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

(11) **EP 1 978 144 A2**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
08.10.2008 Bulletin 2008/41

(51) Int Cl.:
D06F 39/02 *(2006.01)* ***D06F 33/02*** *(2006.01)*

(21) Application number: **08004754.1**

(22) Date of filing: **14.03.2008**

(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 MT NL NO PL PT RO SE SI SK TR
Designated Extension States:
AL BA MK RS

(30) Priority: **05.04.2007 IT RN20070022**

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

(72) Inventors:
- **Bombardieri, Giovanni**
  24021 Albino (BG) (IT)
- **Mariotti, Costantino**
  06028 Sigillo (PG) (IT)
- **Vota, Roberto**
  13051 Andorno-Micca (BI) (IT)
- **Aisa, Valerio**
  60044 Fabriano (AN) (IT)
- **Vinerba, Brunetta**
  60044 Fabriano (AN) (IT)

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

(54) **Washing appliance**

(57) A washing appliance, designed preferably for household use, comprises: a washing tank (2) suitable for containing a washing liquid used for a washing treatment; a line (3) for feeding at least one washing agent, said feed line (3) ending at the washing tank (2) and including at least one compartment (30) accessible by the user who puts the washing agent into it. The washing appliance comprises at least one sensor (4) for detecting predetermined chemical and/or physical properties of the at least one washing agent, said sensor (4) being located upstream of the washing tank (2) relative to the direction in which the washing agent flows along the feed line (3).

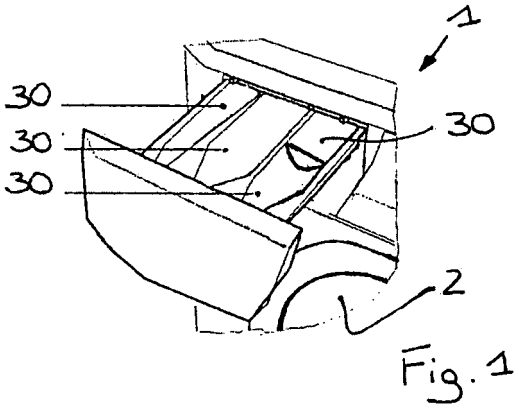

Fig. 1

EP 1 978 144 A2

Description

[0001] This invention relates to a washing appliance, in particular a washing appliance equipped with a detergent detection system.

[0002] Washing appliances comprise electrical appliances such as, for example:

- washing machines for cleaning clothes, bed sheets, etc.;
- dishwashers for washing dishes, cutlery, pans, etc.

[0003] In particular, washing appliances called "laundry washers" are suitable for carrying out at least a washing treatment on textile articles made of any fibre or in any colour and include machines known as "washing machines" and machines known as "washer dryers", if in addition to washing they also carry out at least a treatment for drying textile articles.

[0004] In this text, the term "washing cycle" means the steps making up the washing treatment in their entirety, that is to say, pre-wash, if any, washing proper (main wash) and rinsing, if any.

[0005] Also, the term "washing agent" in this text means both detergents and washing aids such as bleach, descaling agent, fabric softener and rinse aid.

[0006] There are laundry washers comprising a washing agent feed line and a washing tank with a drum in which the laundry to be washed is placed. The washing agent feed line leads into the washing tank and includes a drawer which can be pulled out at least partly and which usually comprises four compartments into which the user can put washing agents (detergents and washing aids such as, for example, fabric softener, bleach, etc.) to be used during the washing cycle: a first compartment for pre-wash detergent, a second compartment for main wash detergent, a third compartment for bleach and a fourth compartment for fabric softener.

[0007] Washing appliances of the kind described above are not free of disadvantages, however.

[0008] The washing cycle performed by the machine is totally independent of the washing agents placed in the washer drawer. In prior art laundry washers, it is not possible for the user to tell the machine what type of washing agents have been placed in the drawer.

[0009] The Applicant has, however, found that, in order to optimize their action, some of the washing agents, in particular some of the washing aids, should be fed into the washing tank at a specific step in the washing cycle. This is particularly true of bleach. In fact, traditional bleach should be fed into the washing tank during the main wash step, while non-chlorine bleach, suitable for coloured, synthetic and wool fibres should be used during the rinse step or, alternatively, during a specific, especially designed pre-wash.

[0010] This invention has for an aim to overcome the above mentioned disadvantages by providing a washing appliance which enables the effect of the washing agents to be optimized.

[0011] Another aim of the invention is to provide a washing appliance that can prevent errors caused by the user placing a washing agent in the wrong compartment.

[0012] These aims and others, which are more apparent in the description which follows, are achieved, in accordance with this invention, by a washing appliance having the structural and functional characteristics described in the independent claims herein. Alternative embodiments of the appliance are described in the dependent claims.

[0013] The invention will now be described in more detail with reference to the accompanying drawings, which illustrate a non-limiting preferred embodiment of it.

- Figure 1 is a partial view of a washing appliance according to this invention;
- Figure 2 is a schematic view of a washing appliance according to this invention.

[0014] With reference to the accompanying drawings, the numeral 1 denotes a washing appliance according to this invention.

[0015] The washing appliance 1 is designed preferably for household use and comprises a washing tank 2 suitable for containing the washing liquid used for a washing treatment. Said washing liquid is advantageously comprised of a mixture of water and a washing agent. Inside the washing tank 2, the washing appliance 1 comprises means for containing the articles to be washed, said containing means defining at least a space for accommodating the articles to be washed. In the case of a laundry washer, for example, the containing means comprise a rotary drum in which the laundry to be washed is placed. Similarly, in the case of a dishwasher, the containing means comprise one or more racks which can usually be pulled out by means of suitable carriages.

[0016] The washing appliance 1 also comprises a feed line 3 for feeding at least one washing agent. The feed line 3 leads into the washing tank 2 and includes at least one compartment 30 accessible by the user who puts the washing agent into it. As stated above, washing agent means detergents and/or washing aids.

[0017] The washing appliance 1 may be one of several different kinds of machine but in the preferred embodiment it is a laundry washer or a dishwasher.

[0018] The washing appliance 1 also comprises at least one sensor 4 for detecting predetermined chemical and/or physical properties of the at least one washing agent. The sensor 4 is located upstream of the washing tank 2 relative to the direction in which the washing agent flows along the feed line 3. The flow of the washing agent along the feed line 3 starts at the at least one compartment 30 and ends at the washing tank 2.

[0019] Preferably, the sensor 4 is located at the at least one compartment 30 which is designed to receive the washing agent. Further, the sensor 4 is operatively associated with the washing agent compartment 30, mean-

ing by this that the sensor 4 is capable of analyzing the contents of the compartment 30.

[0020] Detecting the type of washing agent before starting the washing cycle makes it possible to adapt the washing cycle so as to optimize the properties of the washing agent itself. The sensor 4, although it can detect the properties of solid washing agents, provides the best results with liquid washing agents.

[0021] Although the embodiment described above is preferred, the sensor 4 might not be located exactly at the compartment 30, but downstream of it, for example in an intermediate chamber between the compartment 30 and the washing tank 2. In this case, the chamber should be provided with blocking means so that the washing agent drawn from the compartment 30 can be allowed to enter or prevented from entering the washing tank 2.

[0022] The sensor 4 is operatively connected to a data processing unit which processes the information provided by the sensor 4.

[0023] Advantageously, the data processing unit forms part of an electronic system that controls the washing appliance 1.

[0024] The data processing unit may control the washing cycle parameters according to the information provided by the sensor 4. The expression "control the washing cycle parameters" means also the possibility of determining which step in the washing cycle is the best for drawing the washing agent from the compartment 30 and feeding it into the washing tank 2. Preferably, within the selected step, the washing appliance 1 is also able to determine the best moment for drawing the washing agent from the compartment 30: for example, at the beginning of the step, at the end of the step, or at another time.

[0025] In particular, the data processing unit activates the release of washing agent from the at least one compartment 30 to the washing tank 2, said release occurring at a predetermined step of the washing cycle, the choice of the step being determined on the basis of the information received from the sensor 4. The information relates to the chemical and/or physical properties of the washing agent located in the specific compartment 30 whose contents are released into the washing tank. For example, for an optimum effect, one washing agent may need to be fed in during pre-wash, while another washing agent should be fed in during rinse, and so on. As mentioned above, the Applicant has found that the optimum effect of traditional bleach is obtained by releasing the bleach into the washing tank 2 during the main wash, while non-chlorine bleach is best fed into the washing tank 2 during rinse or during a specific pre-wash. In one particular non-limiting embodiment, the fact that the data processing unit controls the washing cycle parameters may mean for example that detection of non-chlorine bleach in the compartment 30 automatically causes the bleach to be released during rinse and not during the main wash. Alternatively, detection of non-chlorine bleach might cause the bleach to be released during the pre-wash, automatically starting a specific pre-wash especially designed to optimize the properties of the non-chlorine bleach. In the presence of non-chlorine bleach, the choice between the two possibilities is left to the manufacturer and depends on how the washing appliance is programmed.

[0026] The data processing unit comprises means for comparing the chemical and/or physical properties measured by the sensor 4 with the information stored in an archive and associated in advance with the presence of a respective washing agent. Thus, the washing appliance 1 can detect the presence of a certain washing agent that has been entered in the archive.

[0027] The data processing unit has a user interface that provides information relating to the washing agents detected.

[0028] Advantageously, the user interface of the data processing unit communicates to the user interface the presence in the at least one compartment 30 of a washing agent whose chemical and/or physical properties detected by the sensor 4 do not match those expected for that specific compartment 30. This warns the user, for example, if bleach or other washing aid is mistakenly placed in the compartment where the detergent should be placed. In one particular embodiment comprising a plurality of compartments 30, the washing appliance 1 may, on the basis of the information provided by the sensor 4, detect the contents of each compartment 30. The sensor 4 tells the washing appliance in which compartment the detergent has been placed, in which compartment the fabric softener has been placed, in which compartment the bleach has been placed (and whether it is traditional or non-chlorine bleach), and so on. Thus, on the basis of the information from the sensor 4, it is the washing appliance 1 that selects when and from which compartment 30 the washing agent can be released.

[0029] In more general terms, the washing appliance releases the contents of the compartment 30 into the washing tank 2 only if the compartment contains a washing agent whose chemical and/or physical properties detected by the sensor 4 match those of the washing agent required by the washing cycle.

[0030] Different types of sensors may be provided.

[0031] In a first example embodiment, the sensor 4 comprises an optical sensor. The optical sensor takes measurements based on the colour or turbidity of the washing agent located in the respective compartment 30.

[0032] In another embodiment, the sensor 4 comprises an electrical conductivity sensor. This type of sensor measures the electrical conductivity of the washing agent located in the respective compartment 30. One possible disadvantage of an electrical conductivity sensor used for this purpose is that it requires two electrodes that must be in physical contact with the washing agent.

[0033] In the preferred embodiment, the sensor 4 comprises an atmospheric gas/vapour concentration sensor.

[0034] The gas/vapour concentration sensor makes it possible, for example, to distinguish whether the compartment contains traditional or non-chlorine bleach. De-

pending on this information, the data processing unit activates a procedure whereby the washing agent located in the compartment 30 is released to the washing tank 2 at a predetermined step of the washing cycle.

[0035] Advantageously, according to this procedure, the washing agent is released:

- during the main wash if the sensor 4 has detected the presence of traditional bleach; or
- during the rinse or pre-wash step if the sensor 4 has detected the presence of non-chlorine bleach.

[0036] The concentration sensor distinguishes between traditional bleach and non-chlorine bleach because of the different chemical composition of the two types of bleach. On account of the different chemical composition, the vapours of the two types of bleach are quite different. The possibility of distinguishing between the two types of bleach resides in the capacity of the gas/vapour concentration sensor to detect a characteristic component of each product (or, more generally, a different concentration of the same component). In particular, traditional bleach is a solution of sodium hypochlorite and water, while non-chlorine bleach is a solution comprising distilled water, hydrogen peroxide and non-ionic surfactants.

[0037] Depending on the concentration of a particular gas/vapour to which the gas/vapour concentration sensor is sensitive, the sensor increases the electrical conductivity of a specific receptor connected to a transducer which converts the electrical variation into a signal indicating the concentration of that gas/vapour. The concentration sensor is sensitive to temperature and relative humidity. In order to minimize the influence of these variables, there is a heating element which keeps the sensor at the optimum temperature. Alternatively, there may be a sensor for measuring the temperature and relative humidity and capable of compensating the value measured by the concentration sensor.

[0038] A single compartment 30 might also be associated with two or more sensors 4 of different kinds.

[0039] As mentioned above, the washing appliance 1 may comprise a plurality of compartments 30. For example, in the non-limiting example embodiment shown in Figure 1, the washing appliance comprises four compartments: one for the pre-wash detergent, one for the main wash detergent, one for the fabric softener and one for the bleach. The compartments 30 are separate from each other so that their contents cannot mix.

[0040] Advantageously, the four compartments are formed in a single drawer. The drawer may be pulled out by the user to gain access to the compartments for the different washing agents and then re-closed. The different compartments 30 might, however, be accessible independently of each other: for example, they might be located in different drawers. Further, each compartment 30 might form part of a feed line 3 that is independent of the feed line of the other compartments 30.

[0041] Preferably, as illustrated schematically in Figure 2, all the compartments 30 are connected to a single conduit 5 of the feed line 3. In the laundry washer trade, this single conduit 5 is often referred to as loading hopper. Advantageously, the at least one sensor 4 is located in the drawer housing, preferably at the top of the housing at the at least one compartment 30.

[0042] In an example embodiment that is not illustrated, the sensor 4 is operatively associated with at least two compartments 30 and, preferably, the sensor 4 is operatively associated with all the compartments 30. In this case, all the compartments 30 are preferably formed in the same drawer and the sensor 4 must be able to distinguish the information from each compartment 30.

[0043] In another example embodiment, the washing appliance 1 comprises a plurality of sensors 4, each operatively associated with and located at a respective compartment 30.

[0044] Normally, during use, the user places in the respective compartments the different washing agents to be used in the washing cycle.

[0045] The sensors analyse the washing agents and the washing appliance adapts the washing cycle on the basis of this information provided by the sensors. For example, if the substance located in the bleach compartment is a non-chlorine bleach, it is best released into the washing tank during the rinse step or, alternatively, the washing cycle can be adapted to include a specific pre-wash for this type of bleach. Traditional bleach, on the other hand, is best released into the washing tank during the main wash.

[0046] The invention brings important advantages.

[0047] First and foremost, it allows the action of the washing agents, especially washing aids, to be optimized.

[0048] Another important advantage is that it can prevent mistakes made by the user when filling the compartments.

[0049] The invention can be modified and adapted in several ways without thereby departing from the scope of the inventive concept.

[0050] Moreover, all details of the invention may be substituted by other technically equivalent elements.

[0051] In practice, the embodiments of the invention may be made from any material, and in any size, depending on requirements.

Claims

1. A washing appliance, designed preferably for household use, comprising:

   - a washing tank (2) suitable for containing a washing liquid used for a washing treatment;
   - a feed line (3) for feeding at least one washing agent, said feed line (3) leading into the washing tank (2) and including at least one compartment

(30) accessible by the user who puts the washing agent into it;

the washing appliance being **characterized in that** it comprises at least one sensor (4) for detecting predetermined chemical and/or physical properties of the at least one washing agent, said sensor (4) being located upstream of the washing tank (2) relative to the direction in which the washing agent flows along the feed line (3).

2. The washing appliance according to claim 1, **characterized in that** the sensor (4) is located at and operatively associated with the at least one compartment (30) designed to receive the washing agent.

3. The washing appliance according to claim 1 or 2, **characterized in that** the sensor (4) is operatively connected to a data processing unit which processes the information provided by the sensor (4).

4. The washing appliance according to claim 3, **characterized in that** the data processing unit processes the parameters of the washing cycle according to the information provided by the sensor (4).

5. The washing appliance according to claim 3 or 4, **characterized in that** the data processing unit activates the release of washing agent from the at least one compartment (30) to the washing tank, said release occurring at a predetermined step of the washing cycle, the choice of the step being determined on the basis of the information received from the sensor (4) relating to the chemical and/or physical properties of the washing agent located in the specific compartment (30) whose contents are released to the washing tank (2).

6. The washing appliance according to claim 3 or 4 or 5, **characterized in that** the data processing unit comprises means for comparing the chemical and/or physical properties measured by the sensor (4) with the information stored in an archive and associated in advance with the presence of a respective washing agent.

7. The washing appliance according to any of the foregoing claims from 3 to 6, **characterized in that** the data processing unit communicates to a user interface the presence in the at least one compartment (30) of a washing agent whose chemical and/or physical properties detected by the sensor (4) do not match those expected for that specific compartment (30).

8. The washing appliance according to any of the foregoing claims, **characterized in that** the at least one washing agent comprises a washing aid.

9. The washing appliance according to any of the foregoing claims, **characterized in that** the sensor (4) comprises an optical sensor.

10. The washing appliance according to any of the foregoing claims, **characterized in that** the sensor (4) comprises an electrical conductivity sensor.

11. The washing appliance according to any of the foregoing claims, **characterized in that** the sensor (4) comprises an atmospheric gas/vapour concentration sensor.

12. The washing appliance according to claim 11 when it depends directly or indirectly on any of the claims from 3 to 7, **characterized in that** the gas/vapour concentration sensor distinguishes between traditional bleach or non-chlorine bleach in the compartment (30), the data processing unit activating a procedure, depending on this information, whereby the washing agent located in the compartment (30) is released to the washing tank (2) said release occurring at a predetermined step of the washing cycle.

13. The washing appliance according to claim 12, **characterized in that**, according to said procedure, the washing agent is released:

- during the main wash if the sensor (4) has detected the presence of traditional bleach; or
- during the rinse or pre-wash step if the sensor (4) has detected the presence of non-chlorine bleach.

14. The washing appliance according to any of the foregoing claims, **characterized in that** it comprises a plurality of compartments (30).

15. The washing appliance according to claim 14, **characterized in that** the sensor (4) is operatively associated with at least two compartments (30), the sensor (4) being preferably associated with all the compartments (30).

16. The washing appliance according to claim 14, **characterized in that** it comprises a plurality of sensors (4), each operatively associated with, and located at, a respective compartment (30).

17. The washing appliance according to any of the foregoing claims, **characterized in that** it comprises a laundry washer or a dishwasher.

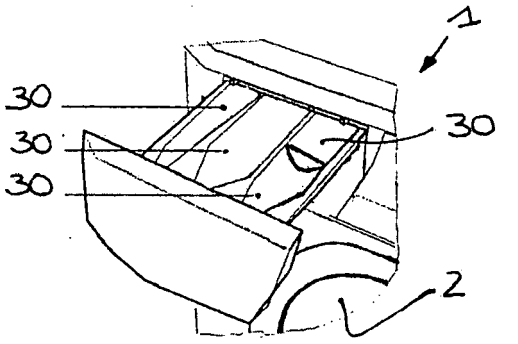

Fig. 1

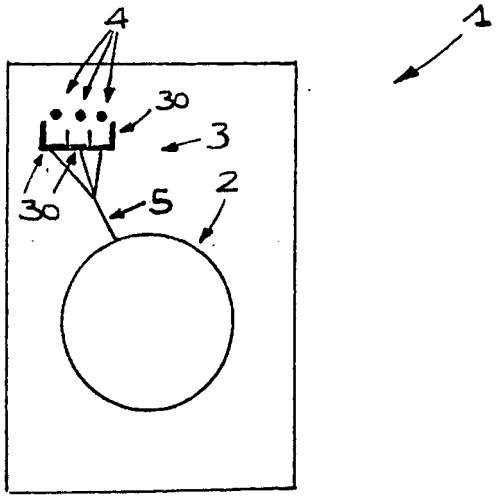

Fig. 2