(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 2 201 885 A1**

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
30.06.2010 Bulletin 2010/26

(51) Int Cl.:
A47L 15/42 *(2006.01)* ***D06F 39/00*** *(2006.01)*

(21) Application number: **09015603.5**

(22) Date of filing: **17.12.2009**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO SE SI SK SM TR
Designated Extension States:
AL BA RS

(30) Priority: **22.12.2008 IT RN20080067**

(71) Applicant: **Indesit Company S.p.A.**
60044 Fabriano (AN) (IT)

(72) Inventors:
- **Benedetto, Gianluca**
  07024 La Maddalena (Olbia-Tempio) (IT)
- **Brugnera, Maria Chiara**
  30174 Mestre (Venezia) (IT)

(74) Representative: **Paolizzi, Marco et al**
C/o Bugnion S.p.A.
Via A. Valentini, 11/15
47900 Rimini (IT)

(54) Dishwasher

(57) A dishwasher comprises:
- a washing compartment (2) designed to accommodate the articles to be washed;
- spraying means (3) for spraying a washing liquid in the washing compartment (2);
- a motor-driven pump (4);
- ducting means (5) for connecting the washing compartment (2) and the spraying means (3), said pump (4) being located along the ducting means (5) in order to pump the washing liquid from the washing compartment (2) to the spraying means (3);
- means (6) for measuring at least one physical property of the washing liquid, comprising a sensor (60) located in the washing compartment (2) or along the ducting means (5) and designed to detect the dirtiness of the washing liquid at the sensor (60).

At least during each reading performed by the sensor (60) for measuring the dirtiness of the washing liquid, the dishwasher (1) adopting a first operating reference condition in which the flow processed by the pump (4) substantially always adopts the same predetermined value.
[Figure 1]

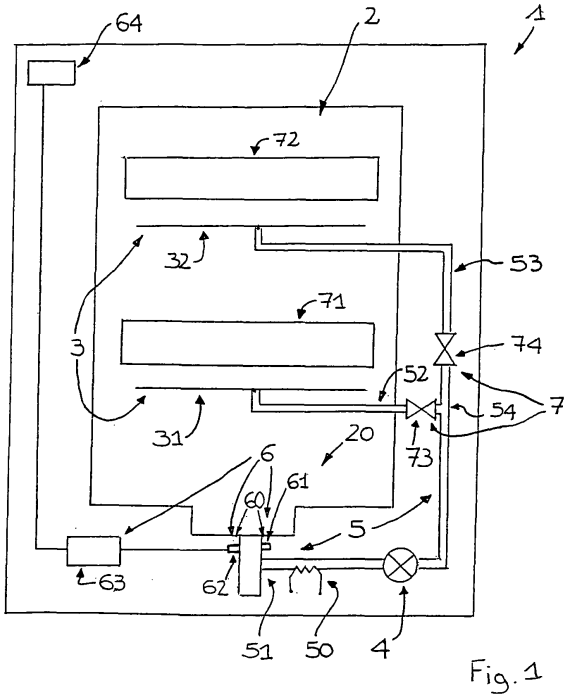

Fig. 1

EP 2 201 885 A1

Description

[0001] This invention relates to a dishwasher.

[0002] There are prior art dishwashers which, depending on the dirtiness of the dishes to be washed, select several washing cycle parameters (for example, the length and number of rinses, etc.).

[0003] Such a dishwasher usually comprises:

- a washing compartment designed to accommodate the articles to be washed;
- spraying means for spraying a washing liquid in the washing compartment;
- a motor-driven pump;
- ducting means for connecting the washing compartment and the spraying means, said pump being located along the ducting means in order to pump the washing liquid from the washing compartment to the spraying means;
- a turbidity sensor located along the ducting means for detecting the dirtiness of the washing liquid passing the sensor. The turbidity sensor is preferably located in a recess made on the bottom of the washing compartment, the recess being part of one end of the ducting means.

[0004] The turbidity of the washing liquid is measured by the dishwasher during an initial step of the washing cycle.

[0005] Depending on the turbidity measured, the dishwasher implements a more or less vigorous cycle.

[0006] However, the turbidity measurement may be influenced by the particular conditions in which that measurement is performed.

[0007] For example, more or less washing liquid turbulence can distort the correct measurement.

[0008] That could mean that the dishwasher makes a mistake when assessing how dirty the dishes are and consequently selects inappropriate washing parameters. In practical terms, that could result in excessive energy or detergent consumption if the washing selected were more vigorous than needed. Alternatively, if the washing selected by the dishwasher were less vigorous than necessary, it might not be enough to clean the dishes properly.

[0009] In this context, the technical purpose which forms the basis of this invention is to propose a dishwasher that overcomes the above-mentioned disadvantages of the prior art.

[0010] In particular, this invention has for an aim to provide a dishwasher which allows reliable measurement of the dirtiness of dishes to be washed.

[0011] This invention also has for an aim to provide a dishwasher which allows reliable measurement of the dirtiness of dishes to be washed without using particularly sophisticated and expensive measuring instruments.

[0012] The technical purpose indicated and the aims specified are substantially achieved by a dishwasher comprising the technical features described in one or more of the appended claims.

[0013] Further features and advantages of the invention are more apparent in the non-limiting description which follows of a preferred, non-limiting embodiment of a dishwasher, illustrated in the accompanying drawings, in which Figure 1 is a schematic view of a dishwasher in accordance with this invention.

[0014] In Figure 1 the numeral 1 denotes a dishwasher in accordance with this invention.

[0015] The dishwasher 1 comprises:

- a washing compartment 2 designed to accommodate the articles to be washed;
- spraying means 3 for spraying a washing liquid in the washing compartment 2.

[0016] Advantageously, the washing liquid comprises water, to which detergent, rinse aid, etc. may be added. After coming into contact with the dishes, the washing liquid also comprises the dirt (usually condiments and food residues) removed from the dishes washed.

[0017] Advantageously, the dishwasher 1 comprises a motor-driven pump 4. The motor-driven pump 4 is preferably a variable speed pump. In addition to a nominal speed and a zero speed, the variable speed pump 4 also has other operating speeds. The pump 4 comprises a rotating impeller. In particular, the pump 4 is of the centrifugal type.

[0018] The dishwasher 1 also comprises ducting means 5 connecting the washing compartment 2 and the spraying means 3. The pump 4 is located along the ducting means 5 in order to pump the washing liquid from the washing compartment 2 to the spraying means 3. Therefore, the washing liquid passes through the pump 4. Advantageously, the ducting means 5 may connect the spraying means 3 to the bottom 20 of the washing compartment 2. In the bottom 20 of the compartment, the washing liquid sprayed by the spraying means 3 gathers due to the effect of gravity and (as already indicated) may be pumped back to the spraying means 3.

[0019] The dishwasher 1 also comprises means 6 for determining at least one physical property of the washing liquid. Said determining means 6 comprise a sensor 60 located in the washing compartment 2 or along the ducting means 5.

[0020] The turbidity sensor 60 is preferably located in a recess made on the bottom of the washing compartment 2, the recess being part of one end of the ducting means 5.

[0021] Appropriately, the sensor 60 can detect the dirtiness of the washing liquid (preferably in transit) at the sensor 60. Advantageously, the sensor 60 is a turbidity sensor. It comprises an emitter 61 of a beam of light and a receiver 62 which is sensitive to the beam of light: The washing liquid is made to pass between the emitter 61 and the receiver 62. Appropriately, the receiver 62 is opposite the emitter 61. The greater the intensity of the

beam of light striking the receiver 62, the cleaner the washing liquid is. The greater the turbidity of the washing liquid is, the more contaminated it is. Typically, the contamination is dirt removed from the dishes, but as is described in more detail below, the sensor 60 could also be used to measure the amount of rinse aid contained in the washing liquid.

[0022] In an alternative embodiment, the sensor 60 could comprise two electrodes and measure the electrical conductivity of the washing liquid located between the two electrodes.

[0023] At least during each reading performed by the sensor 60 for measuring the dirtiness of the washing liquid, the dishwasher 1 adopts a first operating reference condition. This is the case for the entire life of the dishwasher 1.

[0024] Depending on the washing cycle, the reading by the sensor 60 for measuring the dirtiness of the washing liquid might not occur during the washing cycle or it might occur one or more times during the washing cycle.

[0025] In the first operating reference condition, the flow processed by the pump 4 substantially always adopts the same predetermined value (which may also be zero). The value is always the same irrespective of the washing cycle implemented by the dishwasher 1. The expression "the flow processed by the pump 4" refers to the flow of washing liquid which passes through the pump 4.

[0026] In the first operating reference condition, the pressure head of the pump 4 adopts a predetermined value which is always substantially the same. It is known that a pump (in particular a centrifugal pump) may adopt predetermined combinations of pressure head and flow values. Said combinations depend on the speed of rotation of the pump and the resistance of the circuit (linked to circuit load losses).

[0027] As is explained in more detail below, to adopt the first operating reference configuration, the dishwasher 1 acts either on the speed of rotation or on the geometry of the ducting means 5 (for example, by introducing narrowings in the transit cross-section of the ducting means 5).

[0028] As well as being used to allow measurement of the dirtiness, the sensor 60 could have other applications, for example for checking that the correct amount of rinse aid has been dispensed (such information could provide the user with indications about how much rinse aid is left). As becomes clearer below, the dishwasher 1, in its lifetime, at least during each reading performed by the sensor 60 for checking correct dispensing of the rinse aid, adopts a second operating reference condition. In the second operating reference condition, the flow processed by the pump 4 substantially always adopts the same predetermined value (which may also be zero; even with zero flow the sensor 60 is in a zone flooded with the washing liquid).

[0029] The predetermined value adopted by the flow processed by the pump 4 in the first operating reference condition may or may not coincide with that adopted in the second operating condition. In particular, the first operating reference condition may coincide with the second operating reference condition.

[0030] The first and second operating reference conditions are linked to particular operating conditions in which the dishwasher attempts to create standardised conditions to allow a better comparison of the measurements performed by the sensor 60. However, they do not correspond to the dishwasher 1 normal operating conditions (meaning that compared with the length of an entire washing cycle, the dishwasher 1 adopts the first or the second operating reference condition for a very limited time). During a time interval before and/or after the adoption of said first operating reference condition, the dishwasher 1 adopts a washing operating condition in which the flow processed by the pump 4 adopts at least one non-zero value different from that adopted during the first operating reference condition.

[0031] Similarly, during a time interval before and/or after the adoption of said second operating reference condition, the dishwasher 1 adopts a washing operating condition in which the flow processed by the pump 4 adopts at least one non-zero value different from that adopted during the second operating reference condition.

[0032] In the first operating reference condition the pump 4 adopts a first predetermined speed of rotation value that is always the same. Said first predetermined value may even be equal to 0. That allows the sensor 60 reading to be performed in conditions which are standardised as far as possible (with obvious advantages in terms of reading repeatability and stability).

[0033] Advantageously, in the first operating reference condition the flow processed by the pump 4 is between 5 and 50 litres/minute, preferably between 10 and 30 litres/minute, advantageously being equal to 20 litres/minute.

[0034] The first predetermined speed of rotation value is adopted both if two or more readings are performed during the same washing cycle and if the readings are repeated in a series of separate washing cycles.

[0035] At least during a portion of a washing cycle performed by the dishwasher 1, the pump 4 in contrast adopts at least one operating condition (suitably associated with the washing operating condition) in which it adopts at least a second non-zero speed of rotation value different from the first value.

[0036] Irrespective of the parameters set by the user and/or irrespective of the moment of the washing cycle when the reading is performed, the first operating reference condition is adopted by the dishwasher 1 at least during each reading performed by the sensor 60 for measuring the dirtiness of the washing liquid.

[0037] Advantageously, when the dishwasher 1 adopts the first operating reference condition, the pump 4 reduces its speed of rotation in order to reduce the turbulence of the washing liquid at the sensor 60. The

measurement performed by the turbidity sensor 60 could be adversely affected by the turbulence of the washing liquid.

[0038] The first operating reference condition also applies to a first predetermined time period immediately preceding the reading performed by the sensor 60 and is intended to measure the dirtiness of the washing liquid. This allows the sensor 60 to perform the reading after the flow in the ducting means 5 has stabilised (avoiding readings performed during transition periods).

[0039] Advantageously, the first predetermined time period is between 15 seconds and 4 minutes, preferably between 2 and 3 minutes.

[0040] The dishwasher 1 also comprises means for changing the geometry of the ducting means 5 whose activation determines a change in the load losses of the ducting means 5, allowing the dishwasher 1 to switch from the washing operating condition to the first operating reference condition or vice versa.

[0041] For example, but without limiting the scope of the invention, the means for changing the geometry comprise elements able to narrow or widen a cross-section of the ducting means 5 in which the washing liquid flows. To switch from the washing operating condition to the first operating reference condition, the means for changing the geometry of the ducting means 5 determine an increase in the load losses and a consequent reduction in the flow processed by the pump 4.

[0042] The dishwasher 1 comprises a first rack 71 on which the articles to be washed can be placed. The spraying means 3 comprise a first sprayer 31 located under the first rack 71.

[0043] Advantageously, the dishwasher 1 comprises means 7 for shutting off the washing liquid which, at least during each reading performed by the sensor 60 for measuring the dirtiness of the washing liquid, prevent the washing liquid from flowing through the first sprayer 31 (advantageously, this occurs irrespective of the parameters set by the user and/or irrespective of the moment of the washing cycle when the reading is performed). This minimises the risk that the washing liquid sprayed by the spraying means 3, falling on the bottom 20 of the washing compartment 2, may create turbulence at the washing liquid intake zone.

[0044] Advantageously, when the dishwasher 1. adopts the first operating reference condition, the shutoff means 7 prevent the washing liquid from flowing through the first sprayer 31.

[0045] The washing liquid shutoff means 7 may also be seen as an example of the means for changing the geometry of the ducting means 5.

[0046] The dishwasher 1 usually comprises a second rack 72 on which the articles to be washed can be placed, this second rack 72 being above the first rack 71. Advantageously, the spraying means 3 comprise a second sprayer 32 interposed between the first and second racks 71, 72.

[0047] During the reading by the sensor 60, the second sprayer 32 may be fed with the washing liquid. The dishes placed on the first rack 71 intercept the liquid sprayed by the second sprayer 32, breaking up the jet and slowing its fall.

[0048] The Applicant has demonstrated by experimentation that activation of the second sprayer 32 does not particularly interfere with the reading by the sensor 60.

[0049] Advantageously, the ducting means 5 comprise a pipe 51 extending from the washing compartment 2. Relative to the direction of washing liquid outflow from the compartment 2 to the spraying means 3, the pipe 51 has a branch 54 downstream of the pump 4. Departing from the branch 54, there is a first duct 52, allowing fluid communication with the first sprayer 31, and a second duct 53, allowing fluid communication with the second sprayer 32.

[0050] Relative to the direction and orientation of washing fluid outflow, downstream of the branch 54 the washing liquid shutoff means 7 comprise:

- a first valve 73 which allows or inhibits washing liquid feed to the first sprayer 31. As shown by way of example in Figure 1, the first valve 73 is located along the first duct 52;
- a second valve 74 which allows or inhibits washing liquid feed to the second sprayer 32. As shown by way of example in Figure 1, the second valve 74 is located along the second.duct 53.

[0051] In an embodiment not illustrated, the shutoff means 7 comprise a single valve located at the branch 54. Said valve comprises one inlet and two outlets made at the branch 54. The inlet is made at one end of the pipe 51.

[0052] One of the two outlets is located at one end of the first duct 52. The other outlet is located at one end of the second duct 53. Interposed between the inlet and the outlets there is a mobile element which allows the inlet to be connected to one of the two outlets or both of the two outlets or neither of the two outlets.

[0053] As shown by way of example in Figure 1, positioned along the pipe 51 there is an electric heating element 50 which heats the washing liquid. The electric heating element 50 may be of the tubular type. The electric heating element 50 could be positioned at the pump 4 delivery side.

[0054] Advantageously, the first and/or the second rack 71, 72 are at least partly formed by a plurality of wires which are woven together to form meshes through which the washing liquid can pass freely. During washing the first and second racks are inside the washing compartment 2. Both the first rack and the second rack 71, 72 can normally be removed from the washing compartment 2 to make dish loading and unloading easier.

[0055] Advantageously, the shutoff means 7 also prevent the washing liquid from flowing into the first sprayer 31 during a lapse of time immediately preceding the reading performed by the sensor 60. This allows a sensor 60

reading to be performed in a condition which is as stable as possible, leaving the system the time needed to dampen the effects linked to the previous activation of the first sprayer 31.

[0056] Advantageously, said lapse of time is between 15 seconds and 4 minutes, preferably between 2 and 3 minutes.

[0057] The first and second sprayers 31, 32 are free to rotate about an axis of rotation. The rotation of the first sprayer 31 is caused by the pressurised liquid flowing inside the first sprayer 31. Similarly, the rotation of the second sprayer 32 is caused by the pressurised liquid flowing inside the second sprayer 32. Before the reading is performed by the sensor 60 for measuring the dirtiness of the washing liquid, advantageously the dishwasher 1 adopts the first operating reference condition simultaneously with the shutoff means 7 inhibiting the washing liquid from flowing into the first sprayer 31.

[0058] Immediately before the dishwasher 1 adopts the first operating reference condition, for a predetermined time the pump 4 adopts a speed of rotation which is greater than the first predetermined value. Advantageously, said predetermined time is between 1 and 3 minutes, preferably equal to 2 minutes.

[0059] Advantageously, to improve the fluidification of the dirt in the washing liquid, the dishes are heated (preferably to 40°C). This is done by dedicated heating means or by heating the washing liquid which is sprayed against the dishes. Advantageously, the dishes are heated immediately before the dishwasher adopts the first operating reference condition. Said dish heating is optional, since fluidification of the dirt can also be achieved with washing liquid which is not pre-heated.

[0060] Advantageously, during said predetermined time at least the first sprayer 31 sprays the washing liquid in the washing compartment 2. The dirtiest dishes are normally placed in the first rack 71. Therefore, vigorous washing of the dishes in the first rack 71 allows better fluidification in the washing liquid of the dirt from the dishes to be washed (allowing correct measurement of the dirtiness of the dishes).

[0061] Advantageously, the dishwasher 1 comprises an electronic control system which controls adjustment of the pump 4 speed of rotation and/or the shutoff means 7 of the first sprayer 31 and/or the means for changing the geometry of the ducting means 5. Advantageously, the electronic control system can implement a pre-saved algorithm which before using the sensor 60 to perform a reading for measuring the dirtiness of the washing liquid allows adjustment of the flow through the pump 4 (in particular, it allows control of the adjustment to the speed of rotation of the pump 4 and/or the shutoff means 7 of the first sprayer 31 and/or the means for changing the geometry of the ducting means 5).

[0062] Advantageously, the means 6 for determining at least one physical property of the washing liquid comprise at least one data processing device 63 which analyses the results of the readings supplied by the sensor 60. The reading by the sensor 60 for measuring the dirtiness of the washing liquid takes a period of between 10 and 30 seconds, preferably 20 seconds. The data processing device 63 averages the values detected during the reading and identifies a value which is compared with predetermined ranges each associated with a different washing liquid dirtiness (or turbidity).

[0063] Depending on the predetermined range in which the value supplied by the data processing device 63 falls, the dishwasher 1 will select to continue washing by implementing a more or less vigorous cycle.

[0064] This invention also relates to a method for checking the dispensing of a correct amount of rinse aid in the washing liquid of a dishwasher 1. Said method is implemented by a dishwasher 1 comprising one or of the technical features described above. The method also comprises the following steps:

- performing with the sensor 60 a first and a second measurement of at least one physical property of the washing liquid, the first and the second measurement being performed, respectively, before and after the rinse aid is dispensed into the washing liquid, at least during the first and the second measurement, the dishwasher 1 adopting each time a second operating reference condition in which the flow of the pump 4 substantially adopts a predetermined value which is always substantially the same each time the dishwasher 1 uses the sensor 60 to check that the rinse aid has been dispensed in the correct amount;
- using the first and second measurements to determine a change in the at least one physical property of the washing liquid before and after the detergent is dispensed;
- comparing the change in the at least one physical property of the washing liquid before and after the rinse aid is dispensed with at least one predetermined minimum change corresponding to a condition in which the correct amount of rinse aid has been dispensed into the washing liquid (preferably, but not necessarily, this step is carried out using the data processing device 63); sending a signal to a dishwasher 1 user interface if the change before and after rinse aid dispensing is less than the predetermined minimum change (preferably, but not necessarily, this step is carried out using a dishwasher control circuit board to which the data processing device 63 is operatively connected for transmitting information). Advantageously, the user interface comprises a warning light which may come on when the signal reaches the interface.

[0065] The physical property of the washing liquid analysed using the sensor 60 is normally turbidity.

[0066] As already indicated, the second operating reference condition dishwasher 1 may coincide with the dishwasher 1 first operating reference condition. In particular, the pump 4 speed of rotation in the first operating

condition may or may not coincide with that adopted in the second operating condition.

[0067] Advantageously, during dishwasher 1 use, it allows the user to select an automatic washing programme in which the dishwasher 1 itself can change at least some washing parameters depending how dirty the dishes are.

[0068] This invention also relates to a method for measuring the dirtiness of the dishes placed in a washing compartment 2 of a dishwasher 1. The method may therefore be implemented using a dishwasher having one or more of the technical features of the dishwasher 1 described above. In particular, the method involves implementation of the following steps:

i) using spraying means 3 to spray a washing liquid against the dishes in order to at least partly remove the dirt from the dishes;
ii) pumping the washing liquid from the washing compartment 2 with a pump 4 located along ducting means 5 which connect the washing compartment 2 and the spraying means 3 and again spraying the dishes with the washing liquid pumped from the washing compartment 2;
iii) measuring the dirtiness of the washing liquid, with the dishwasher 1 implementing the following procedure during this step:

- changing the flow processed by the pump 4, adjusting it to a predetermined value which is always the same each time the dishwasher 1 uses the sensor 60 for measuring the dirtiness of the washing liquid;
- using the sensor 60 to measure the turbidity of the washing liquid at the sensor 60;
- keeping the flow of washing liquid processed by the pump 4 constant at least during the step of measuring the turbidity of the washing liquid. As already indicated, to change the flow the pump 4 speed of rotation may be changed (in particular reduced) or the geometry of the ducting means 5 may be changed in order to change (in particular increase) the load losses.

[0069] The flow adjustment step precedes the first operating reference condition for a period of time equal to the first predetermined time period (advantageously between 15 seconds and 4 minutes).

[0070] The turbidity of the washing liquid is associated with the dirtiness of the washing liquid and therefore the dirtiness of the dishes placed in the washing compartment 2.

[0071] Advantageously, the dishwasher 1 compares the turbidity value measured using the sensor 60 with various predetermined turbidity thresholds each associated with a different degree of dirtiness.

[0072] Depending on the result supplied; the dishwasher 1 may then select implementation of subsequent more or less vigorous washing steps.

[0073] Advantageously, the method also comprises the step of preventing the washing liquid from flowing through the first sprayer 31 designed to spray the washing liquid from below the first rack 71. The step of preventing the washing liquid from flowing through the first sprayer 31 is at least partly simultaneous with the step of measuring the turbidity of the washing liquid at the sensor 60. Preferably, the step of inhibiting the washing liquid from flowing through the first sprayer 31 also applies to a lapse of time immediately preceding the reading of the dirtiness of the washing liquid performed by the sensor 60. As already indicated, said lapse of time is between 15 seconds and 4 minutes.

[0074] As already indicated, the step of adjusting the pump 4 speed and/or inhibiting the washing liquid from flowing through the first sprayer 31 precedes the step of measuring the turbidity of the washing liquid.

[0075] This invention has important advantages.

[0076] First, it allows a reliable measurement of the contamination of the washing liquid by elements such as rinse aid or condiments or food residues.

[0077] Another important advantage is linked to the fact that a reliable measurement of the contamination is obtained without using a particularly expensive sensor or components.

[0078] It shall be understood that the invention described above may be modified and adapted in several ways without departing from the scope of the inventive concept. Moreover, all the details of the invention may be substituted by other technically equivalent elements. In practice, all the materials used, as well as the dimensions, may vary according to requirements.

Claims

1. A dishwasher comprising:

- a washing compartment (2) designed to accommodate the articles to be washed;
- spraying means (3) for spraying a washing liquid in the washing compartment (2);
- a motor-driven pump (4);
- ducting means (5) for connecting the washing compartment (2) and the spraying means (3), said pump (4) being located along the ducting means (5) in order to pump the washing liquid from the washing compartment (2) to the spraying means (3);
- means (6) for determining at least one physical property of the washing liquid, comprising a sensor (60) located in the washing compartment (2) or along the ducting means (5) and designed to detect the dirtiness of the washing liquid at the sensor (60) itself;

at least during each reading performed by the sensor (60) to measure the dirtiness of the washing liquid, the dishwasher (1) adopting a first op-

erating reference condition where the flow processed by the pump (4) substantially always adopts the same predetermined value;
during a time interval before and/or after the adoption of said first operating reference condition, the dishwasher (1) adopting a washing operating condition where the flow processed by the pump (4) adopts at least one non zero value different from that adopted during the first operating reference condition.

2. The dishwasher according to claim 1, **characterized in that** in the first operating reference condition, the pressure head of the pump (4) substantially always adopts the same predetermined value.

3. The dishwasher according to claim 1 or 2, **characterized in that** in the first operating reference condition, the pump (4) adopts a first predetermined rotation speed that is always the same.

4. The dishwasher according to any of the foregoing claims, **characterized**
in that, when the dishwasher (1) adopts the first operating reference condition, the pump (4) reduces its rotation speed in order to reduce the turbulence of the washing liquid along the ducting means (5).

5. The dishwasher according to any of the foregoing claims, **characterized**
in that the first operating reference condition also applies to a first predetermined time period immediately preceding the reading performed by the sensor (60).

6. The dishwasher according to claim 5, **characterized in that** the first predetermined time period is between 15 seconds and 4 minutes.

7. The dishwasher according to any of the foregoing claims, **characterised in that** it comprises:

- a first rack (71) on which the articles to be washed can be placed, the spraying means (3) comprising a first sprayer (31) located under the first rack (71);
- means (7) for shutting off the washing liquid and which, at least during each reading performed by the sensor (60) to measure the dirtiness of the washing liquid, prevent the washing liquid from passing through the first sprayer (31).

8. The dishwasher according to claim 7, **characterized in that** it comprises a second rack (72) on which the articles to be washed can be placed, said second rack (72) being located above the first rack (71); the spraying means (3) comprising a second sprayer (32) located between the first and second racks (71, 72).

9. The dishwasher according to claim 7 or 8, **characterized in that** the shutoff means (7) prevent the washing liquid from flowing into the first sprayer (31) at least during a lapse of time immediately preceding the reading performed by the sensor (60) to measure the dirtiness of the washing liquid.

10. The dishwasher according to claim 9, **characterized in that** the lapse of time is between 15 seconds and 4 minutes.

11. The dishwasher according to any of the foregoing claims, **characterized**
in that the sensor (60) is a washing liquid turbidity sensor.

12. The dishwasher according to any of the foregoing claims, **characterized**
in that it comprises means for changing the geometry of the ducting means (5) whose activation determine a change in the load losses of the ducting means (5), enabling the dishwasher (1) to switch from the operating washing condition to the first operating reference condition or vice versa.

13. A method implemented by the dishwasher according to any of the foregoing claims from 1 to 12 for checking that a correct amount of rinse aid is dispensed into the washing liquid in the dishwasher (1), the method comprising the following steps:

- performing with the sensor (60) a first and a second measurement of at least one physical property of the washing liquid, the first and the second measurement being performed, respectively, before and after the rinse aid is dispensed into the washing liquid, at least during the first and the second measurement, the dishwasher (1) adopting each time a second operating reference condition where the flow of the pump (4) adopts a predetermined value that is always substantially the same each time the dishwasher (1) uses the sensor (60) to check that the rinse aid has been dispensed in the correct amount;
- using the first and the second measurement to determine a change in the at least one physical property of the washing liquid before and after the detergent is dispensed;
- comparing the change in the at least one physical property of the washing liquid before and after the rinse aid is dispensed with at least one predetermined minimum change corresponding to a condition in which the correct amount of rinse aid has been dispensed into the washing liquid;
- sending a signal to a user interface of the dish-

washer (1) if the change in the at least one physical property of the washing liquid before and after the dispensing of the rinse aid is less than the predetermined minimum change.

14. The method according to claim 13, **characterized in that** the second operating reference condition of the dishwasher (1) coincides with the first operating reference condition of the dishwasher.

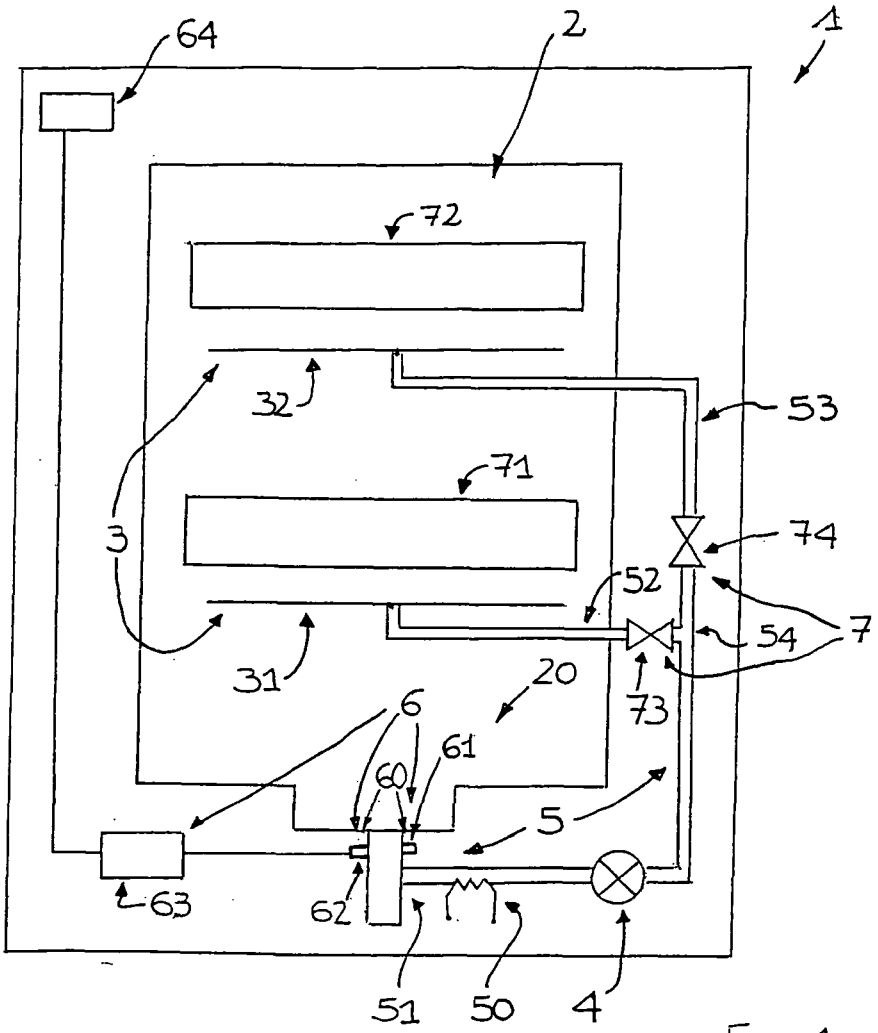

Fig. 1

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 09 01 5603

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X A	EP 1 929 925 A (SAMSUNG ELECTRONICS CO LTD [KR]) 11 June 2008 (2008-06-11) * paragraph [0025] - paragraph [0031]; figure 1 * * paragraph [0034] - paragraph [0038]; figures 2,3a,3b *	1-11,13, 14 12	INV. A47L15/42 D06F39/00
X A	US 3 888 269 A (BASHARK LARRY THOMAS) 10 June 1975 (1975-06-10) * column 2, line 52, paragraph 3 - line 68; figure 37 * * column 4, line 37 - line 47 *	1-11 12-14	
X A	US 2006/021637 A1 (KANG MYUNG H [KR]) 2 February 2006 (2006-02-02) * paragraph [0062] - paragraph [0075]; figures 1,3 *	1-11 12-14	
A	DE 102 53 009 B3 (WHIRLPOOL CO [US]) 8 April 2004 (2004-04-08) * abstract *	1-14	

TECHNICAL FIELDS SEARCHED (IPC)

A47L
D06F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	19 April 2010	Clarke, Alister

CATEGORY OF CITED DOCUMENTS

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

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

1

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 09 01 5603

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

19-04-2010

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 1929925 A	11-06-2008	CN 101194821 A	11-06-2008
		KR 20080050834 A	10-06-2008
		US 2008128000 A1	05-06-2008
US 3888269 A	10-06-1975	NONE	
US 2006021637 A1	02-02-2006	KR 20060010361 A	02-02-2006
DE 10253009 B3	08-04-2004	EP 1419727 A2	19-05-2004
		US 2004163679 A1	26-08-2004

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82