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(54) **STAIN REMOVAL DEVICE USING BLEACH CHEMICAL SOLUTION AND HEAT GENERATION**

(57) Stain removal device (201, 301A, 401A, 301B, 401B) for treating a stained area (101) on a cloth (102), whereby said stain removal device (201, 301A, 401A, 301B, 401B) comprises a heating plate (102) for heating a bleach chemical solution previously dosed onto the stained area (101) of the cloth (102), the stain removal device (201, 301A, 401A, 301B, 401B) further comprises means (302, 203) for absorbing vapors of the bleach chemical solution generated from the stained area (101) and/or draw air containing said vapors.

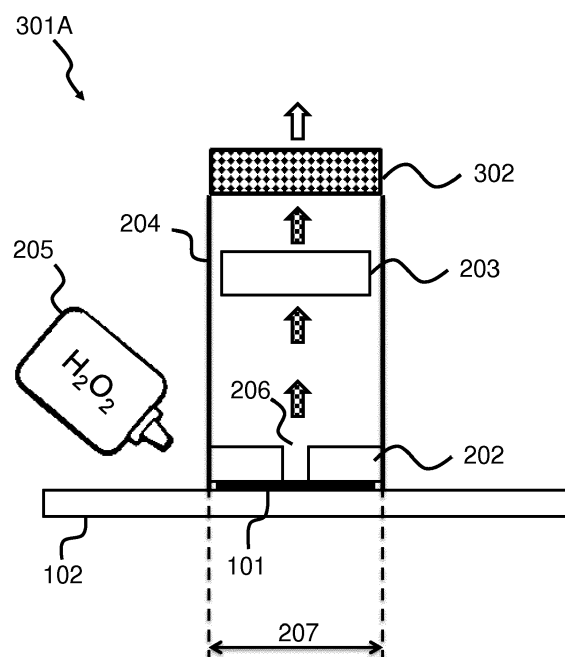


FIG.3A

Description

FIELD OF THE INVENTION

[0001] The invention relates to the field of stain removal.

BACKGROUND OF THE INVENTION

[0002] Hydrogen peroxide (H_2O_2) is an oxidizing bleach chemical agent which widely used for disinfecting, medical, and cosmetics.

[0003] Low concentration hydrogen peroxide (usually less than 10%, 3% and 6% most common) can be directly purchased on shelf for cleaning and hygiene purpose in household.

[0004] As H_2O_2 solution is a strong oxidant, active to many organic molecules, reducing agent and is also corrosive to many metals, high concentration H_2O_2 (>40%) can be considered hazardous under certain regulations.

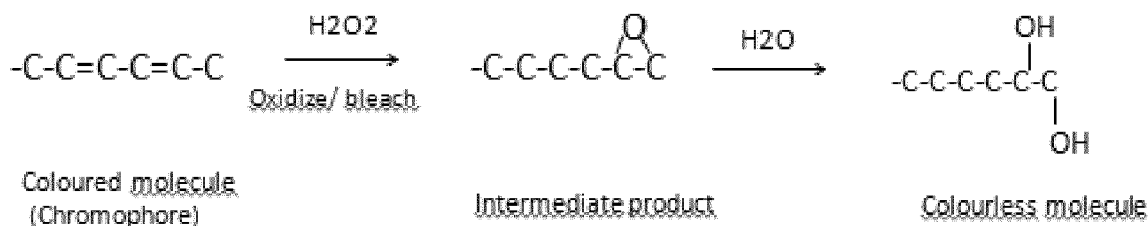
[0005] Some liquid or gel type of stain removers or laundry detergents also contains certain amount of H_2O_2 as bleaching agent to remove staining on clothes.

[0006] There exists the following laundry cleaning products on the market:

A first product uses a gel as pre-treatment that works into stain before laundry.

A second product is a portable stain remover with a marker pen size that can be brought outside and directly applied onto clothes.

[0007] The bleaching/oxidizing reaction between H_2O_2 and stain molecules can be described in general as below.



[0008] The obtained products of this reaction are oxidized molecules (colorless) and H_2O .

[0009] As the H_2O_2 concentration in commercial stain removing products are low, the bleaching reaction is not as effective and requires comparatively long time to diminish the stain color, normally 5 min to 30 min waiting time is needed depends on the stain age and stain type.

SUMMARY OF THE INVENTION

[0010] It is an object of the invention to propose a stain removal device that avoids or mitigates above-mentioned problems.

[0011] The invention is defined by the independent claims. The dependent claims define advantageous embodiments.

[0012] To this end, the stain removal device for treating a stained area on a cloth comprises:

a heating plate for heating a bleach chemical solution previously dosed onto the stained area,
 a housing for enclosing the stained area and the heating plate,
 an absorption component for absorbing vapors of said bleach chemical solution generated from the stained area,
 said absorption component cooperating with said housing and being arranged above said heating plate.

[0013] Alternatively, the stain removal device for treating a stained area on a cloth comprises:

a heating plate for heating a bleach chemical solution previously dosed onto the stained area,
 a housing for enclosing the stained area and the heating plate,
 a suction fan arranged in said housing to draw air containing vapors of said bleach chemical solution generated from the stained area.

[0014] This solution allows removing stain color very fast (in less than 5 min) by heating up the low concentration (for

example 3%) of bleach chemical solution, such as H_2O_2 , after being applied onto the stained area. It is especially effective on stains that can be oxidized like juice, wine, coffee etc.

[0015] The bleaching/oxidizing reaction rate is greatly enhanced due to the high temperature introduced.

[0016] After reaction is completed, excess of bleach chemical agent decomposes into H_2O and oxygen slowly, as high temperature is introduced in this process.

[0017] Under temperature higher than 100 degrees Celsius, water also can be very effectively evaporated out, and resulting in a dry, stain-free clothes.

[0018] One advantage of this solution is that removing stain and drying the stained area on the fabric is done at the same time, no water rinsing is required and no chemical residue is left over on clothes.

[0019] The absorption component and/or suction fan prevents vapor inhalation and skin contact by user and eliminates any possible health-related side effects.

[0020] Detailed explanations and other aspects of the invention will be given below.

BRIEF DESCRIPTION OF THE DRAWINGS

[0021] Particular aspects of the invention will now be explained with reference to the embodiments described hereinafter and considered in connection with the accompanying drawings, in which identical parts or sub-steps are designated in the same manner:

Fig.1 illustrates the stain removal process according to the invention,
 Fig.2 depicts a first embodiment of a device according to the invention,
 Fig.3A depicts a second embodiment of a device according to the invention,
 Fig.3B depicts a device according to the invention corresponding to a modified version of the device depicted in Fig.3A,
 Fig.4A depicts a third embodiment of a device according to the invention,
 Fig.4B depicts a device according to the invention corresponding to a modified version of the embodiment depicted in Fig.4A,
 Fig.5 depicts a flow chart of a method according to the invention,
 Fig.6A, Fig.6B, Fig.6C depict various embodiments of a heating plate used in a device according to the invention.

DETAILED DESCRIPTION OF EMBODIMENTS

[0022] In the following, the invention is described using hydrogen peroxide H_2O_2 as bleach chemical agent. However, the invention also applies to any bleach chemical agent containing hydrogen peroxide or peroxy acids, or a mixture of both kinds.

[0023] Fig.1 illustrates the stain removal process according to the invention.

[0024] The overall principle of the present invention and stain removal process can be described as follows.

[0025] First stage S1: H_2O_2 solution is sprayed on a stained area 101 of a cloth 102. The H_2O_2 solution oxidizes stain molecules from colored to colorless.

[0026] Second stage S2: Heating of the sprayed H_2O_2 solution up to a temperature more than 100 degreeC in order to:

Accelerate the oxidization reaction rate,
 Evaporate the water,
 Decompose H_2O_2 into water and oxygen.

[0027] Third stage S3: The stained area 101 has been transformed into a colorless area 103, and the cloth 102 is dry. No water rinsing step is needed as there is no chemical residue left over on the cloth 102.

[0028] Fig.2 depicts a first embodiment of a device 201 according to the invention. The device 201 comprises:

a heating plate 202 that is used to heat up the H_2O_2 solution previously dosed onto the stained area 101 of the cloth 102,
 a suction fan 203 to draw air containing H_2O_2 vapors generated from the stained area 101,
 a housing 204, for example made of plastic, for enclosing the heating plate 202 and the suction fan 203.

[0029] The H_2O_2 vapors are illustrated by arrows directing upward.

[0030] In this embodiment, H_2O_2 solution is dosed manually by user on the stained area. For example, a container/bottle/cartridge 205 containing H_2O_2 solution can be used to this end.

[0031] Preferably, the heating plate 202 comprises at least one hole 206 (for example in a middle part of the heating plate 202) to let H_2O_2 vapors pass through. Alternatively or in combination (not shown), the housing 204 has an opening

207 (for example the diameter of the housing 204) which is larger than the heating plate 202 in order to more efficiently enclose the H_2O_2 vapors within the housing 204.

[0032] Fig.3A depicts a second embodiment of a device 301A according to the invention. It is based on the embodiment of Fig.2. The device 301A further comprises:

an absorption component 302 cooperating with the housing 204 for absorbing the H_2O_2 vapors.

[0033] Preferably, the absorption component 302 is arranged at a top part of the housing 204.

[0034] The housing 204 preferably surrounds the absorption component 302.

[0035] The absorption component 302 aims to prevent H_2O_2 vapours to propagate around the stain remover device 301A. Indeed, when H_2O_2 has a high temperature, some H_2O_2 vapours will be released into air which may result in chemical inhalation and skin contact by user.

[0036] The absorption component 302 prevents or reduce the possible H_2O_2 vapors that would be released around the stain remover device 301A otherwise. H_2O_2 or H_2O_2 -water vapors can be sucked out by the suction fan 203, and passing through the absorption component 302 and been "trapped" or "quenched".

[0037] H_2O_2 vapors and/or water vapors pass through the absorption component 302 arranged at a top part of the housing. H_2O_2 vapors and/or water vapors are absorbed in the absorption component 302 while passing through it.

[0038] Fig.3B depicts a device 301B according to the invention corresponding to a modified version of the embodiment depicted in Fig.3A.

[0039] In this embodiment, the suction fan 203 has been removed. Air containing vapors of the bleach chemical solution is no more forced to move towards the absorption component 302. Air containing vapors of the bleach chemical solution is mainly moved by diffusion.

[0040] This solution has a lower performance compared to the embodiment of Fig.3A in terms of speed of absorbing vapors of the bleach chemical solution, but can still achieve an efficient absorption.

[0041] Fig.4A depicts a third embodiment of a device 401A according to the invention. It is based on the device of Fig.3B. The device 401A comprises:

a container 402 for storing H_2O_2 solution,

a system to carry H_2O_2 solution onto the stained area 101 of the cloth 102. The system may also simply be a tube 403 carrying the H_2O_2 solution falling by gravity onto the stained area 101. Alternatively, as represented, the system may further comprise a liquid pump 404 to more effectively carry H_2O_2 solution onto the stained area 101 via the tube 403.

a heating plate 202 that is used to heat up the H_2O_2 solution previously dosed onto the stained area 101,

a suction fan 203 to draw air containing H_2O_2 vapours generated from the stained area 101,

an absorption component 302 arranged at a top part of the housing for absorbing H_2O_2 vapours,

a housing 204, for example made of plastic, for enclosing the heating plate 202, the container 402., the system 403-404 to carry H_2O_2 solution, the suction fan 203 , and the absorption component 302.

[0042] As illustrated, the vapors are caused to flow around the heated plate 202 within the housing 204, in direction of the absorption component 302.

[0043] Preferably, the heating plate 202 comprises a hole 405 (for example in its middle) in order to let the H_2O_2 solution pass through it and reach the stained area 101. The hole 405 receives the pipe 403.

[0044] Preferably, as illustrated, the housing 204 has an opening 207 (for example corresponding to its diameter, if the housing 204 has a cylindrical shape) which is larger than the heating plate 202 to more efficiently enclose the H_2O_2 vapours within the housing.

[0045] Alternatively, when the heating plate 202 is as large as the opening 207 of the housing 204, the heating plate 202 preferably comprises at least one hole to allow H_2O_2 vapors and/or water vapors be carried out of the stained area 101:

A first embodiment is illustrated in Fig.6A: this embodiment comprises one hole 406A arranged in a central part of the heating plate 202, and having a diameter larger than the pipe 403.

[0046] A second embodiment is illustrated in Fig.6B: this embodiment comprises two holes 406B arranged in the heating plate 202.

[0047] A third embodiment is illustrated in Fig.6C: this embodiment comprises four (partial) holes 406C arranged in the heating plate 202.

[0048] In those embodiments, H_2O_2 vapors and/or water vapors are carried in the central part of housing 204, around the container 402.

[0049] The absorption component 302 works same as in the embodiment of Fig.3. The H_2O_2 vapors and/or water

vapors pass through the absorption component at a top part of the housing. H₂O₂ vapors and/or -water vapors are absorbed in the absorption component while passing through.

[0050] Any material that is able to absorb water or water vapors or react with H₂O₂ can be used in the absorption component. For example, materials that absorb water (desiccant) include silica beads (indicating silica), silica gel, calcium sulfate, calcium oxide, calcium chloride, montmorillonite, molecular sieve, etc.

[0051] Materials that react with H₂O₂ include active carbon, catalysis like metal ions and enzyme, reducing agent like ferrous sulfate, etc.

[0052] The absorption component 302 can be formed by or filled-in with a single material mentioned above, or a combination of material mentioned above.

[0053] Fig.4B depicts a device 401B according to the invention corresponding to a modified version of the embodiment depicted in Fig.4A.

[0054] In this embodiment, the suction fan 203 has been removed. Air containing vapors of the bleach chemical solution is no more forced to move towards the absorption component 302. Air containing vapors of the bleach chemical solution is mainly moved by diffusion.

[0055] This solution has a lower performance compared to the embodiment of Fig.4A in terms of speed of absorbing vapors of the bleach chemical solution, but can still achieve an efficient absorption.

[0056] Fig.5 depicts a flow chart of a method according to the invention of treating a stained area 101 on a cloth 102. The method comprises:

- a step 501 of dosing a bleach chemical solution (for example H₂O₂) onto the stained area of the cloth,
- a step 502 of heating the stained area,
- a step 503 of enclosing the heated stained area 101,
- a step 504 of absorbing vapors of said bleach chemical solution generated from the stained area.

[0057] Preferably, the method also comprises a step 505 of drawing air containing said vapors.

[0058] The above embodiments as described are only illustrative, and not intended to limit the technique approaches of the present invention. Although the present invention is described in details referring to the preferable embodiments, those skilled in the art will understand that the technique approaches of the present invention can be modified or equally displaced without departing from the protective scope of the claims of the present invention. In the claims, the word "comprising" does not exclude other elements or steps, and the indefinite article "a" or "an" does not exclude a plurality. Any reference signs in the claims should not be construed as limiting the scope.

Claims

1. A stain removal device (301B, 401B) for treating a stained area (101) on a cloth (102), the stain removal device comprising:

- a heating plate (202) for heating a bleach chemical solution previously dosed onto the stained area (101),
- a housing (204) for enclosing the stained area (101) and the heating plate (202),
- an absorption component (302) for absorbing vapors of said bleach chemical solution generated from the stained area (101), said absorption component (302) cooperating with said housing (204) and being arranged above said heating plate (202).

2. A stain removal device as claimed in claim 1, further comprising a suction fan (203) arranged in said housing (204) to draw air containing said vapors.

3. A stain removal device (201, 301A, 401A) for treating a stained area (101) on a cloth (102), the device comprising:

- a heating plate (202) for heating a bleach chemical solution previously dosed onto the stained area (101),
- a housing (204) for enclosing the stained area (101) and the heating plate (202),
- a suction fan (203) arranged in said housing (204) to draw air containing vapors of said bleach chemical solution generated from the stained area (101).

4. A stain removal device as claimed in claim 3, further comprising an absorption component (302) cooperating with said housing (204) for absorbing said vapors.

5. A stain removal device as claimed in claim 1 or 4, wherein said absorption component (302) is arranged at a top

part of the housing (204).

6. A stain removal device as claimed in any one of the preceding claims, wherein the heating plate (202) comprises at least one hole (206) to let said vapors pass through.

7. A stain removal device as claimed in any one of the preceding claims, further comprising a container (402) for storing the bleach chemical solution and a system (403, 404) to carry the bleach chemical solution onto the stained area (101).

8. A stain removal device as claimed in claim 7, wherein the system to carry the bleach chemical solution comprises a liquid pump (404).

9. A stain removal device as claimed in claim 7, wherein the heating plate (202) comprises a hole (405) to let the bleach chemical solution pass through.

10. A stain removal device as claimed in any one of the claims 1 or 4, wherein the absorption component (302) is made of any one of the following materials: silica beads, silica gel, calcium sulfate, calcium oxide, calcium chloride, montmorillonite, molecular sieve, active carbon, metal ions and enzyme, ferrous sulfate.

11. A stain removal device as claimed in any one of the preceding claims, wherein the bleach chemical solution comprises hydrogen peroxide H_2O_2 .

12. A container (205, 402) for containing a bleach chemical solution, said container being adapted to cooperate with a stain removal device as claimed in any one of the preceding claims.

13. A container as claimed in claim 12, said container corresponding to a refillable tank.

14. A container as claimed in claim 13, said container corresponding to a removable cartridge.

15. A container as claimed in any one of the claims 12 to 14, wherein the bleach chemical solution comprises hydrogen peroxide H_2O_2 .

16. Method of treating a stained area (101) on a cloth (102), comprising the steps of:

dosing (501) a bleach chemical solution onto the stained area (101),
heating (502) the stained area (101),
enclosing (503) the heated stained area (101),
absorbing (504) vapors of said bleach chemical solution generated from the stained area (101).

17. Method as claimed in claim 16, further comprising the step of:

drawing air (505) containing said vapors.

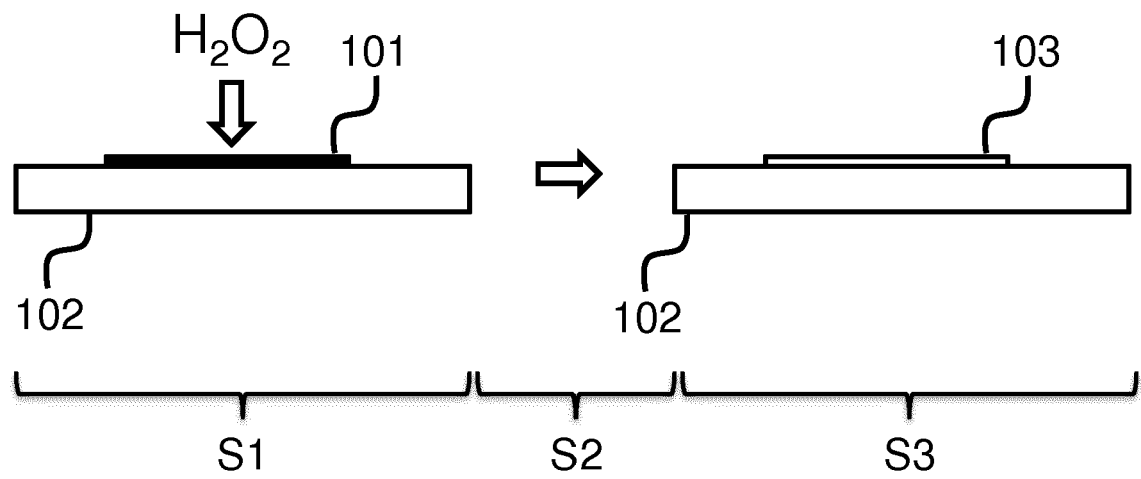


FIG.1

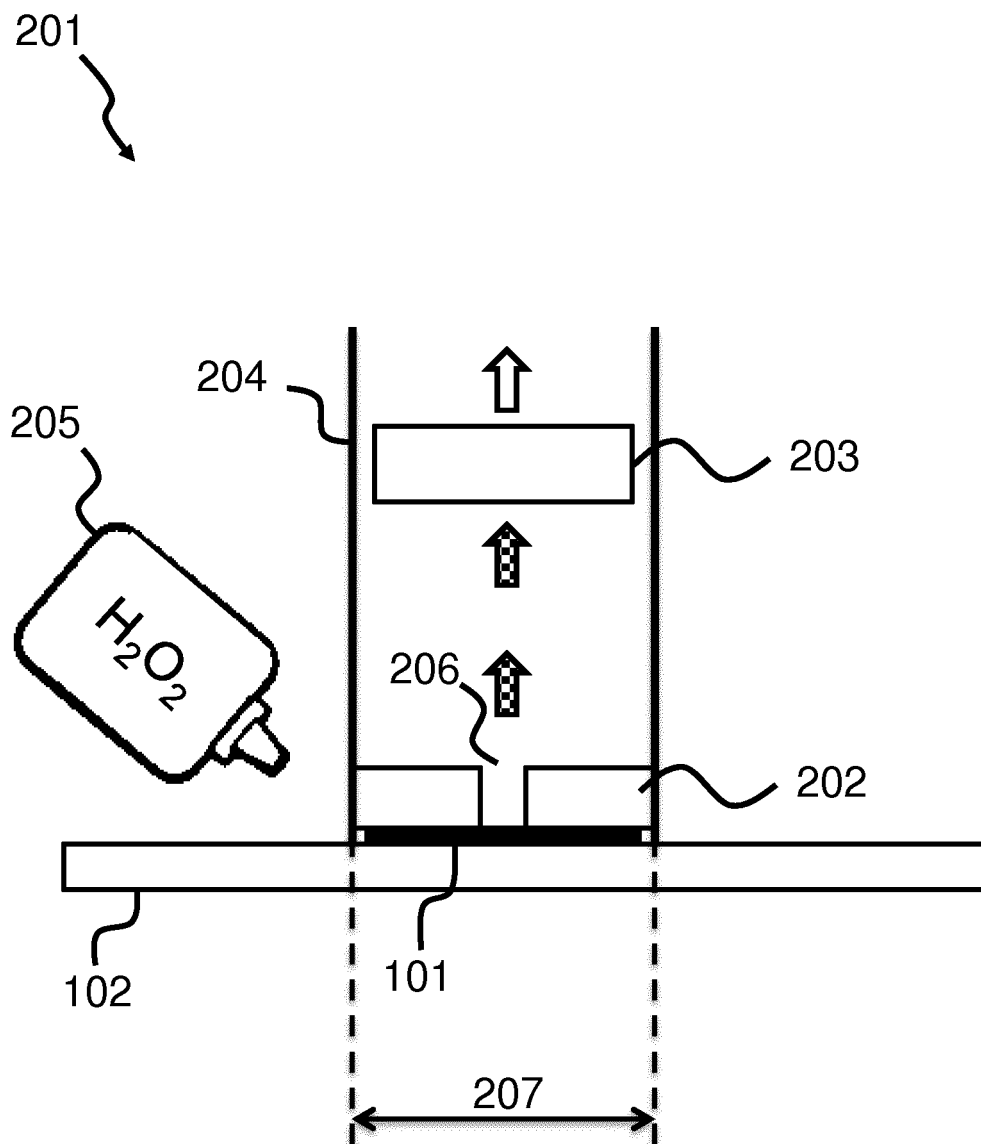


FIG.2

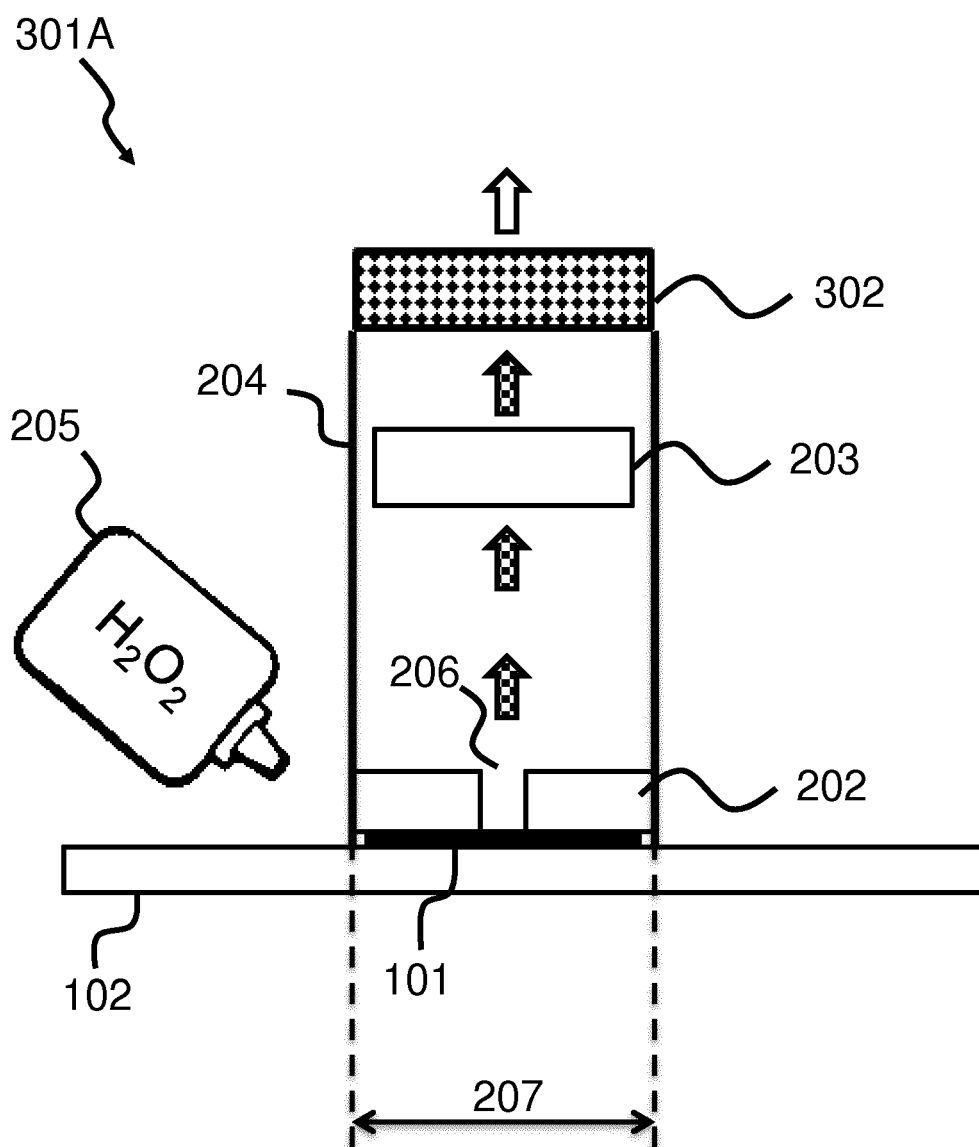


FIG.3A

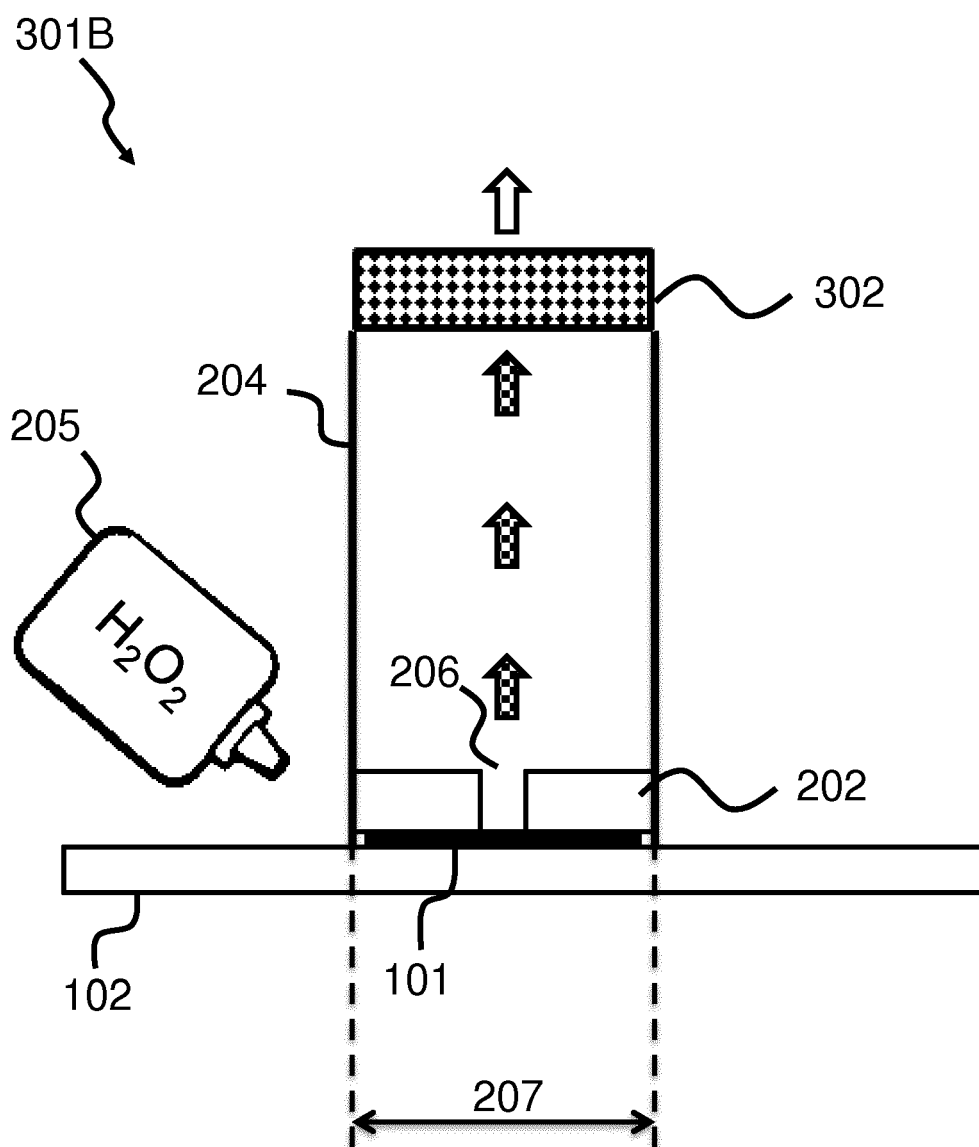


FIG.3B

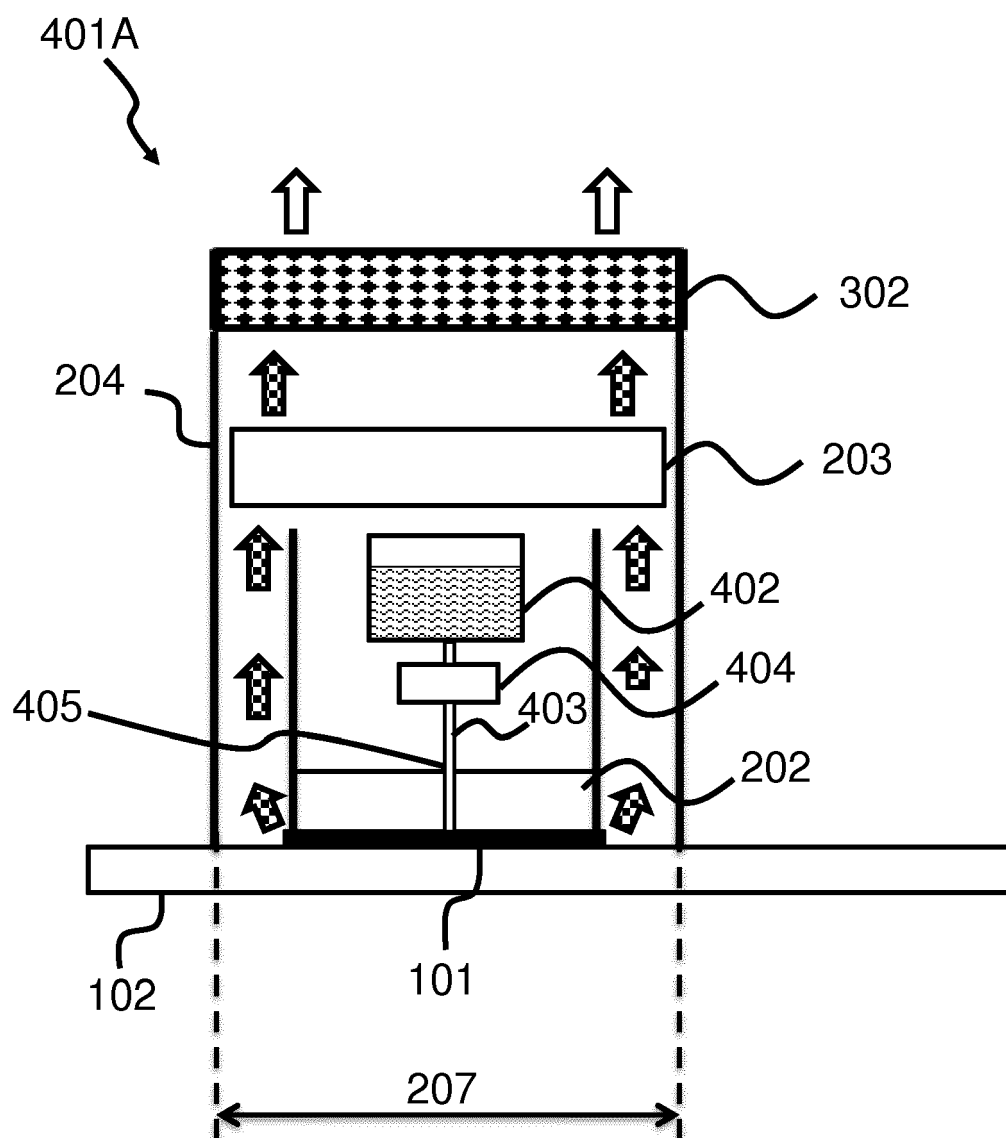


FIG.4A

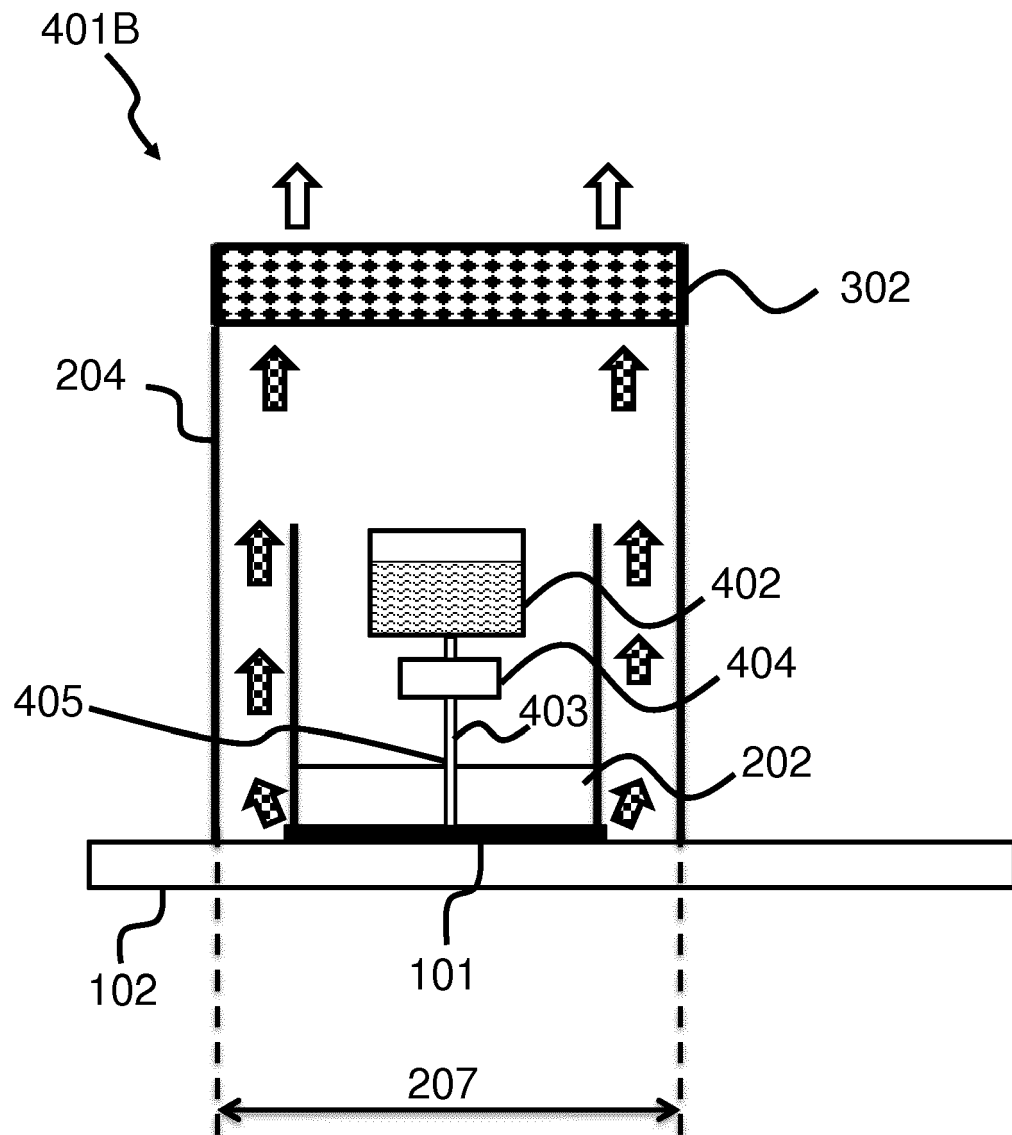


FIG.4B

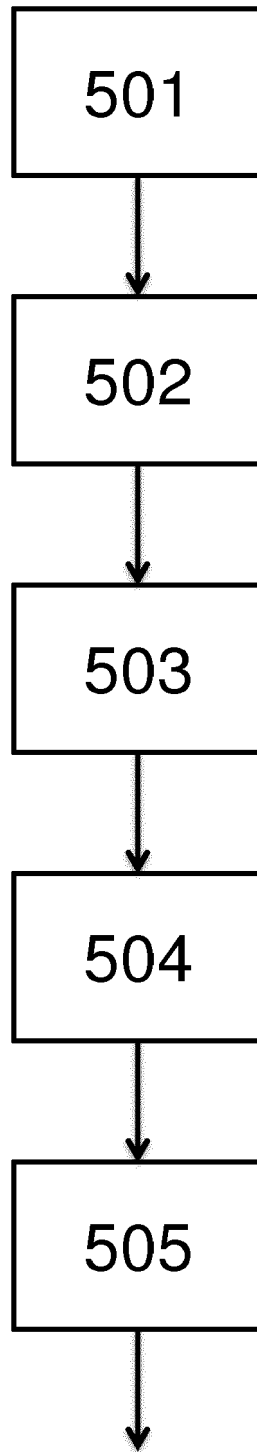


FIG.5

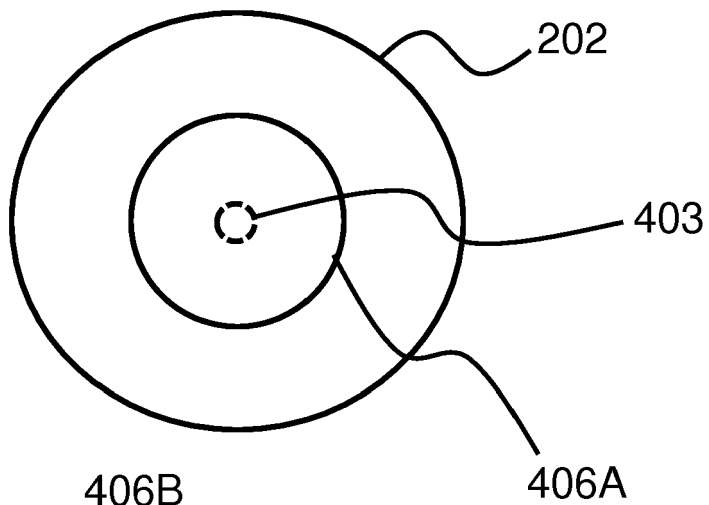


FIG. 6A

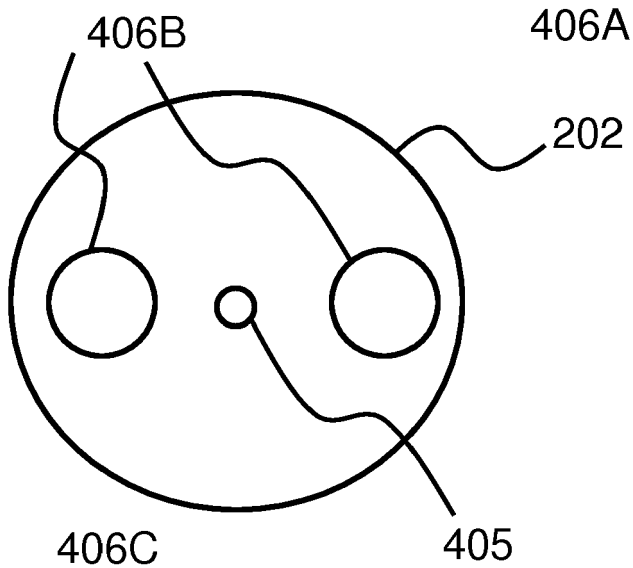


FIG. 6B

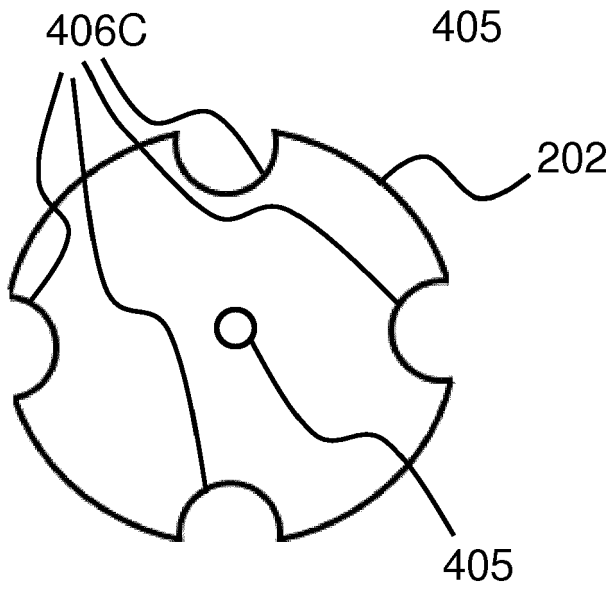


FIG. 6C



EUROPEAN SEARCH REPORT

Application Number
EP 17 20 7319

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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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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 1 June 2018	Examiner Clivio, Eugenio
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	

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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