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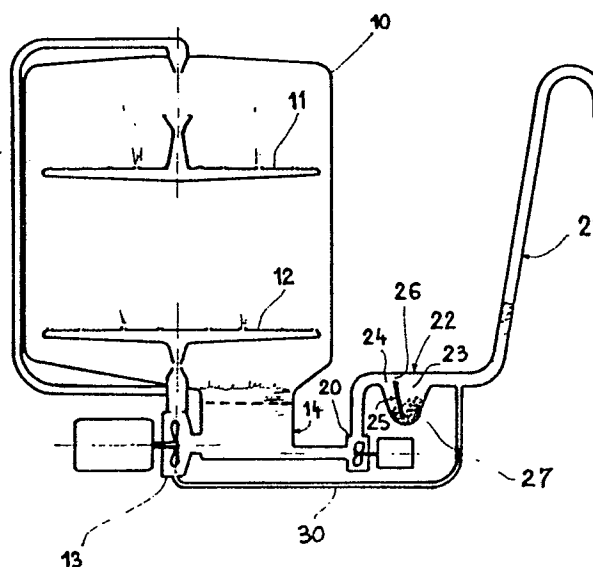
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⑤④ **Washing machine, particularly dishwashing machine, provided with a self-cleaning filter.**

⑤⑦ Washing machine, particularly dishwashing machine, provided with a self-cleaning filter for filtering the washing and rinsing liquid.

The filter consists of a container (22) having at least two chambers (23, 24) and containing a filtering mass (27) including granules with a density higher or lower than the liquid.

Preferably, the filter is connected with the hydraulic circuit of the machine between an outlet of the circulation pump (13) and the outlet of the discharge pump (20).



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DESCRIPTIONWASHING MACHINE, PARTICULARLY DISHWASHING
MACHINE, PROVIDED WITH A SELF-CLEANING FILTER

The present invention relates to a dishwashing machine, in particular a domestic dishwashing machine, provided with self-cleaning filter means capable of filtering the washing and rinsing liquid, in order to separate and eliminate the dirt particles, avoiding their redeposition on the articles to be washed.

A plurality of known washing machines, i.e. dishwashing machines or laundry washing machines, are provided with filters for protecting the pumps which are provided in the hydraulic circuit, or for retaining the dirt particles removed from the articles to be washed.

The problem relating to the washing liquid filtration is particularly critic in domestic dishwashing machines, which are generally provided with a washing liquid circulating pump and a discharge pump.

Usually, the dishwashing machines comprise a mechanical filter with relatively wide mesh grid in order to prevent objects from passing through and damaging the pumps, and a mechanical filter with fine mesh

grid in order to prevent the dirt particles from re-depositating on the articles to be washed, especially during the last rinsing phase.

5 Said filters are generally located on the bottom of the washing tub and have to be manipulated by the user for periodical cleaning operations; therefore, it can be difficult to clean them up and to locate them in the correct position.

10 Furthermore, said filters are often very complicated, easy to clog or unable to retain the very small particles suspended in the washing liquid.

Systems have been proposed for automatically cleaning said filters by means of a liquid jet in counterflow with respect to the normal direction during the washing period.

15 To this purpose it is necessary to modify the operating and control means of the apparatus; for instance, reversible pumps are to be provided, or an auxiliary duct having valves operated by the control means of the machine. This latter is, accordingly, complicated and unreliable, particularly because it uses valves through which liquid containing dirt particles flows.

20 The replacement of static filters with centrifugal filters has reduced the maintenance problems, but has caused further inconveniences in integrating said filters into the hydraulic circuit of the machines; above all, it still is difficult to separate dirt particles having a specific weight substantially equal to that of the liquid to be filtered.

30 Finally, attention must be paid to the growing demand of consumption reduction, in particular of

water; this demand contrasts with filter operating performances, especially in the case of self-cleaning filters, which usually require a greater water consumption.

5 It is very important, and is the main scope of the present invention, to provide a filter system able to intercept particles even of few microns, at the same time providing a very simple and effective cleaning operation automatically and without any manual intervention by the user.

10 Furthermore, the new system does not require any additional water consumption for its cleaning.

15 These scopes are attained, according to the invention, in a washing machine provided with a filter comprising a filtering mass formed by granules freely placed in a container having two chambers which are freely interconnected at the area in which said filtering mass lies when the filter is in operation.

20 Preferably, when the washing machine comprises a liquid circulating pump and a discharge pump, the filter is connected with the hydraulic circuit of the machine between the outlet of the circulating pump and the outlet of the discharge pump.

25 The features and advantages of the invention will become more clearly apparent from the following description, given by way of example with reference to the accompanying drawing, the only figure of which shows a diagrammatical representation of a preferred embodiment of a dishwashing machine provided with a filter according to the invention.

30 With reference to the drawing, the invention

relates to a dishwashing machine comprising a washing tub 10, with rotary spray arms 11 and 12 therein for spraying the washing and rinsing liquid onto the articles, said liquid being circulated by a circulating pump 13, the intake duct of which is connected to a sump 14 provided on the bottom of the tub 10 and the delivery duct of which branches towards the spray arms.

Furthermore, the dishwashing machine is provided with a discharge pump 20 capable of sucking the washing liquid from the sump 14 and discharging it through a drain hose 21.

According to the invention, a self-cleaning filter 22 is connected with the hydraulic circuit of the machine between the outlet of the circulating pump 13 and the outlet of the discharge pump 20.

The filter 22 comprises a container divided in two substantially vertical chambers 23, 24 by means of an internal partition 25.

Said filter chambers are freely interconnected to each other at their bottom, as the internal partition 25 extends until a given distance from the bottom of the container.

Moreover, said partition 25 may be provided with an opening 26 adjacent to its upper end; said opening providing a by-pass for the liquid flowing through the filter.

The opening 26 is provided to regulate the pressure in the chamber 23 in order to avoid unwanted water discharges and to improve the performance of the filtering mass.

In particular, the chamber 23 is connected

through a duct 30 with an outlet of the circulating pump 13; the chamber 24, on the other hand, is connected with the outlet of the discharge pump 20.

5 The filter 22 is also connected with the drain hose 21 of the machine.

On the bottom of the container a filtering mass 27 made of substantially spherical granules is freely placed.

10 The use of a granular filtering mass for liquid depuration is well known in several technical applications but a filtering system of this kind appears to be advantageous especially for treating large volumes of liquid during long lasting periods.

15 This certainly is a technical prejudice against its use in washing machines designed to filtrate reduced water amounts during very short periods.

Furthermore, a filter of this kind is to be integrated in machines, e.g. dishwashing and clothes washing machines, having very reduced size and provided with small internal space for housing additional devices.

20 Extremely important is the problem relating to the housing of the filtering mass, which is normally included between suitably perforated meshes in order to avoid dragging of granules by the flowing liquid.

25 The presence of said retainment means is very critical as they cause frequent clogging of the filter, in this way making it ineffective.

30 According to the invention, the filter 22 overcomes all these drawbacks simply and efficiently. It can have, in fact, very small dimensions, because

only a portion of the circulated liquid flows through it.

On the other hand, said filter is continuously working during the operation of the pumps, i.e. during washing liquid circulation; therefore, the whole liquid amount is statistically filtered during the complete washing cycle.

Moreover, the filtering mass is freely laid on the bottom of the filter and the by-pass in the partition between said vertical chambers prevents the pressure in the filter from reaching values so high as to cause the granular material to be dragged by the flowing liquid.

The granular material may be different by nature and dimensions, but in order to achieve the scopes of the invention stainless steel balls having a diameter of 0,5 to 5 mm have experimentally been found to be apt for the purpose, being capable of retaining small dirt particles of a size in the order of 20 microns.

According to the invention, the hydraulic circuit does not need any adjusting and control means; in particular it does not require valves which are usually unreliable when dirty water flows through them.

Essentially, the automatic cleaning is very efficient because the pressure of the water circulated in counterflow by the discharge pump is sufficient to move and mix up the filtering mass, thus removing and eliminating the dirt particles through said drain hose.

Obviously, the use of such a filter always requires a wide mesh grid at the suction side of the

pumps in order to protect them from possible items collected on the bottom of the tub.

Of course, the above described filter may be made and connected in different ways, without departing from the scope of the invention.

For instance, it may be configured like a siphon-type tube, the two siphon branches of which form the vertical chambers on the bottom of which the filtering mass is laid; in that case it is only necessary to provide a simple connecting duct between the two vertical siphon branches to provide the by-pass corresponding to the opening provided in the partition of the filter described above.

Furthermore, two or more series-connected filters may be provided, comprising relevant filtering masses of different granulometry; otherwise, said masses can be laid one upon the other within a same filter in order to achieve a selective filtration.

Moreover, the filtration may be performed during operation of the circulating pump while the discharge pump is inoperative, or vice-versa, during the filter cleaning phase.

As an alternative, the filter cleaning phase may be performed during operation of both pumps.

Attention must be drawn upon the fact that the filter according to the invention may be provided with granules having a density value other than the washing liquid.

The example described above clearly shows that said granules have a density which is higher than the water and rest, therefore, on the bottom of

the container.

On the contrary, when granules have a density value lower than the water (this is the case, for instance, of granules consisting of hollow glass balls),
5 the filter should be turned upside down with reference to the drawing, that is to say, with the chamber partition extending from the bottom of the container to a level adjacent to its top.

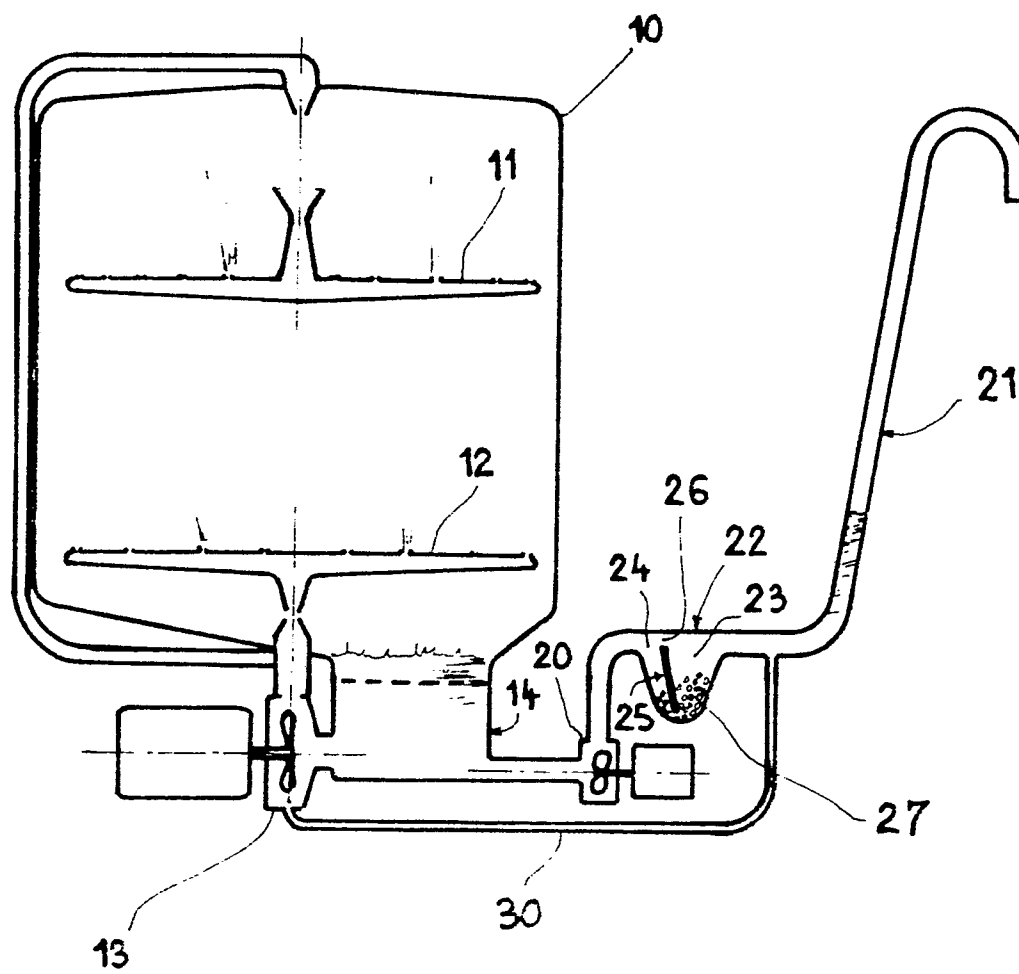
In this case, when the filter is working,
10 the granules are pushed upwards in the area of connection between the two chambers and are interested by the flow of liquid to be filtrated.

CLAIMS

1. Washing machine, more particularly domestic dish-
washing machine, having a hydraulic circuit for circulaa
ting and discharging the washing and rinsing liquid,
said circuit comprising at least a pump and a self-cleaa
5 ning filter, characterized in that said filter (22) is
provided with a filtering mass (27) of granular mate-
rial freely disposed in a container (22) which is proa
vided with at least two chambers (23, 24) interconnec-
ted at the area in which said filtering mass lies when
10 the filter is in operation.
2. Washing machine according to claim 1, characterized
in that said chambers (23, 24) are separated by an in-
ner partition (25) comprising at least a by-pass (26)
15 with respect to said granular filtering mass (27).
3. Washing machine according to claim 2, characterized
in that said chambers (23, 24) extend vertically and
are freely interconnected at their bottom, where said
20 filtering mass (27) is freely laid, said mass consi-
sting of granules the density of which is higher than
the washing liquid.
4. Washing machine according to claim 2, characterized
25 in that said chambers (23, 24) are freely interconnec-
ted at their upper portion where said filtering mass
lies when the filter is in operation, said mass consi-
sting of granules the density of which is lower than
the washing liquid.

5. Washing machine according to claim 1, comprising a liquid circulating pump and a discharge pump for said liquid, characterized in that said filter (22) is connected with the hydraulic circuit of the machine between an outlet of the circulating pump (13) and the outlet of the discharge pump (20).

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EUROPEAN SEARCH REPORT

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
Y	US-A-3 016 147 (COBB et al.) * Whole document *	1	A 47 L 15/42
A	---	5	
Y	FR-A- 388 414 (FRANC) * Whole document *	1	
A	---	2,3	
A	US-A-2 369 915 (QUINN) * Whole document * ---	1,2,3	
A	FR-A-2 287 887 (LICENTIA) * Whole document * -----	1,5	<div>TECHNICAL FIELDS SEARCHED (Int. Cl.4)</div> <div>A 47 L D 06 F B 01 D</div>
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 04-07-1986	Examiner SCHARTZ J.
<div>CATEGORY OF CITED DOCUMENTS</div> <div> X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document </div> <div> T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document </div>			