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## (54) METHOD AND DEVICE FOR PRODUCING A CLEANING COMPOUND

(57) The present invention relates to a method for producing a cleaning compound (4) with a device (5) for producing a cleaning compound (4), particularly for a home appliance, from water (1), oxygen solved in the water (1), and a cleaning product (3). The method comprises a step of providing the water (1), the oxygen solved in the water (1), and the cleaning (3) product (3) in the device (5). The method further comprises the step of producing water (2) containing reactive oxygen species in the device (5) by forming reactive oxygen species in the water (1) from the water (1) and the oxygen. Furthermore, the method comprises the step of producing the cleaning compound (4) in the device (5) by blending the water (2) containing reactive oxygen species with the cleaning (3) product (3).

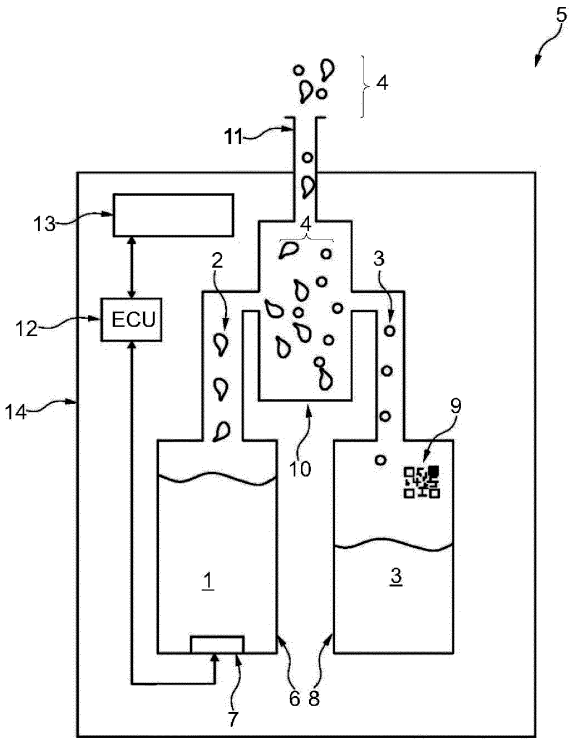


Fig. 1

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## Description

**[0001]** The present invention relates to a method for producing a cleaning compound. The invention also relates to such a cleaning compound. The invention further relates to a device for producing a cleaning compound by such a method and to a home appliance comprising such a device.

**[0002]** There is a multitude of cleaning compounds for household use, particularly for use in home appliances. This is accompanied by a need for selecting, purchasing, carrying, storing, and properly using multiple cleaning compounds each often being stored in a large container and having specific instructions for use. Additionally there are negative impacts on the environment due to a high requirement for packaging and the amount of cleaning compound used. There are also risks involved concerning the health of a user and endangering particularly children, who can ingest the cleaning compounds.

**[0003]** Furthermore, the cleaning compounds are often not as effective as desired by a consumer or user, and are often complicated to dispense and apply to the intended place of usage.

**[0004]** The present invention deals with the problem of specifying a new, improved, or at least alternative method for producing and applying a cleaning compound by means of a suitable device which can particularly be part of a home appliance.

**[0005]** The present invention further deals with the problem of specifying a device for producing a cleaning compound by such a method.

**[0006]** This problem is solved by the subject matter of the independent patent claims. Preferred embodiments are the subject matter of the dependent patent claims.

**[0007]** Accordingly, the basic idea of the invention is to produce water containing reactive oxygen species and to subsequently blend the water with a cleaning product. Instead of such cleaning product, a maintenance product or a care product can be used for blending the water. A such-like production process can be carried out in an appropriate device. In this way, a suitable cleaning compound can be produced in a fast and simple way for a specific cleaning or maintenance purpose and be dispensed and provided efficiently to an intended place of usage. Additionally, a need for selecting, purchasing, carrying, storing, and properly using multiple cleaning compounds each often being stored in a large container and having specific instructions for use, is not required. Furthermore, such a method and device have environment-friendly advantages due to reducing the amount of required packaging, and even reducing the amount of cleaning compound applied. The method according to the invention also reduces the risk of ingesting cleaning or maintenance products, particularly for children.

**[0008]** The method for producing a cleaning compound - also called bleach system -, according to the invention, particularly for a home appliance, comprises a first step of providing water, providing oxygen solved in the water, and providing the cleaning product, preferably in a suitable device. The method further comprises a second step of producing water containing reactive oxygen species in the device by forming reactive oxygen species in the water from the water and the oxygen. Furthermore, the method comprises a third step of producing the cleaning compound by blending the water containing reactive oxygen species with the cleaning product which can also be called "bleach precursor".

**[0009]** In the context of the present invention, the cleaning compound produced can also be a compound to be used for maintenance and/or care purposes.

**[0010]** According to a preferred embodiment, the cleaning product is provided stored in a cartridge and/or in a capsule. In this way, a user friendly and efficient production is achieved, while also allowing to easily and quickly adapt the method to a specific purpose of cleaning, maintaining or care purposes.

**[0011]** According to a further preferred embodiment, the cartridge and/or capsule storing the cleaning product to be blend is tagged with an identifier for identifying the cleaning product before the cleaning compound is produced.

**[0012]** Advantageously, the reactive oxygen species are formed by means of ultrafine bubbles, electro-Fenton process, photo-catalysis, electro-catalysis or plasma. This embodiment achieves a particularly effective formation of reactive oxygen species in the water and enhances the effectiveness of the produced cleaning compound.

**[0013]** In another advantageous embodiment, the cleaning product can be provided in solid or in liquid form. Such a product is particularly easily blend with the water containing reactive oxygen species, the user friendliness is increased, and the production and handling of the cartridges and capsules respectively is simplified.

**[0014]** Expediently, the cleaning compound is provided to its intended place of usage after its production by means of the method described above. In this way, the device used for producing the cleaning compound is not required to be placed in or at the place of usage during the application of the cleaning compound, and can be used for another purpose.

**[0015]** The invention further relates to a cleaning compound produced by the above-described method. The previously explained advantages of the method according to the present invention therefore also transfer to the cleaning compound.

**[0016]** In an advantageous embodiment, the quantity and/or final formulation of the produced/dispensed cleaning compound produced by the above-described method is dependent on at least one external parameter. The at least one external parameter can be the kind of surface to be cleaned or the size of the surface to be cleaned or the volume of the surface to be cleaned.

**[0017]** The invention further relates to a device, particularly for a home appliance, for producing a cleaning compound according to the method according to the present invention. The previously explained advantages of the method according to the present invention therefore also transfer to the device.

**[0018]** According to a preferred embodiment, the device comprises a water tank for containing the water. Such a device can produce a cleaning compound without the need for water from an external source.

**[0019]** Preferably, the device comprises an oxygenating unit using ultrasound, ultrafine bubbles, electro-Fenton process, photo-catalysis, electro-catalysis or plasma for forming the reactive oxygen species. This embodiment achieves a particularly effective formation of reactive oxygen species in the water and enhances the effectiveness of the produced cleaning compound.

**[0020]** Further preferably, the device comprises a blending container for blending the water containing reactive oxygen species with the cleaning product. Such an embodiment achieves particularly good blending results and a production of a particularly effective cleaning compound.

**[0021]** Advantageously, the device comprises a dispensing element for providing the cleaning compound to its intended place of usage. In this way, the device for producing the cleaning compound is not required to be placed in or at the place of usage during the application of the cleaning compound, and can be used for another purpose. Additionally, this allows for a particularly user friendly providing of the cleaning compound to its intended place of usage.

**[0022]** Further adventurously, the device comprises an electronic control unit, wherein the electronic control unit can be communicating with the oxygenating unit in operation, and is configured/programmed to run the method according to the invention.

**[0023]** According to another preferred embodiment, the device comprises a cartridge and/or capsule storing the cleaning product to be blend. In this way a particularly user friendly and efficient production is achieved, while also allowing to easily and quickly adapt the method to a specific purpose of cleaning.

**[0024]** Further preferably, the device comprises an automated identification and data capture unit communicating with the electronic control unit for identifying the cleaning product to be blend and stored in the cartridge and/or capsule tagged with the identifier.

**[0025]** In another advantageous embodiment, the device comprises a user interface communicating with the electronic control unit for displaying information to a user concerning the method according to the invention. This embodiment enhances the user friendliness.

**[0026]** Furthermore, the invention relates to a home appliance comprising a device according to the present invention. The previously explained advantages of the method according to the present invention and of the device therefore also transfer to the home appliance.

**[0027]** The home appliance or the device can comprise a sensor unit having at least one sensor. The at least one sensor can be a loading sensor, a turbidity sensor, a pH-sensor, a conductivity sensor, a temperature sensor, a pressure sensor, a water hardness sensor or any other kind of known sensor. In this way, the at least one sensor can provide sensor data related to the at least parameter on which the quantity and/or final formulation of the produced/dispensed cleaning compound produced by means of the method described above is dependent on.

**[0028]** Further important features and advantages of the invention can be gathered from the sub-claims, from the drawing and from the associated figure description using the drawing.

**[0029]** It goes without saying that the features mentioned above and those still to be explained below can be used not only in the respectively specified combination but also in other combinations or on their own without departing from the scope of the present invention.

**[0030]** An example of the invention is illustrated in the drawing and will be explained in more detail in the following description.

**[0031]** Figure 1 schematically shows an example of a device 5 for producing a cleaning compound 4 according to the invention and by means of the method according to the invention Thus, in operation, the device 5 runs the method for producing the cleaning 4 compound according to the present invention.

**[0032]** The device 5 comprises a water tank 6 for containing water 1 or any other fluid comprising water or having a chemical composition able to form reactive oxygen species in combination with oxygen. The device 5 further comprises an oxygenating unit 7 arranged in the water tank 6. The unit 7 uses ultrasound, ultrafine bubbles, electro-Fenton process, photo-catalysis, electro-catalysis, plasma or other known methods for forming reactive oxygen species in the water 1 contained in the water tank 6.

**[0033]** The device 5 also comprises a cartridge and a capsule 8 for storing the cleaning product 3. The cartridge and the capsule 8, respectively, can be configured to be insertable into and removable from the device 5 allowing to use a specific product 3. The device further comprises an automated identification and data capture unit (not shown in figure 1), also known as AIDC unit, communicating with an electronic control unit 12 of the device 5 for identifying the cleaning and product 3 stored in the cartridge or in the capsule 8, respectively. For this purpose, the cartridge or capsule 8, respectively, can be tagged with an identifier 9, such as a QR-code, a bar code, a RFID transponder/emitter or other AIDC identifiers.

**[0034]** Additionally, the device 5 comprises a blending container 10 for blending water 2 containing reactive oxygen species, with the cleaning product 3. The blending container 10 is in fluid connection with the water tank 6 and the cartridge 8 or capsule 8, respectively, such that the water 2 containing reactive oxygen species in the water tank 6 and the product 3 stored in the cartridge or capsule 8, respectively, can be transported to the blending container 10. For providing the cleaning compound 4 to its intended place of usage, such as a surface the cleaning compound 4 is to be applied to or a detergent container of a dish washer or washing machine, the device 5 comprises a dispensing element 11.

**[0035]** According to the example of figure 1 the device also comprises a housing 14. The dispenser 11 protrudes from the housing 14, such that the cleaning compound 4 can be dispensed more easily.

**[0036]** In the example of figure 1, the above-mentioned electronic control unit 12 of the device 5 is also communicating with the oxygenating unit 7 and is configured/programmed to run the method according to the invention. The device 5 can comprises a user interface 13. The user interface 13 is communicating with the electronic control unit 12 for displaying information to a user concerning the method according to the invention carried out in the device 5. The information can for example be related to the product 3, the amount of cleaning compound 4 to be produced, the ratio of mixture, the amount of water 2 containing reactive oxygen species to be produced, cleaning programs, and similar information. The user interface 13 can also be also configured for operating, setting, and adjusting the device 5.

**[0037]** The device 5 for producing the cleaning compound 4 is used for a home appliance (not shown in figure 1), particularly a dish washer or a washing machine. Thus, the home appliance comprises the device 5 and can for example be used to apply the cleaning compound 4 to surfaces to be maintained or cleaned or textiles to be cleaned.

**[0038]** In the following, an example of the method according to the invention is described:
The method is carried out in the device 5. The method serves to for produce the cleaning compound 4 from the water 1, oxygen solved in the water 1, and the above-described product 3. The method comprises a step of providing the water 1, oxygen solved in the water 1, and the cleaning product 3 in the device 5.

**[0039]** In the example of figure 1, the cleaning product 3 is provided within the capsule 8. Alternatively or additionally, the product 3 can also be provided in the above-mentioned cartridge. The capsule 8 can be tagged with a QR-Code 9, which is used to identify the cleaning product 3 stored in the capsule 8 before the cleaning compound 4 is produced. The cleaning product 3 is liquid, but could also be solid.

**[0040]** When at least the water 1 is provided, water 2 containing reactive oxygen species is produced inside of the device 5 by forming reactive oxygen species in the water 1 by using the water 1 and the oxygen. The reactive oxygen species are formed by means of electro-catalysis. It is also possible to form the reactive oxygen species by means of ultrafine bubbles, electro-Fenton processes, photo-catalysis, or plasma technologies.

**[0041]** Afterwards, the cleaning compound 4 is produced inside the device 5 by blending the water 2 containing the reactive oxygen species with the cleaning product 3. In the context of this invention a cleaning compound 4 can also be a compound used for maintenance or care.

**[0042]** The cleaning compound 4 produced according to the method of the invention is then provided to its intended place of usage by means of the dispensing element 11.

**[0043]** An example of cleaning product suitable for use in a washing machine is:

| Ingredients | Percentage (weight-%) | Compound |
|---|---|---|
| Tensioactives | 10 to 25 | Alkyl ether sulphonate |
| Prebleach | 5 to 25 | 6-phthalimido hexanoic acid |
| Enzimes | 0 to 4 | protease, amilase, lipase, celulase, pectinase, mananase.... |
| Soap | 5 to 25 | Fatty acid (16 carbon atoms) |
| Colorants, perfumes | 0 to 1 | Limonene |
| Solvents | 0 to 0,3 | 2-isopropanol |
| Water | Qsp 100 | |

**[0044]** An example of cleaning compound suitable for use in a washing machine based on a cleaning product mentioned above is:

| Ingredients | Percentage (weight-%) | Compound |
|---|---|---|
| Tensioactives | 10 to 25 | Alkyl ether sulphonate |
| bleach | 5 to 25 | 6-phthalimido peroxy hexanoic acid |

(continued)

| Ingredients | Percentage (weight-%) | Compound |
|---|---|---|
| Enzimes | 0 to 4 | protease, amilase, lipase, celulase, pectinase, mananase.... |
| Soap | 5 to 25 | Fatty acid (16 carbon atoms) |
| Colorants, perfumes | 0 to 1 | Limonene |
| Solvents | 0 to 0,3 | 2-isopropanol |
| Water | Qsp 100 | |

**[0045]** An example of cleaning product suitable for use in a dishwasher is:

| Ingredients | Percentage (weigth-%) | Compound |
|---|---|---|
| Tensioactives | 10 to 25 | Alkyl ether sulphonate |
| Solvents (alcohols) | 1 to 3 | 2-isopropanol |
| Prebleach | 1 to 5 | tetra acetyl ethylene diamine |
| Salts | 1 to 5 | Sodium percarbonate |
| Chelating agent | 0 to 1 | Citric Acid |
| Antimicrobial | 0 to 0,2 | Tributyl(tetradecyl)ammonium clhoride |
| Colorants, perfumes | 0 to 1 | Limonene |
| Water | Qsp 100 | |

**[0046]** An example of cleaning compound suitable for use in a dishwasher based on a cleaning product mentioned above is:

| Ingredients | Percentage (weigth-%) | Compound |
|---|---|---|
| Tensioactives | 10 to 25 | Alkyl ether sulphonate |
| Solvents (alcohols) | 1 to 3 | 2-isopropanol |
| Bleach | 1 to 5 | acetic acid + di acetyl ethylene diamine |
| Salts | 1 to 5 | Sodium percarbonate |
| Chelating agent | 0 to 1 | Citric Acid |
| Antimicrobial | 0 to 0,2 | Tributyl(tetradecyl)ammonium clhoride |
| Colorants, perfumes | 0 to 1 | Limonene |
| Water | Qsp 100 | |

**LIST OF REFERENCE CHARACTERS/SIGNS**

**[0047]**

1 Water
2 Water containing reactive oxygen species
3 Cleaning product
4 Cleaning compound
5 Device for producing a cleaning compound
6 Water tank
7 Oxygenating unit
8 Cartridge and/or capsule

9 Identifier
10 Blending container
11 Dispenser
12 Electronic control unit
13 User interface
14 Housing

## Claims

1. A method for producing a cleaning compound (4), particularly for a home appliance, from water (1), oxygen solved in the water (1), and a cleaning product (3), the method comprising the steps of: a) Providing water (1), oxygen solved in the water (1), and the cleaning product (3); b) Producing water (2) containing reactive oxygen species in the device (5) by forming reactive oxygen species in the water (1) from the water (1) and the oxygen; c) Producing the cleaning compound (4) by blending the water (2) containing reactive oxygen species with the product (3).

2. The method according to claim 1, **characterized in that** in step a) the product (3) is provided stored in a cartridge and/or in a capsule (8).

3. The method according to claim 2, **characterized in that** the method further comprises the following additional step c1) carried out before step c):
c1): The cartridge and/or capsule (8) storing the product (3) to be blend in step c) is tagged with an identifier (9) for identifying the product (3).

4. The method according to any of claims 1 to 3, **characterized in that** in step b) the reactive oxygen species are formed by means of ultrafine bubbles, electro-Fenton process, photo-catalysis, electro-catalysis or plasma.

5. The method according to any of claims 1 to 4, **characterized in that** the product (3) provided in step a) is provided in a solid or liquid state.

6. Cleaning compound (4), produced by the method according to any of the preceding claims.

7. Cleaning compound according to claim 6, **characterized in that** the quantity and/or final formulation of the cleaning compound (4) produced by means of the device (5) is dependent on at least one external parameter.

8. A device (5), particularly for a home appliance, for producing a cleaning compound (4) according to the method according to any of claims 1 to 5.

9. The device according to claim 8, **characterized in that**

- the device (5) comprises a water tank (6) for containing the water (1, 2);
- the device (5) comprises an oxygenating unit (7) using ultrasound, ultrafine bubbles, electro-Fenton process, photo-catalysis, electro-catalysis or plasma for forming the reactive oxygen species;
- the device (5) comprises a blending container (10) for blending the water (2) containing reactive oxygen species with a cleaning product (3);
- the device (5) comprises a dispensing element (11) for providing the cleaning compound (4) to its intended place of usage;
- the device (5) comprises an electronic control unit (12) which is configured/programmed to run the method according to any of claims 1 to 6.

10. The device (5) according to any of claims 8 or 9, **characterized in that** the device (5) comprises a cartridge and/or capsule (8) for storing the product (3) to be blend;

11. The device (5) according to claim 10, **characterized in that** the device (5) comprises an automated identification and data capture unit communicating with the electronic control unit (12) for identifying the cleaning (3) product (3) to be blend and stored in the cartridge and/or capsule (8) tagged with the identifier (9).

12. The device (5) according to any of claims 8 to 11, **characterized in that** the device (5) comprises a user interface

(13) for communication with the electronic control unit (12) for and displaying information to a user concerning the execution of method according to any of claims 1 to 5.

**13.** A home appliance comprising a device (5) according to any of claims 8 to 12.

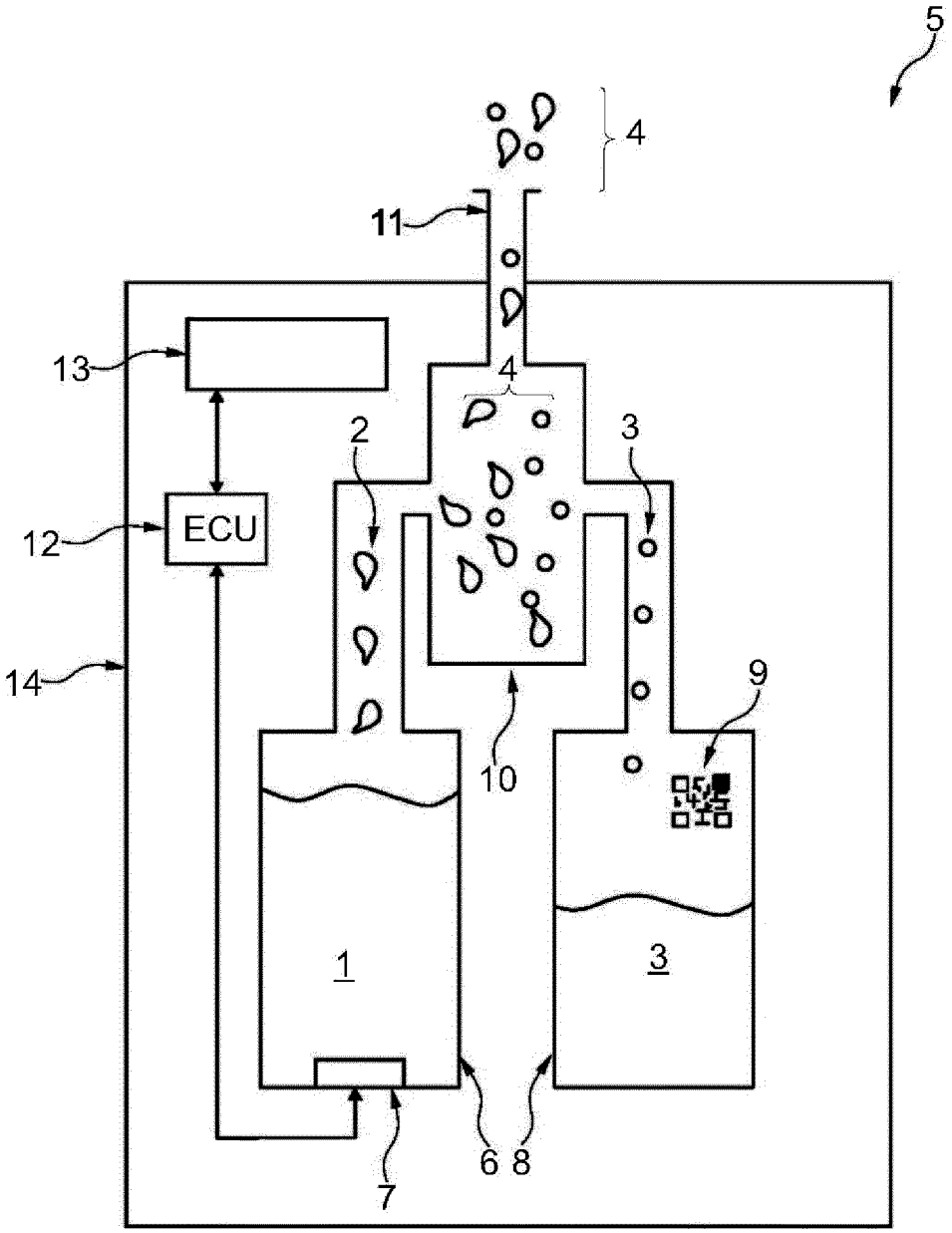


Fig. 1

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# EUROPEAN SEARCH REPORT

Application Number
EP 19 38 2075

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| Category | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim | CLASSIFICATION OF THE APPLICATION (IPC) |
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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 | 23 July 2019 | Weinberg, Ekkehard |

CATEGORY OF CITED DOCUMENTS

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## ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 19 38 2075

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