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(54) **DEVICE FOR THE TREATMENT OF LAUNDRY USING BIOCIDES**

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(75) Inventor: **Michael Kohne**, Gundelfingen (DE)

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Correspondence Address:  
**EDELL, SHAPIRO & FINNAN, LLC**  
1901 RESEARCH BOULEVARD, SUITE 400  
ROCKVILLE, MD 20850 (US)

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(73) Assignee: **SMART FIBER AG**, Rudolstadt (DE)

(57) **ABSTRACT**

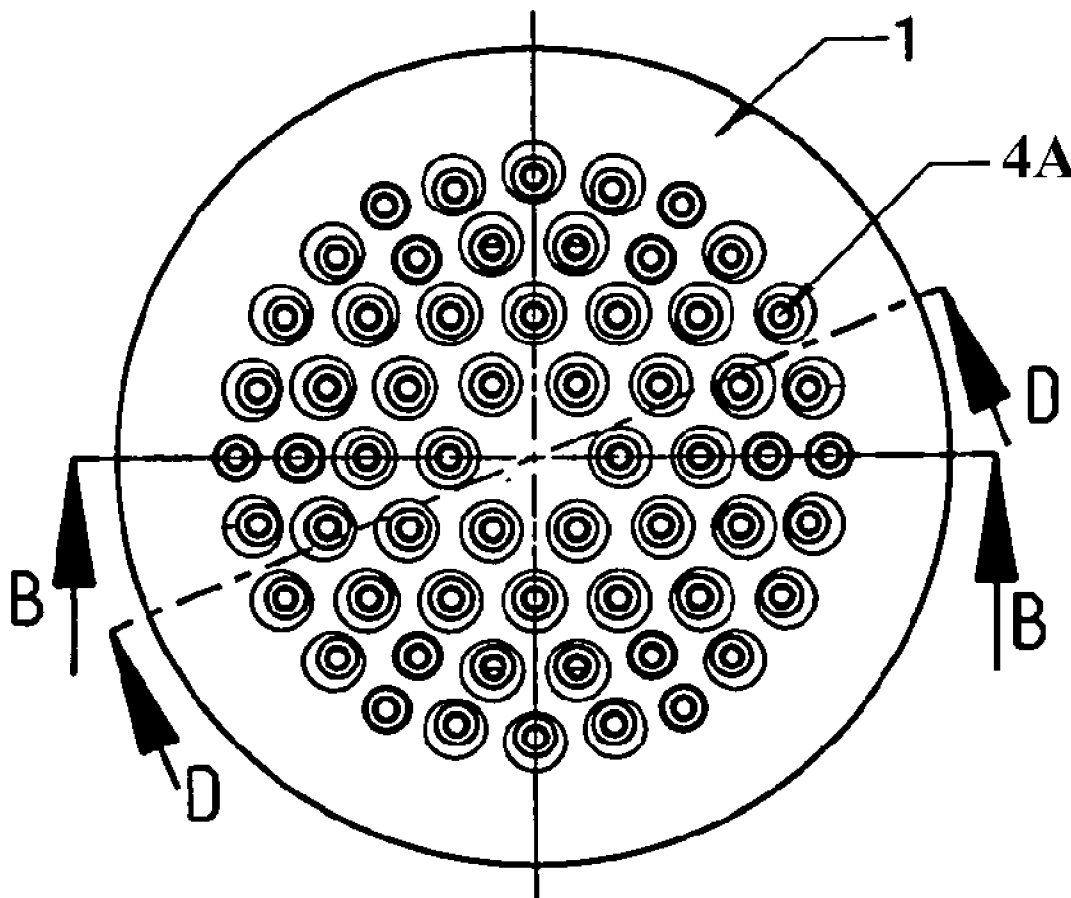
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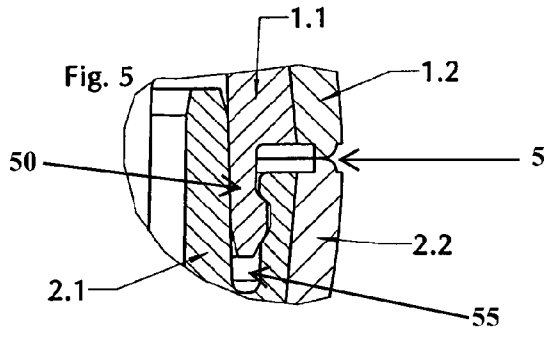
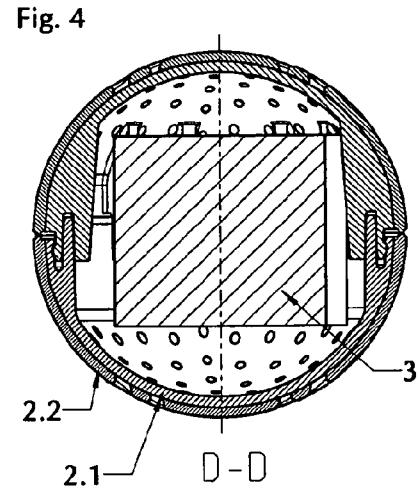
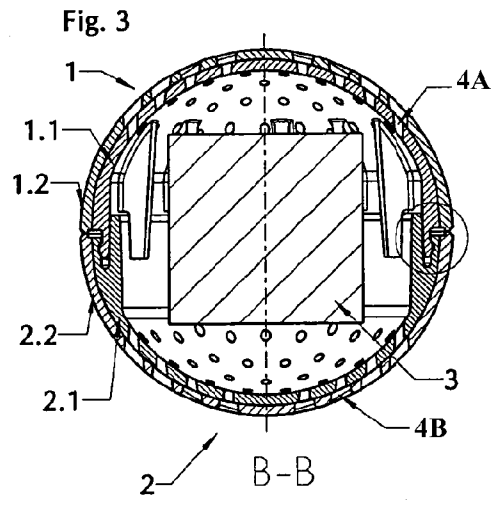
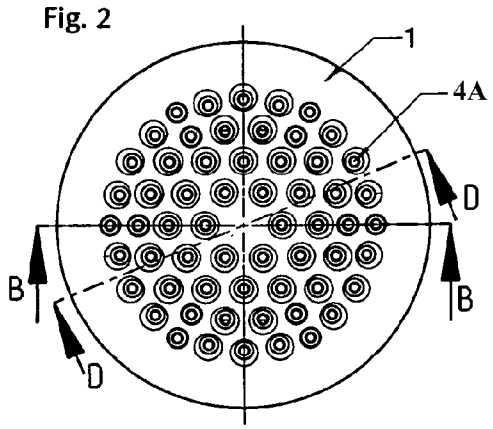
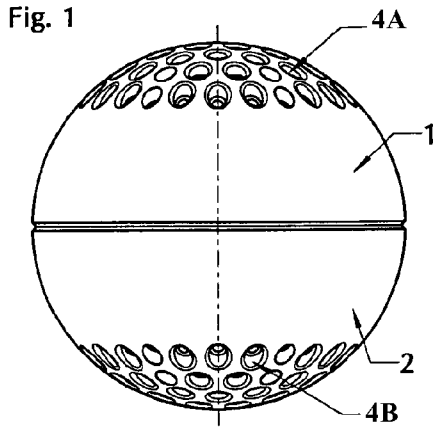
An apparatus for the biocidal treatment of laundry in a washing machine includes a hollow body in which a biocidal substance is enclosed and whose shell has openings for the passage of the washing and rinsing bath. The biocidal substance is chosen in such a way that it is at least substantially harmless for the human metabolism and is effective for a certain period of time beyond the washing process in the washed laundry.

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**Related U.S. Application Data**

(63) Continuation of application No. PCT/EP2008/001811, filed on Mar. 6, 2008.





## DEVICE FOR THE TREATMENT OF LAUNDRY USING BIOCIDES

### CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application is a continuation of International Application No. PCT/EP2008/001811, filed on Mar. 6, 2008, entitled "Device for the Treatment of Laundry Using Biocides," which claims priority under 35 U.S.C. §119 to Application No. DE 102007012972.8 filed on Mar. 14, 2007, entitled "Device for the Treatment of Laundry Using Biocides," the entire contents of which are hereby incorporated by reference.

### FIELD OF THE INVENTION

[0002] The invention relates to a device for the biocidal treatment of laundry in a washing machine.

### BACKGROUND

[0003] Biocides are capable of killing or at least growth-retarding microorganisms such as bacteria, viruses, fungi and/or spores. Certain biocidal substances have a biocidal effect in suitable dosing, and are generally harmless to the human organism and especially human metabolism. When these substances are added to washing machines, they decrease the level of bacteria therein. These biocidal substances are typically delivered utilizing a dosing apparatus to deliver the biocide to either the detergent or directly into the drum upon loading the same with laundry. A biocidal treatment of each batch of laundry in this manner, however, is both laborious and entails the risk of underdosage or overdosage.

[0004] Thus, it would be desirable to provide an apparatus that is easy to handle for biocidal treatment of laundry in a washing machine, especially a domestic (non-commercial) washing machine.

### SUMMARY

[0005] The present invention is directed toward a device that dispenses predetermined amounts of biocide within an aqueous environment and, in particular, during the wash cycle of a washing machine. The device includes a housing having an exterior body and an interior body nested within the exterior body. The interior body defines an internal chamber in which a biocide is contained. The housing includes a series of apertures that provide fluid communication into the interior chamber of the housing. In operation, the device is placed into the drum of a washing machine filled with water. As the drum operates, fluid enters the housing through the apertures, interacting with the biocide, a portion of which is dispensed into the water. The biocide-enriched water then travels out through the apertures in the housing. In this manner, biocide is delivered to the laundry-filled drum. The biocide coats drum components and clothing therein to prevent to formation of bacteria.

### BRIEF DESCRIPTION OF THE DRAWINGS

[0006] FIG. 1 illustrates a front view of the biocide-dispensing apparatus in accordance with an embodiment of the present invention.

[0007] FIG. 2 illustrates a top view of the apparatus of FIG. 1.

[0008] FIG. 3 illustrates a cross-sectional view taken along line B-B in FIG. 2.

[0009] FIG. 4 illustrates a cross-sectional view taken along line D-D in FIG. 2.

[0010] FIG. 5 illustrates a close-up view of the device of FIG. 1, showing the latch mechanism and the details on an enlarged scale.

[0011] Like reference numerals in the various figures are utilized to designate like components.

### DETAILED DESCRIPTION

[0012] This present invention is directed toward hollow body including a biocidal substance enclosed therein. The shell of the body includes openings for the passage of the washing and rinsing baths. The hollow body contains a biocidal substance whose type, composition and optionally carrier structure is chosen by the manufacturer in such a way that it is released continually into an aqueous medium (i.e., into the washing and/or rinsing baths of the washing machine) in an effective concentration which is harmless for humans. The user therefore only needs to place the hollow body (together with the laundry) into the drum of the washing machine and operate the machine normally. The biocidal substance and/or its carrier structure can especially be chosen in such a way that they remain active over many washing cycles, e.g. more than 100 cycles.

[0013] FIGS. 1 and 2 illustrate the dispensing device in accordance with an embodiment of the invention. As shown, the device may include a housing in the form of a hollow sphere having an upper shell portion or hemisphere 1 and a bottom shell portion or hemisphere 2. The shell portions 1, 2 are perforated and may be latched together (discussed in greater detail below). The dimensions of the sphere may be any suitable for its described purposed. By way of the example, the exterior diameter of the sphere can be approximately 50 mm.

[0014] FIGS. 1 and 3 further show that the upper shell portion 1 is provided with a first set of holes 4A and the bottom shell portion 2 is provided with a second set of holes 4B. The arrangement, number, and cross-section of the openings in the hollow-body shell have an influence on the concentration of the biocidal substance in the washing and/or rinsing baths. Appropriately, the holes 4A, 4B in the hollow-body shell can consist of two sets of mutually opposite holes with diameters of between 0.5 mm and 5 mm, with these two sets of holes being appropriately opposite of one another.

[0015] The sphere further includes an internal chamber in which a biocidal substance is contained. Referring to the embodiment illustrated in FIG. 3, a carrier body 3 (shown as a cube) is enclosed in the interior of the hollow sphere. The carrier body or substrate 3 contains a biocidal substance (e.g., a bactericide). The carrier body 3 can be a fiber structure in the form of a non-woven material or multi-layer knitwear or fabric which is doped (e.g., impregnated) with the biocidal substance. By way of example, the carrier body 3 may include silver-containing cellulosic fibers with ion-exchanging properties. Support materials to be considered can also be doped porous polymers, polyurethane, activated carbon, zeolites, ceramics, and the like.

[0016] The carrier body 3 may further include nanoscale particles coated onto or embedded into a carrier material (also called a substrate or support structure). Suitable organic or inorganic, porous or water-permeable carrier materials are known. Preferably, the biocidal substance comprises metal

ions. These can include ions of at least one of the metals of Ag, Cu, Zn, Au, Ir, Pd, Ti, Al and Sn. Alternatively, the biocidal substance can comprise quaternary ammonium compounds, triclosan, isothiazoline, antibiotics, chitosan or mixtures thereof. It is understood that the use of a mixture of different biocidal substances is also possible.

[0017] In other embodiments, it is possible to omit the carrier body 3 when the biocidal substance is a granulated or compact, e.g., a slightly soluble metal salt.

[0018] Depending on the choice made, the average effective concentration is set by the number and the cross section of the holes, the type of carrier material, and the quantity of its doping with the biocidal substance and, alternatively, its granulation and quantity. By way of example, the concentration of the biocide may be from approximately 1 µg/L to 10 mg/L water.

[0019] Preferably, the hollow body comprises an inner shell and an outer shell. This offers the advantage that the outer shell can be formed of a soft or elastic material which protects the laundry drum components, as well as provides an arrangement that is appealing with respect to color and haptics (texture/touch). In the embodiment of FIGS. 3 and 4, both shell portions 1, 2 are two-layered, with the upper shell portion 1 including an inner shell 1.1 nested within an outer shell 1.2 and the lower shell portion 2 including an inner shell 2.1 nested within an outer shell 2.2. The inner shells 1.1, 2.1 may be formed from plastic that ensures mechanical strength such as a glass-fiber-reinforced polypropylene. The outer shells 1.2, 2.2 may be formed from a thermoplastic elastomer. The inner 1.1, 2.1 and outer 1.2, 2.2 shells may be integrally connected by melting together or in any other suitable manner.

[0020] Both the inner 1.1, 2.1 and outer 1.2, 2.2 shells may include the above-described apertures or holes 4A, 4B that provide fluid communication through the wall of the sphere, permitting water to enter and exit the internal chamber of the sphere. By way of example, each shell 1.1, 1.2, 2.1, 2.2 may include holes having the same or different diameters. By way of specific example, the holes 4A, 4B may be provided in a stepped arrangement, i.e., the cross sectional dimensions of the holes in the outer shells 1.2, 2.2 may be slightly larger than the cross sectional dimension of the corresponding holes in the inner shell 1.1, 2.1. By way of specific example, the diameter of the hole is approximately one millimeter.

[0021] The inner shell 1.1 of the upper portion 1 and the inner shell 2.1 of the bottom portion 2 may be latched together circumferentially in a substantially non-detachable manner. As shown in FIG. 5, the inner shells 1.1, 2.1 are coupled via a latch 5, e.g., tongue-and-groove connection. Specifically, the upper inner shell 1.1 may include a tongue 50 that mates with a corresponding groove 55 formed into the lower inner shell 2.1. For this purpose, the upper inner shell 1.1 is provided with numerous webs which provide it with a high stiffness, so that the hollow sphere can only be opened by destroying the same.

[0022] The apparatus may further include an indicator or sensor embedded into the hollow-body shell in at least one location operable to indicate the end of the useful life of the apparatus by, e.g., changing its color. This is especially useful when the apparatus can be used for a very large number of laundry batches, e.g. 100, by suitable choice of the biocidal structure. The period of use can also be limited in such a case by mechanical wear and tear of the hollow body. Specifically, one or both shell portions 1, 2 can carry an indicator substance

which assumes the place of one hole (not illustrated). The sensing time depends on the number, duration, and the washing bath temperatures. The sensor indicates that the effectiveness of the biocidal substances is coming to an end.

[0023] While the invention has been described in detail and with reference to specific embodiments thereof, it will be apparent to one skilled in the art that various changes and modifications can be made therein without departing from the spirit and scope thereof. For example, the hollow body is preferably a hollow sphere, and may be formed from a detergent-resistant plastic.

[0024] The biocides may include substances that, when in contact with an aqueous medium, are released in an effective concentration which is harmless for human metabolism. Biocidal substances are especially preferred which are effective not only during the washing cycle, but also lead to an impregnation of the laundry, so that the laundry is equipped in a biocidal manner after the washing for a prolonged period of time, i.e., the invasion and/or the reproduction of microorganisms is reduced considerably or even suppressed completely for some time. This effect was proven especially in a quantitative respect in the use of metal ions as mentioned above, especially silver ions.

[0025] The two half-shells of the hollow body may be latched onto each other, and in particular, may be non-detachably latched to each other by the manufacturer after the introduction of the biocidal substance.

[0026] It is to be understood that terms such as “top”, “bottom”, “front”, “rear”, “side”, “height”, “length”, “width”, “upper”, “lower”, “interior”, “exterior”, and the like as may be used herein, merely describe points of reference and do not limit the present invention to any particular orientation or configuration. Thus, it is intended that the present invention covers the modifications and variations of this invention provided they come within the scope of the appended claims and their equivalents.

1. A laundry treatment apparatus for the biocidal treatment of laundry in a washing machine, the apparatus comprising:
  - a hollow body including a shell defining an internal chamber;
  - a carrier containing a biocidal substance, wherein the carrier is enclosed within internal chamber of the hollow body; and
  - openings formed into the shell for the passage of an aqueous medium into and out of the internal chamber,
 wherein the biocidal substance is released from the carrier upon contact with the aqueous medium such that the apparatus disperses the biocidal substance into washing and rinsing baths of the washing machine to provide the laundry with biocidal properties.
2. The apparatus according to claim 1, wherein the hollow body shell comprises a first shell section coupled to a second shell section.
3. The apparatus according to claim 1, wherein the hollow body is formed of plastic.
4. The apparatus according to claim 1, wherein the hollow body shell comprises an inner shell portion nested within an outer shell portion.
5. The apparatus according to claim 4, wherein:
  - the inner shell is formed of a glass-fiber reinforced polypropylene; and
  - the outer shell is formed of a thermoplastic elastomer.

6. The apparatus according to claim 1, wherein the openings in the hollow body shell comprise two mutually opposite sets of holes having diameters of between 0.5 mm and 5 mm.

7. The apparatus according to claim 1 further comprising an indicator embedded into at least one location in the hollow body shell, the indicator being operable to indicate the depletion of the biocidal substance by changing color.

8. (canceled)

9. The apparatus according to claim 1, wherein the biocidal substance comprises nanoscale particles disposed on a carrier material.

10. The apparatus according to claim 1, wherein the biocidal substance is water soluble.

11. The apparatus according to claim 1, wherein the biocidal substance comprises metal ions.

12. The apparatus according to claim 11, wherein the metal ions are selected from the group consisting of Ag, Cu, Zn, Au, Ir, Pd, Ti, Al and Sn.

13. The apparatus according to claim 1, wherein the biocidal substance comprises quaternary ammonium compounds, triclosan, isothiazoline, antibiotics, chitosan or mixtures thereof.

14-15. (canceled)

16. A device for dispersing biocide into a washing machine, the device comprising:

a hollow body comprising:

an outer shell having a first set of holes;

an inner shell nested within the outer shell, the inner shell having a second set of holes,

wherein each hole formed into the outer shell is in fluid communication with a corresponding hole formed into the inner shell;

an internal chamber defined by the inner shell of the hollow body; and

a substrate comprising a water soluble biocide disposed within the internal chamber,

wherein the holes cooperate to permit fluid to pass through the inner and outer shells and into the internal chamber such that the fluid contacts the substrate and exits the internal chamber as biocide-enriched fluid.

17. The device according to claim 16, wherein: the inner shell is formed of a glass-fiber reinforced polypropylene; and the outer shell is formed of a thermoplastic elastomer.

18. The device according to claim 17, wherein: the hollow body comprises a sphere having a first hemisphere coupled to a second hemisphere via a latch; and the latch comprises a tongue formed on the first hemisphere that mates with a groove formed into the second hemisphere.

19. The device according to claim 16, wherein the biocide comprises metal ions selected from the group consisting of Ag, Cu, Zn, Au, Ir, Pd, Ti, Al and Sn.

20. The device according to claim 16, wherein the biocide comprises quaternary ammonium compounds, triclosan, isothiazoline, antibiotics, chitosan, and mixtures thereof.

21. The apparatus according to claim 1, wherein the biocidal substance comprises nanoscale particles disposed on a fibrous carrier material

22. The apparatus according to claim 1, wherein the biocidal substance comprises nanoscale particles embedded into a fibrous carrier material.

23. The apparatus according to claim 1, wherein the biocidal substance is released in a concentration that is harmless for human metabolism and is effective to transfer biocidal properties to laundry after washing for a predetermined period of time.

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