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(54) A method of filtering the washing and/or rinsing liquid in a dishwasher and apparatus for implementing the method

(57) The invention relates to a method of filtering the washing liquid in a dishwasher comprising a tank (1) for holding the items to be washed, in which the flow of washing liquid is drawn from the tank by a main recirculation pump (25) drawing from the bottom (9) of the tank (1) and is admitted to the tank through a plurality of spray nozzles (6) for a predetermined period of time, the flow being passed through a circuit comprising a primary screen (10) disposed in the bottom (9) of the tank and a perforated basket (11) for retaining the large particles of dirt removed from the items to be washed, as well as through a chamber (14) disposed beneath the primary screen (10), at least partially surrounding the perforated basket (11), and having filtering elements (16) for retaining fine dirt particles.

The method includes a step in which a portion of the flow of washing liquid is drawn off by means of a suitable auxiliary pump (29) at a point of the circuit downstream of the filtering elements (16) for retaining the fine particles, the portion of washing liquid drawn off is sent to an additional filtering member (34) and, after filtration, the portion is returned to the flow of washing liquid.

The method thus achieves the result of an ability to perform washing and rinsing cycles in a dishwasher with circulating liquids which are substantially free of dirt particles in suspension.

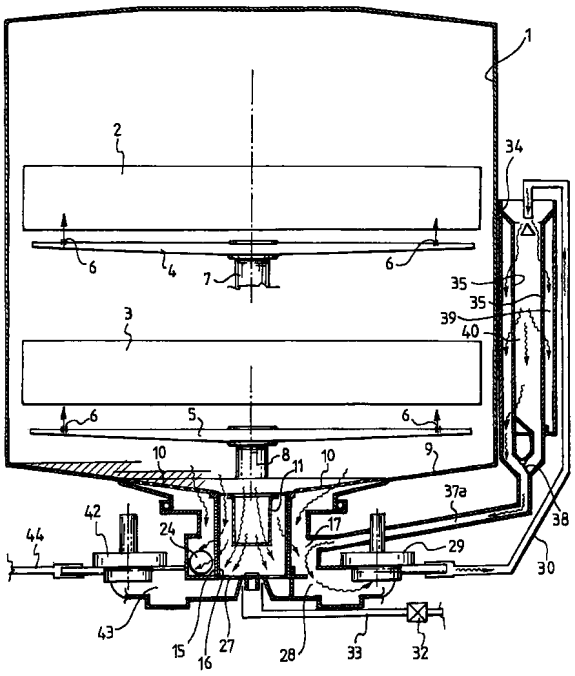

FIG. 2

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Description

[0001] The present invention relates to a method of filtering the washing liquid in a dishwasher comprising a tank for holding the items to be washed, the flow of washing liquid being drawn from the tank by a main recirculation pump drawing from the bottom of the tank and being admitted to the tank through a plurality of spray nozzles for a predetermined period of time, the flow being passed through a circuit comprising a primary screen disposed in the bottom of the tank and a perforated basket for retaining the large particles of dirt removed from the items to be washed, and through a chamber disposed beneath the primary screen, at least partially surrounding the perforated basket, and having filtering elements for retaining fine dirt particles.

[0002] The invention also relates to apparatus for implementing the method.

[0003] The term "washing liquid" is intended to define in the following description any solution with detergent for use in a dishwasher during the actual washing stages as well as the water used during the rinsing stages which take place after and between the washing stages.

[0004] As is known, dishwashers of the type mentioned above provide for various operating cycles to be selected by the user according to the amount of food residues present on the dishes, this definition including plates, glasses, cutlery, pots and kitchen utensils.

[0005] The greater the degree of soiling of the dishes and the more efficient the cycle selected for removing the dirt, the greater is the degree of contamination of the washing liquid recycled.

[0006] In fact, although the primary screen and the perforated basket in the bottom of the tank can retain the larger particles of dirt and the other smaller particles are retained by the further filtering means commonly known as micro-filters, a quantity of finely reduced and pulverized particles continues to be recycled in the tank.

[0007] These particles are therefore deposited not only on the dishes, leaving undesired marks, but also on the walls of the tank and of the members responsible for the recirculation, leading, in time, to the formation of blockages.

[0008] To eliminate this problem, the use of a large number of rinsing stages has been proposed, but without achieving acceptable elimination of the fine particles of food residues which sometimes remain obstinately caught even in the small areas of contact between the dishes arranged in the tank.

[0009] The increase in the number of rinsing stages leads, amongst other things, to a considerable increase in water consumption, which is contrary to the norms in force which require consumption to be limited.

Methods based on very sophisticated filtering devices including filtering surfaces which can retain even very fine dirt particles, combined with devices for washing the filtering surfaces with a counter-flow so as to keep them as effective as possible by frequent cleaning operations, have also been proposed.

[0010] The subject of the Applicant's copending European patent application No. 98830456.4 represents an example of a technical solution to the problem inherent in the filtration of the washing and/or rinsing liquid in dishwashers, although this is also not free of problems such as limited filtration efficiency and the risk of rapid clogging of the micro-filter surfaces disposed in the main circuit of the washing flow.

[0011] In fact, according to the prior art mentioned above, the entire quantity of washing liquid circulated by the main cycle pump is filtered during the working cycles as it passes from the tank to the filtering members and from these back into the tank.

[0012] The particles which are not retained by the filtering members therefore continue to recirculate together with the liquid during the working stages with the risk that even the fine particles retained by the filtering members may be detached therefrom and go back into circulation.

[0013] The object of the present invention is to provide a filtering method which as far as possible eliminates all of the residues and dirt from the washing liquid during the recycling thereof, also avoiding the risk of premature clogging of the filtering members fitted in the working circuit for the flow of washing liquid.

[0014] This object is achieved by the method and the apparatus defined by the following claims.

[0015] The invention will now be described in greater detail with reference to a preferred embodiment thereof, illustrated by way of non-limiting example, in the appended drawings, in which:

Figure 1 is a schematic vertical cross-section of a dishwasher provided with a first embodiment of the filtering apparatus for implementing the method of the invention,

Figure 2 is a schematic vertical cross-section of a dishwasher provided with a second embodiment of the filtering apparatus for implementing the method of the invention,

Figure 3 is schematic view similar to that of Figure 2 with the valve members arranged in the position for washing the filtering elements with a counter-flow,

Figure 4 is a schematic vertical cross-section of the bottom portion of a dishwasher provided with a third embodiment of the filtering apparatus for implementing the method of the invention,

Figure 5 is a schematic section similar to that of Figure 4 with the valve members arranged in the position for washing the filtering elements with a counter-flow.

With reference to the above-mentioned drawings and in particular to Figures 1, 2 and 3, the washing tank of a conventional dishwasher is indicated 1 and is equipped with at least two baskets 2 and 3 for the arrangement, in conventional manner, of the dishes to be washed, and at least two rotors 4 and 5 each having nozzles, schematically indicated 6, for spraying the washing or rinsing liquid, according to the stage of the cycle, against the items to be washed, not shown in the drawings.

[0016] The rotors 4 and 5 are freely rotatable on respective support pillars 7 and 8, in conventional manner.

[0017] The bottom 9 of the tank 1 has a primary screen 10 in the centre of which there is a perforated basket 11 which can be removed manually.

[0018] The screen 10 and the basket 11 have respective holes through which the washing or rinsing liquid can pass and which can retain the large particles of food residues which are removed from the items during washing.

[0019] In a position below the primary screen 10, the apparatus comprises a first chamber 12 which communicates axially, by means of an annular opening 13, with a further chamber which will be referred to further below. A second chamber 14 is arranged concentrically with the basket 11 and with the first chamber 12.

[0020] The chamber 14 has a cylindrical wall 15 with an inner surface covered by a filtering element 16. This filtering element 16 blocks the passage of very tine dirt particles which would otherwise remain in suspension in the washing water.

[0021] Around the second chamber 14, as mentioned above, the apparatus has a third chamber 17 which extends axially as far as the wall 18 constituting the base of the first chamber 12, with which the third chamber 17 communicates via the aforementioned annular opening 13.

[0022] The connection with the wall 18 is formed, in the embodiment illustrated, by means of an annular seal 19 inserted between a collar 20 fixed to the wall 18 and an opposed collar 21 fixed to the wall 22 which constitutes the periphery of the chamber 17.

[0023] The third chamber 17 is connected by means of an opening 23 to the intake duct 24 of the recirculation pump 25 of which the output, not shown, supplies the nozzles 6 on the rotors 4 and 5 in known and conventional manner.

[0024] The base 26 of the second chamber 14 has a duct 27 which puts the chamber 14 into communication with the intake duct 28 of a pump 29 which has an output 30 and which, as will be explained below, can act as a discharge pump and, alternatively, as a further recycling pump, in the implementation of the filtration method of the present invention.

[0025] The base 26 also has a nozzle 31 connected permanently to the water supply coming from the water mains, by means of an on/off solenoid valve 32 disposed in a pipe 33 and controlled by the operating cycle of the dishwasher.

[0026] In the embodiment illustrated, the nozzle 31 is positioned on the base 26 in a position coaxial with the chamber 14 and with the basket 11 so as to direct its jet against the cylindrical filtering surface 16 of the chamber 14 and against the basket.

[0027] With particular reference to the embodiment of Figure 1, the apparatus comprises an additional filtering member 34 having, in its interior, walls 35 with filtering elements for retaining very fine dirt particles.

[0028] The filtering member 34 is positioned vertically adjacent the rear wall of the tank 1 and is connected to the output 30 of the pump 29 by means of a pipe 36. The outlet pipe 37 of the filtering member 34 opens directly into the tank 1 in the vicinity of the bottom 9. Instead of discharging into the filtering member 34, the pipe 36 may be reversed towards the discharge as indicated schematically at 36a.

[0029] During the working cycle of the dishwasher, whilst the liquid is circulated by the pump 25, a portion of the liquid is drawn off by the pump 29 through the duct 28 and is sent to the filtering member 34 through the pipe 36.

[0030] After it has passed through the walls 35 and left the fine dirt particles present in suspension in the liquid on the filtering elements thereof, the liquid is readmitted directly to the tank 1 through the pipe 37. This additional filtration step performed on a portion of the total flow of washing liquid lightens the work of the filtering elements 16 of the chamber 14 which, in contrast, are struck by the entire flow of washing liquid throughout the cycle.

[0031] The result is more effective washing by the dishwasher.

[0032] Alternatively, the additional filtration step by means of the filtering member 34 may take place periodically during corresponding pauses of the main pump 25, that is, during pauses in the working cycle.

[0033] It is clear from the foregoing that, during the washing cycle, whilst the large particles of food residues removed from the items being washed are retained by the primary screen 10 and collected in the basket 11, the remaining particles broken up and pulverized during the various movements from the tank 1 to the nozzles 6 under the action of the pump 25 are retained by the filtering elements 16 disposed on the internal surface of the cylindrical wall 15 of the second chamber 14 as well as by the filtering elements provided on the walls 35 of the additional filtering member 34.

[0034] The path of the washing liquid during recycling is illustrated by the arrows of Figure 1.

[0035] Upon completion of the recycling stage, the pump 29 can be operated as a discharge pump and the liquid can be directed towards the end 36a of the pipe 36 opening outside the filtering member 34.

Clean water can advantageously be admitted to the second chamber 14 through the nozzle 31 during the discharge stage by a suitable command imparted to the solenoid valve 32 by the control cycle.

[0036] The jet of clean water from the nozzle 31 helps to wash the filtering elements 16 and also the basket 11 with a counter-flow.

[0037] With reference to Figures 2 and 3, the filtration method already described with reference to Figure 1 is implemented with the variation that the flow filtered by the member 34 is no longer admitted directly to the washing tank 1 but is sent back into the duct 28 immediately upstream of the intake of the pump 29.

[0038] The output pipe from the filtering member 34 has been indicated 37a in Figure 2 and 3.

[0039] The filtering member 34 in the embodiment shown in Figures 2 and 3 comprises a three-way valve 38 which enables the pipe 37a to be put into communication with the annular inner portion 39 of the member 34, where the liquid filtered by the walls 35 collects, as shown in Figure 2, or with the axial inner chamber 40, as shown in Figure 3.

[0040] The latter position of the valve 38 enables the additional filtering member 34 to be washed by a counterflow, removing the impurities retained by the filtering walls 35.

[0041] During this washing stage, clean water may be admitted not only through the nozzle 31 but also directly into the filtering member 34 through an additional nozzle 41.

[0042] The apparatus of Figures 2 and 3 comprises a further pump 42 for discharging the washing liquid. This pump is connected to the chamber 14 by an intake duct 43 via the duct 27 formed in the base 26 of the chamber 14.

[0043] Discharge from the dishwasher takes place through a duct 44.

[0044] It can be appreciated from the foregoing description that, with the embodiment of the apparatus of Figures 2 and 3, the filtration method also comprises a step in which a portion of the flow coming from the tank 1 is drawn off by the pump 29 during the execution of a washing cycle in which the recycling pump 25 is active, and is sent, via the duct 30, to the additional filtering member 34.

[0045] From there, after filtration, the said portion of the flow is made to join the main flow in the chamber 17 which is directly in communication with the duct 28.

[0046] The filtration step performed by the pump 29 with the additional filtering member 34 may take place simultaneously with the operation of the washing cycle implemented by the pump 25, or during predetermined pauses thereof.

[0047] A further embodiment of the apparatus for implementing the above-described filtration method can be seen in Figures 4 and 5.

[0048] The additional filtering member is constituted by a structure comprising a primary screen 10a, a perforated basket 11a, a chamber 14a with a filtering wall 15a, with a base 26a, and ducts 27a formed therein.

[0049] The structure of the additional filtering member is disposed beneath the bottom 9 of the tank 1 in a position adjacent the main filtering structure associated with the primary screen 10.

[0050] This structure further comprises a chamber 17a which is not described further since it has characteristics similar to those of the chamber 17.

[0051] A nozzle 31a is provided for performing the washing and this nozzle is disposed in the base 26a.

[0052] The chamber 14a is put into communication with a manifold 28a which leads into the pump 29a, corresponding to the pump 29 of the embodiments described above, into which the duct 28 coming from the main filtering member also leads.

[0053] The output 30a of the pump 29a is connected to a three-way valve 38a which, in a first position, puts the pump into communication with a duct 37b which, in the embodiment illustrated, opens directly into the washing tank 1 in the vicinity of the bottom 9 thereof.

[0054] In the other position, the valve 38a puts the pump 29a into communication with a pipe 44a leading to the outlet, as shown in Figure 5.

[0055] This position of the valve 39a is used during the washing of the filters when clean water is admitted through the nozzles 31 and 31a.

[0056] The filtration method implemented by the apparatus of Figures 4 and 5 corresponds substantially to that implemented by the apparatus shown in Figure 1, in which the liquid coming out of the additional filtering member is admitted directly to the tank 1.

[0057] According to the invention, the result of an ability to perform washing and rinsing cycles in a dishwasher with circulating liquids which are substantially free of dirt particles in suspension is thus achieved.

Claims

1. A method of filtering the washing liquid in a dishwasher comprising a tank (1) for holding the items to be washed, the flow of washing liquid being drawn from the tank by a main recirculation pump (25) drawing from the bottom (9) of the tank (1) and being admitted to the tank through a plurality of spray nozzles (6) for a predetermined period of time, the flow being passed through a circuit comprising a primary screen (10) disposed in the bottom (9) of the tank and a perforated basket (11) for retaining the large particles of dirt removed from the items to be washed, and through a chamber (14) disposed beneath the primary screen (10), at least partially surrounding the perforated basket (11), and having filtering elements (16) for retaining fine dirt particles, characterized in that it includes a step in which a portion of the flow of washing liquid is drawn off by means of a suitable auxiliary pump (29, 29A) at a point in the circuit downstream of the filtering elements (16) for retaining the fine particles, the portion of washing liquid drawn off is sent to an additional filtering member (34, 34a) and, after filtration, the portion is returned to the flow of

washing liquid.

2. A method according to Claim 1, characterized in that the portion of the flow of washing liquid drawn off by the auxiliary pump (29, 29a) is returned, after the additional filtration, into the flow of washing liquid passing through the tank (1) containing the items to be washed.

3. A method according to Claim 1, characterized in that the portion of the flow of washing liquid drawn off by the auxiliary pump (29, 29a) is returned, after additional filtration, into the flow of washing liquid immediately upstream of the point in the circuit at which the portion was drawn off.

4. A method according to Claims 1 to 3, characterized in that the step of the drawing-off, the additional filtration, and the return of the portion of the flow of washing liquid into the flow takes place simultaneously with the recycling of the washing flow performed by the main recirculation pump (25).

5. A method according to Claim 4, characterized in that the step of the drawing-off, the additional filtration, and the return of the portion of the flow of washing liquid into the flow takes place for intermittent periods of time shorter than that imparted by the main recirculation pump (25).

6. A method according to Claims 1 to 3, characterized in that the stage of the drawing-off, the additional filtration, and the return of the portion of the flow of washing liquid into the flow takes place during a pause of the main recirculation pump (25).

7. A method according to Claims 1 to 6, characterized in that it includes a step in which the additional filtering member is washed in a counter-flow, the washing liquid used being discharged outside the tank.

8. Apparatus for implementing the method according to Claims 1 to 7, comprising a tank (1) for holding the items to be washed, a main recirculation pump (25) for drawing the flow of washing liquid from the bottom (9) of the tank and admitting it to the tank through a plurality of spray nozzles (6) for a predetermined period of time, a primary screen (10) disposed in the bottom (9) of the tank and a perforated basket (11) for retaining the large particles of dirt removed from the items to be washed, and a chamber (14) disposed beneath the primary screen (10), at least partially surrounding the perforated basket (11), and having filtering elements (16) for retaining fine dirt particles, characterized in that it includes additional filtering means (34, 34a) arranged in parallel with the chamber (14) disposed beneath the primary screen (10) and at least partially surrounding the basket (11), as well as an auxiliary pump (29, 29a) for drawing off a portion of the flow of washing liquid and for sending it to the additional filtering means (34, 34a).

9. Apparatus according to Claim 8, characterized in that the additional filtering means (34, 34a) have filtering elements (35, 35a) for retaining fine dirt particles.

10. Apparatus according to Claims 8 and 9, characterized in that the additional filtering means (34a) are disposed beneath the bottom (9) of the tank (1) for holding the items to be washed.

11. Apparatus according to Claims 8 to 10, characterized in that the additional filtering means (34) are disposed along the rear vertical side of the tank (1) for holding the items to be washed.

12. Apparatus according to Claims 8 to 11, characterized in that it includes a valve member (38) for reversing the direction of the flow in the additional filtering means and washing the surfaces of the filtering elements (34) of the filtering means with a counter-flow.

13. Apparatus according to Claims 8 to 12, characterized in that it includes a nozzle (41, 31a) for the supply of clean washing water to the additional filtering means (34, 34a) from the exterior.

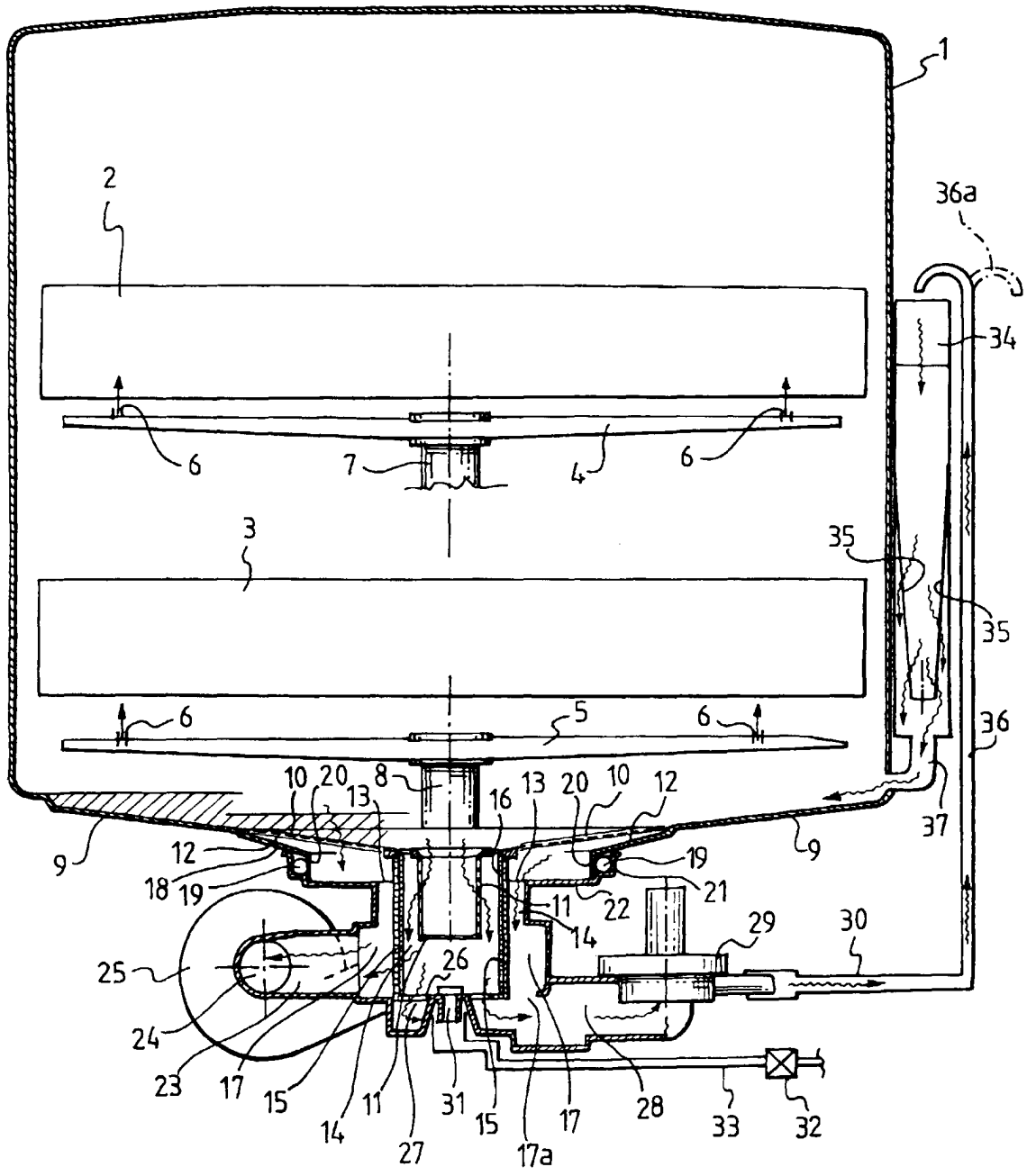
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FIG.1

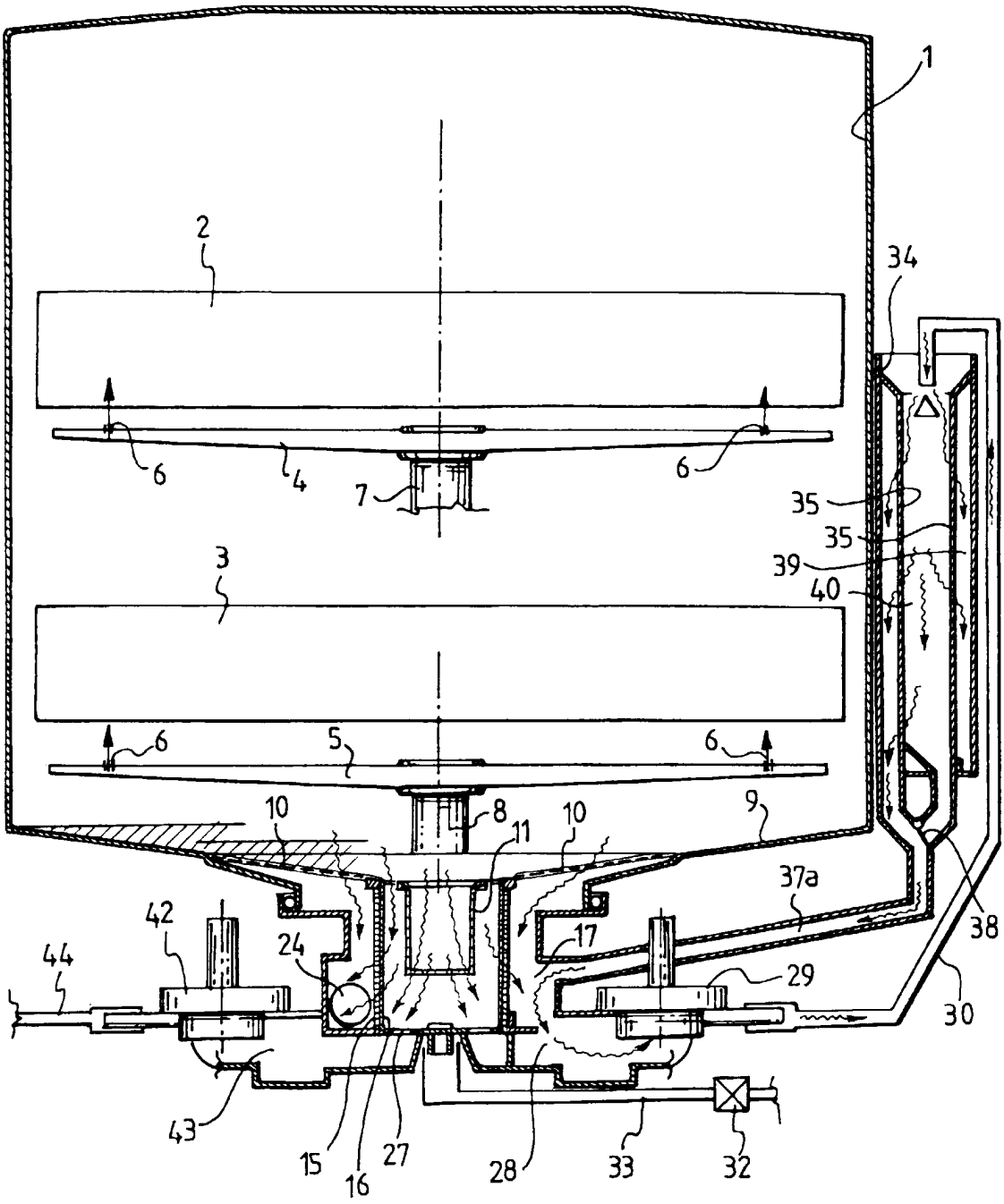
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FIG.2

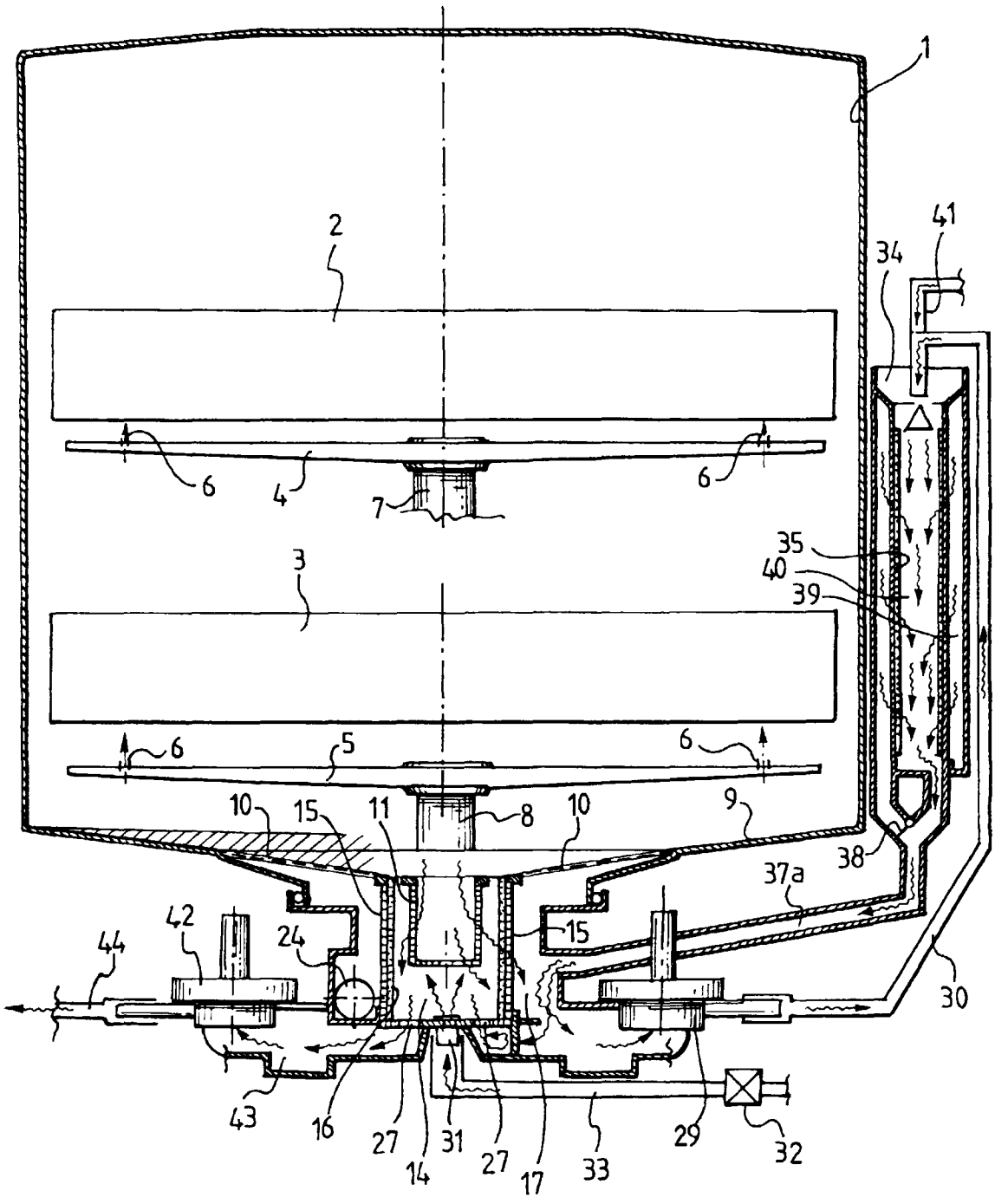
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FIG.3

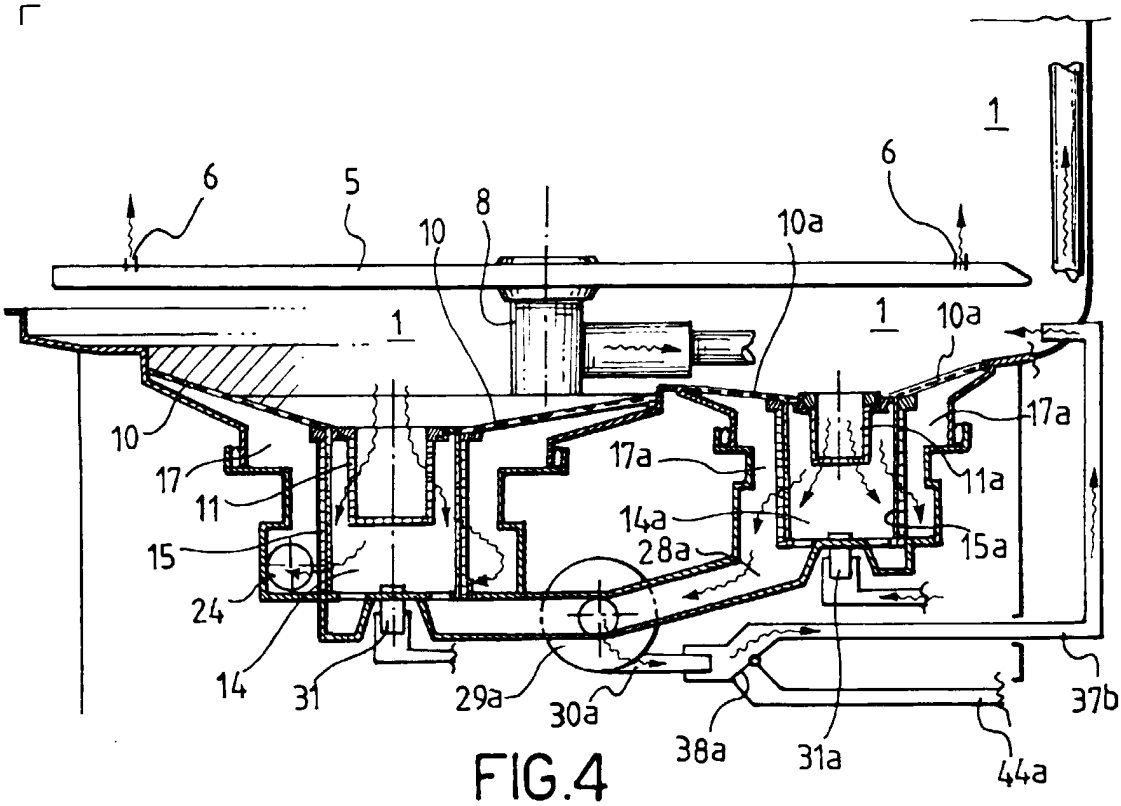
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FIG.4

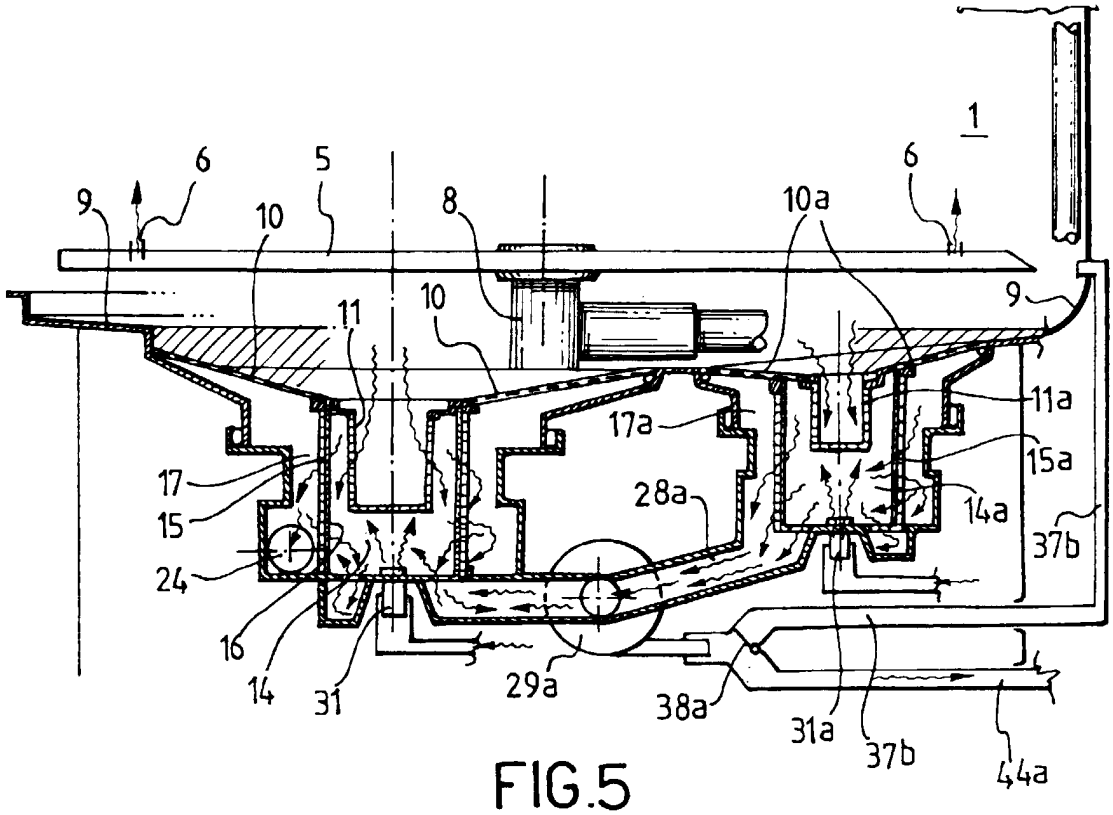
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FIG.5

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 98 83 0569

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.6)
X A	US 4 346 723 A (HOBART CORPORATION) 31 August 1982 * the whole document *	1,2,4, 7-10 3,5,6, 11,12	A47L15/42
A	EP 0 198 496 A (ZANUSSI ELETTRODOMESTICI S.P.A.) 22 October 1986 * the whole document *	1,3,4, 7-10	

TECHNICAL FIELDS SEARCHED (Int.Cl.6)

A47L

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	20 April 1999	Courrier, G

CATEGORY OF CITED DOCUMENTS

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