket between the first chamber and the pumping chamber, said pumping means circulating the fluid in the basket through the openings in the wall portion into and through the first chamber towards the opening in the base portion; and

a filter element disposed at the opening in the base portion of the basket to prevent passage of particles in the washing fluid from the first chamber through the openings and into the basket so that the partial counter flow prevents clogging of the filter element and the pulsating flow created by the pumping means causes a suspension of the particles, which are prevented from passing into the basket, in an area of the chamber adjacent to the openings in the base portion of the basket.

9. A washing machine according to claim **8,** wherein the pumping means are a plurality of fins disposed on a lower surface of the base portion of the agitator, said fins extending radially from the axis of the agitator along a spiral path.

10. A washing machine according to claim **9,** wherein the filter element comprises an elongated frame with the filter material stretched thereacross, said frame having means for detachably mounting the element in the opening in the base portion of the basket.

11. In a washing machine according to claim **4,** wherein each of the pumping fins has a portion positioned on the base portion of the agitator so that said portion of the fin moves over the filter means during oscillating movement of the agitator.

12. In a washing machine according to claim **6,** wherein each of the pumping fins has at least a portion positioned to move over the filter material during oscillating movement of the agitator.

13. A washing machine according to claim **9,** wherein each of the fins has a portion which is radially positioned on the agitator to move over the filter element disposed at the openings in the base portion of the basket during oscillating movement of the agitator.

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