(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
24 March 2011 (24.03.2011)

PCT

(10) International Publication Number
WO 2011/032848 A1

(51) International Patent Classification:
C02F 1/00 (2006.01) *C02F 1/76* (2006.01)
C02F 1/68 (2006.01)

(21) International Application Number:
PCT/EP2010/062959

(22) International Filing Date:
3 September 2010 (03.09.2010)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
2126/MUM/2009 17 September 2009 (17.09.2009) IN

(71) Applicant *(for all designated States except AE, AG, AU, BB, BH, BW, BZ, CA, CY, EG, GB, GD, GH, GM, IE, IL, IN, KE, KN, LC, LK, LS, MT, MW, MY, NA, NG, NZ, OM, PG, SC, SD, SG, SL, SZ, TT, TZ, UG, US, VC, ZA, ZM, ZW)*: **UNILEVER NV** [NL/NL]; Weena 455, NL-3013 AL Rotterdam (NL).

(71) Applicant *(for AE, AG, AU, BB, BH, BW, BZ, CA, CY, EG, GB, GD, GH, GM, IE, IL, KE, KN, LC, LK, LS, MT, MW, MY, NA, NG, NZ, OM, PG, SC, SD, SG, SL, SZ, TT, TZ, UG, VC, ZA, ZM, ZW only)*: **UNILEVER PLC** [GB/GB]; A company registered in England and Wales, under company no.41424 of Unilever House, 100 Victoria Embankment, London Greater London EC4Y 0DY (GB).

(71) Applicant *(for IN only)*: **HINDUSTAN UNILEVER LIMITED** [IN/IN]; Hindustan Lever House, 165/166 Backbay Reclamation, Maharashtra, Mumbai 400 020 (IN).

(72) Inventors; and

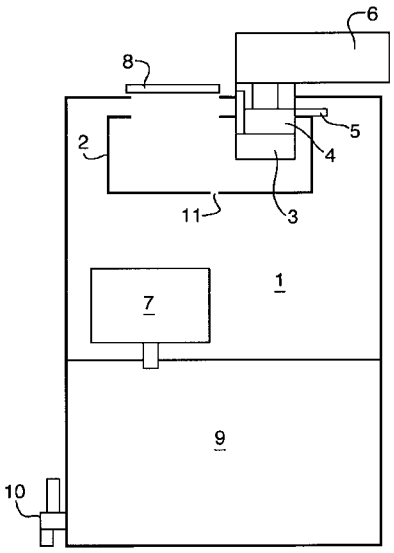
(75) Inventors/Applicants *(for US only)*: **CHATTERJEE, Jaideep** [IN/IN]; Hindustan Unilever Ltd., Research Centre, 64 Main Road, Whitefield, Bangalore 560 066 (IN). **GUPTA, Santosh Kumar** [IN/IN]; Hindustan Unilever Ltd., Research Centre, 64 Main Road, Whitefield, Bangalore 560 066 (IN). **RAMACHANDRAN, Rajeesh Kumar** [IN/IN]; Hindustan Unilever Ltd., Research Centre, 64 Main Road, Whitefield, Bangalore 560 066 (IN). **PRATAP, Shailendra** [IN/IN]; Hindustan Unilever Ltd., Research Centre, 64 Main Road, Whitefield, Bangalore 560 066 (IN). **WASKAR, Morris** [IN/IN]; Hindustan Unilever Ltd., Research Centre, 64 Main Road, Whitefield, Bangalore 560 066 (IN). **KUSHWAHA, Priyanka** [IN/IN]; Hindustan Unilever Ltd., Research Centre, 64 Main Road, Whitefield, Bangalore 560 066 (IN).

(74) Agent: **ROSEN JACOBSON, Frans L.M.**; Unilever Patent Group, Olivier van Noortlaan 120, NL-3133 AT Vlaardingen (NL).

[Continued on next page]

(54) Title: A WATER PURIFICATION DEVICE

Fig.1.



(57) Abstract: The invention relates to a water purification device and a process for water purification and in particular relates to a water purification device that maybe used as a gravity fed system or adapted to be connected to the main water supply. It is a single chamber water purification device which is capable of dosing a controlled level of a biocide to the water and has a filtration unit that functions as a f ilter-cum-scavenger. This water purification device provides several advantages over the prior art especially in terms of reducing the complexity of the device thus making it economical and reducing the number of replaceable parts without affecting the performance in terms of microbial safety or flow rate. Another advantage of the system is that it can be adapted for use with solid and liquid biocides.

WO 2011/032848 A1

(81) **Designated States** *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) **Designated States** *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— *with international search report (Art. 21(3))*

A Water Purification device

Technical field:

The present invention relates to a water purification device and a process for water purification and in particular relates to a water purification device that may be used as a gravity fed system or adapted to be connected to the main water supply.

The invention has been developed primarily for use in drinking water application and will be described hereinafter with reference to this application. However, it will be appreciated that the invention is not limited to this particular field of use.

Background and Prior Art:

Any discussion of the prior art throughout the specification should in no way be considered as an admission that such prior art is widely known or forms part of the common general knowledge in the field.

A large population of people in the world live in countries where there is a severe shortage of hygienic potable water. People have to depend directly on ground water sources like wells, ponds and rivers. Often these water sources are contaminated by sewage, industrial effluents and agricultural by-products like pesticide residues. For water to be microbially safe, WHO recommends 6 log removal of bacteria, 4 log removal of virus and 3 log removal of cysts. Whilst bacteria and virus removal to the required extent is possible by using chemical disinfection (e.g. by contacting with halogen) or radiation-based disinfection (e.g. by exposure to ultraviolet radiation), these disinfection methods do not achieve 3 log removal of cysts.

Gravity fed devices are available where it is possible to achieve 6 log removal of bacteria, 4 log removal of virus and 3 log removal of cysts

using filtration in combination with biocide action. Gravity fed devices function in the absence of pressurised and running water.

WO 2005095284 (Unilever, 2005), discloses a gravity fed water purification system comprising a filtration unit adapted to separate particulate and soluble material from the input water and this is in the form of a carbon block and usually has an additional non-woven fabric filter, a chemical dispensing unit such that flow rate of water exiting the filtration unit is controlled by a flow control means before the water encounters a biocide dispensed by the chemical dispensing unit, the water thereafter being retained in a retention chamber for a predetermined period of time before exiting the water purification system through a scavenger means adapted to separate the dispensed biocide and its by-products from the exit water. This device is quite complex having a number of replaceable parts

WO07000238 (Unilever, 2007), discloses a water purification device comprising an upper and a lower chamber comprising an outlet means for collecting purified water and a filter medium for removing suspended particulates and dissolved organics. The biocide system integral with it is a device which may dispense a unit dose of biocide and water may be fed into a chamber where the biocide could be dispensed. This designed only for a solid biocide and can not be adopted for a liquid biocide. The disadvantage with solid biocides is that they degrade on exposure to air.

WO08083896 (Unilever, 2008) discloses a gravity fed water purification device which may incorporate controlled dosing of a liquid biocide. The device uses a dosing passage comprising a venturi where a top chamber is in fluid communication with a bottom chamber, and water may flow from the top chamber to the bottom chamber. The water in this system has to flow at a high flow rate and the dosing rate depends on the rate of flow of water. Dosing of the biocide is caused by a negative (suction)

pressure at the discharge end of the liquid dosing tube, which is caused by water flowing through a venturi, which is connected to the discharge end of the tube in an air-tight manner. The air pressure in the compartment containing the liquid biocide, in this case, is at atmospheric pressure, which is "sucked" out of the biocide containing compartment by the negative pressure at its discharge end. In practice, the venturi based dosing system is highly sensitive to the physical dimensions, and control of dosage is more difficult. The system requires a lot of material for construction thus making it expensive.

The present inventors have been able to design a novel biocide dosing system which is due to a positive pressure created inside the biocide dosing compartment. This dosing system is significantly less sensitive to physical dimensions allowing for improved control of biocide dosage. In addition the narrow venturi as used in the prior art get clogged due to poor quality input water, the risk of which is eliminated in the dosing system disclosed in the present invention.

It has now been possible to develop a single chamber water purification device which is capable of dosing a controlled level of a biocide to the water and provide a filtration unit that functions as a filter-cum-scavenger. This water purification device provides several advantages over the prior art especially in terms of reducing the complexity of the device thus making it economical and reducing the number of replaceable parts without affecting the performance in terms of microbial safety or flow rate. Another advantage of the system is that it can be adapted for use with solid and liquid biocides.

It is an object of the present invention to overcome or ameliorate at least one of the disadvantages of the prior art.

The object of the present invention is to provide a water purification device which is less complex and thus making it economical in its construction.

Another object of the present invention to provide a water purification device with reduced number of replaceable parts and thus making it economical in its construction.

Another object of the present invention is to provide a water purification device that can be adapted to use both solid and liquid biocides.

Another object of the present invention is to provide a water purification device that can be used as a gravity fed device as well as adapted to be used in inline systems.

Summary of the invention:

According to the present invention there is provided a water purification device comprising:

i. a water purification chamber comprising a fill cup provided with an inlet port and with a porthole, said fill cup positioned at the top end of the water purification chamber is in fluid communication through the port hole with the water purification chamber;

ii. a positive air pressure created in the tube connecting the fill cup and biocide dispensing box that is in fluid communication with biocide storage compartment and a biocide dispensing port causes the biocide to be dispensed from the biocide dispensing box through the biocide dispensing port into the water purification chamber, and said water purification chamber is in fluid communication

through a filter with a pure water discharge chamber comprising a water discharge mechanism.

According to another aspect of the present invention there is provided a process for purification of water comprising:

i. filling water into fill cup with a porthole to create an air pressure in the tube;
ii. discharging the liquid biocide from the biocide dispensing box into the water purification chamber;
iii. creating an air pressure in the pure water discharge chamber by actuating the discharge mechanism;

such that the water from the water purification chamber after passing through the filter collects in the pure water discharge chamber.

The term "comprising" is meant not to be limiting to any subsequently stated elements but rather to encompass non-specified elements of major or minor functional importance. In other words the listed steps, elements or options need not be exhaustive. Whenever the words "including" or "having" are used, these terms are meant to be equivalent to "comprising" as defined above.

Brief description of the figures:

Figure 1 is an embodiment of the water purification device according to the invention.

Figure 2 is another embodiment of the water purification device according to the invention showing bellows as the discharging mechanism.

Figure 3 is yet another preferred embodiment of the purification device according to the invention.

Figure 4 is yet another preferred embodiment of the purification device according to the invention provided with a siphon mechanism.

Detailed Description of the invention:

Thus the present invention provides for a water purification device comprising:

i. a water purification chamber comprising a fill cup provided with an inlet port and with a porthole, said fill cup positioned at the top end of the water purification chamber is in fluid communication through the port hole with the water purification chamber;

ii. a positive air pressure created in the tube connecting the fill cup and biocide dispensing box that is in fluid communication with biocide storage compartment and a biocide dispensing port causes the biocide to be dispensed from the biocide dispensing box through the biocide dispensing port into the water purification chamber, and said water purification chamber is in fluid communication through a filter with a pure water discharge chamber comprising a water discharge mechanism.

The biocide may be provided as a solid or a liquid form. When it is in the solid form the device is designed to dissolve right amount of the solid to provide the correct quantity of liquid biocide in the biocide dispensing box. The biocide is preferably selected from any halogen releasing compounds and preferably chlorine releasing biocide including chlorinated trisodium phosphate, Sodium or Potassium or calcium hypochlorite, the various N-chlorinated compounds known in the art to release active chlorine such as sodium or potassium dichloroisocyanurate, trichlorocyanuric acid, monochloramine, dichloramine, [(monotrichloro)- tetra(monopotassium dichloro)]

pentaisocyanurate, 1,3-dichloro-5,5-dimethylidanotone, Chloramine T, p-toluene-sulfodichloroamide, thrichloromelamine, N-chloramine, N-chlorosuccinimide, N,N'- dichloroazodicarbonamide, N-chloroacetyl-urea, N,N-dichloroazo-dicarbonamide, N-chloroacetyl-urea,N,N-dichlorbiurile,chlorinated dicyandiamide.

Suitable liquid biocides that can be used in the device of the invention include aqueous solutions of sodium hypochlorite, sodium dichloro-isocyanuric acid, iodine, quaternary ammonium compounds or gluteraldehyde. Most preferred liquid biocide is an aqueous solution of sodium hypochlorite. When sodium hypochlorite is the liquid biocide used, it is added in the biocide storage compartment at a concentration in the range of 0.01 to 50 weight %, more preferably in the range of 1 to 20 weight % in water. With the use of the device of the invention, it is possible to get the concentration of the biocide in the water purification chamber in the range of 0.5 to 100 ppm by weight, more preferably in the range of 1 to 50 ppm by weight in water.

The filter cum biocide scavenger preferably comprises an activated carbon block filter media. The activated carbon block filter media comprises powder activated carbon (PAC) and a binder which are well mixed and made into a block by pressure and heat treatment. The PAC is preferably selected from bituminous coal, coconut shell/wood charcoal, petroleum tar. Preferably, the PAC used has size uniformity co-efficient of less than 2, or more preferably less than 1.5, a carbon tetrachloride number exceeding 50%, more preferably exceeding 60%.

The filter cum biocide scavenger is further provided with a particulate filter that is a single or multi-layered non-woven fibrous-fabric filter wherein the outermost layer is pleated. The filter could alternately comprise of a combination of a pleated and spirally wound fabric filter.

Particularly preferred carbon block filter media are those disclosed in GB2390987, more preferably that disclosed in our co-pending application 320/MUM/2004. The co-pending application describes a carbon block filter media for use in gravity fed filters comprising powder activated carbon (PAC) having a particle size such that 95 wt% of the particles pass through 50 mesh and not more than 12% passes through 200 mesh and a binder material having a Melt Flow Rate (MFR) of less than 5. Further preferred carbon block filter media has 55 to 80 wt % of the PAC particles in the particle size range of 100 to 200 mesh in the lower 50 volume% of the carbon block filter media.

The discharge mechanism may be a tap or a bellow actuated hand pump discussed later.

The invention will now be illustrated with help a specific non-limiting example of a water purification device according to the invention in Figures 1-4.

Detailed Description of the figures:

Figure 1 is an embodiment of the water purification device according to the invention. The device has a water purification chamber (1) comprising a fill cup (2) which is provided with a small porthole (11) preferably at the bottom of the fill cup to ensure that the water in the fill cup is drained out over extended time. The aperture of the porthole is substantially smaller than the inlet port of the fill cup which will ensure that the rate at which water is drained from the fill cup through the port is significantly slower than the rate at which the cup can be filled by the user. The water purification chamber is provided with a cover (8) opening which will allow the user to pour water into the fill cup as it is positioned at the top end of the water purification chamber. The inlet port of the

water purification chamber to receive input water is in line with the inlet port of the fill cup such that substantially all the input water flows into the fill cup. It is also designed such that filling in the fill cup allows water to overflow into the water purification chamber. There is a tube (3) connecting the fill cup and biocide dispensing box (4) that is in fluid communication with biocide storage compartment (6) and a biocide dispensing port (5). Below the water purification chamber is provided a pure water discharge chamber (9) to receive the purified water. The input water in the water purification chamber after being treated with a biocide passes through a filter-cum-biocide scavenger (7) into the pure water discharge chamber. The filter is positioned on the partition wall that separates the water purification chamber and the pure water discharge chamber. The filter helps in removing the residual biocide, organics, any suspended dirt and particulate matter and residual micro-organisms. The purified water can be discharged from the pure water discharge chamber by a discharge mechanism (10). The discharge mechanism is a tap attached to the lower end of the pure water discharge chamber.

When water flows into the fill cup through the inlet port of the water purification chamber and fills up the same, the level of water in fill cup creates an air pressure in the tube and enables the discharge of the biocide from the biocide dispensing box into the water purification chamber through the biocide dispensing port.

Figure 2 is another embodiment of the water purification device according to the invention. The water purification chamber (1) is provided with a lid which has an inlet port vertically above the fill-cup such that water that is poured in flows into the fill cup (2) and later fills the water purification chamber. As the water level rises in the fill cup an air pocket is formed in the tube (3) and when the water level reaches the top of 2, the air pressure in the tube is enough to dispense a few drops of the liquid biocide from the biocide dispensing port (5) into the water

purification chamber (1). Further addition of water into fill cup causes the water purification chamber to fill up, due to overflow, which also results in the uniform mixing of the liquid biocide throughout water purification chamber. After the mixing of biocide with the water, there is provided a filter-cum-biocide scavenger (7). Water from water purification chamber will pass through this scavenger and accumulate in pure water discharge chamber (9). Figure 2 provides a different dispensing device as compared to figure 1. Section (13) in the figure is connected to the pure water discharge chamber by means of a tube. Section (13) comprises of a non-return valve and a bellow. By pressing the bellow one can dispense the pure water from elevated dispensing tap (10). The elevated discharge point has several in-use advantages one of which is that the device need not be placed at the edge of a platform. At the time of pressing the bellow there will be a creation of pressure in the pure water discharge chamber as a result of which, water from the pure water chamber may go back to the water purification chamber (1) through the filter. To prevent this there is provided a non return valve (12) at the foot of the filter-cum-biocide scavenger (7). Due to this non-return valve the pressure created by pumping the bellow will help to dispense the water from elevated dispensing tap.

The biocide storage compartment has an opening through which the biocide can be replaced. When a liquid biocide is used, filling of the biocide storage compartment leads to the filling up of the biocide dispensing box. Alternately the biocide storage compartment could be a replaceable air-tight “bottle” which is in fluid communication with the biocide dispensing box like a closed inverted bottle over a liquid reservoir. This ensures discharge of the liquid biocide from the storage “bottle” only when the level of the biocide in the biocide dispensing box falls below the level of the lowest part of the inverted biocide storage “bottle”.

Figure 3 represents another preferred embodiment of the water purifier. The water purification chamber (1), the fill cup (2), the filter-cum-biocide scavenger (7), the biocide dispensing port (5), the biocide dispensing box (4), the pure water discharge chamber (9) everything remains same as in figure 2. In Figure 3 there is no non return valve at the foot of the filter-cum-scavenger as there is no bellow in the section 14. Section 14 only has a vent which is connected to the pure water discharge chamber. By opening the vent one can discharge the water from the tap (10). The opening of the air vent is either manually operated or actuated by a timer. The vent (14) is provided to control the residence time of water in the water purification chamber which has the biocide. By controlling the residence time one may get the desired level of purity of water.

Figure 4 represents another embodiment of the water purification device showing a water purification chamber (1) provided at its bottom inner section a filter chamber (15) that encloses the filter-cum-biocide scavenger (7). The filter chamber is provided with a water-tight cover (16) and an air vent (17). A siphon discharge mechanism (18) is provided to operatively connect the water purification chamber and the filter chamber such that the water from the water purification chamber flows into the filter chamber only through the siphon discharge mechanism. The air vent allows the siphon discharge mechanism to operate by allowing an upwardly directed passage for air to exit the filter chamber. The exit from the filter chamber is through the filter-cum-biocide scavenger, while the entry of water into the filter chamber occurs through the siphon discharge mechanism. The water tight cover ensures that water enters the filter Chamber only through the siphon. As the water purification chamber (1) fills-up to the highest level of the siphon, the siphon begins to discharge water into the filter chamber. As the water with biocide fills the filter chamber, water flows through the filter cum scavenger which removes colloidal impurities from the water as well as the residual biocide, and discharges water into the pure water discharge

chamber (9), Pure water devoid of biocide is available from pure water discharge chamber, through a dispensing means such as a tap (10).

Water is poured into the fill cup (2), in order to fill the device. The device cover (8) has an opening vertically above the fill-cup such that it would be obvious to the user that water has to be filled in through it.

As the water level rises in the fill cup, an air pocket is formed in the tube (3). This pressure is transmitted into dispensing box (4). When the water level reaches the top of fill cup, the air pressure in the air pocket is enough to dispense a few drops of the liquid biocide out of biocide dispensing box, through the biocide dispensing port (5) into the water purification chamber (1). Further addition of water into the fill cup causes the water purification chamber to fill up, due to overflow, which also results in the uniform mixing of the liquid biocide throughout the water purification chamber.

The biocide dispensing box is in fluid communication with a biocide storage compartment (6) such that the liquid biocide in biocide storage compartment is prevented from flowing out by vacuum. There is a small opening at the bottom of fill up, which is provided to ensure that fill cup gets drained out over time. The drain rate of the hole at the bottom of fill cup ensures that the drain rate is significantly slower than the rate at which the cup can be filled by the user. It also ensures that the air pocket forms during the next re-fill thereby ensuring smooth operation over several litters of water.

Examples:

Example 1

i. Test water:

A test water having TDS of 1000ppm and the TSS of 15 ppm was used for testing the efficacy of the water purification device as described in Figure 4 of the present invention.

ii. Evaluation of microbial safety.

To five liters of Test water described in Table 1, a culture of *E. coli* ATCC 10536 stock and MS2 bacteriophage stock was added to obtain a Log_{10} (input count per 100 ml): 7.25 log of *E.coli* and 5.96 log of MS2. This water was passed through the device and out put water was collected after passing 100 ml (Sample 1) and 3 L (Sample 2) and the samples were tested using standard Sterile MacConkey's Agar Medium for *E.coli* and ATCC Medium #271: *Escherichia* Medium along with a suitable host for MS2. The data is presented in Table 2.

Table 2

Organism	Sample Number	Log Reduction
E.coli		
	Sample 1	7.25
	Sample 2	7.25
MS2		
	Sample 1	5.96
	Sample 2	5.96

The above data show that the device was effective in removing microorganisms and purifying the water to levels suitable for drinking purposes.

It will be appreciated that the water purification device according to the present invention is less complex with reduced number of replaceable parts and thus making it economical in its construction.

5

Claims

1. According to the present invention there is provided a water purification device comprising:
    i. a water purification chamber comprising a fill cup provided with an inlet port and with a porthole, said fill cup positioned at the top end of the water purification chamber is in fluid communication through the port hole with the water purification chamber;
    ii. a positive air pressure created in the tube connecting the fill cup and biocide dispensing box that is in fluid communication with biocide storage compartment and a biocide dispensing port causes the biocide to be dispensed from the biocide dispensing box through the biocide dispensing port into the water purification chamber, and said water purification chamber is in fluid communication through a filter with a pure water discharge chamber comprising a water discharge mechanism.

2. A water purification device as claimed in claim 1 wherein the water purification chamber is provided with an inlet port adopted to receive input water that is in line with the inlet port of the fill cup such that substantially all the input water flows into the fill cup.

3. A water purification device as claimed in claim 1 or 2 wherein the aperture of the porthole of the fill cup is substantially smaller than the inlet port of the fill cup.

4. A water purification device as claimed in any one of the preceding claims wherein the biocide dispensed from the biocide dispensing box is in the liquid form.

5. A water purification device as claimed in any one of the preceding claims wherein the filter is encased in a filter chamber comprising an air vent.

6. A water purification device as claimed in claim 5 wherein the water purification chamber is operatively connected with the filter chamber through a siphon discharge mechanism such that the water from the water purification chamber flows into the filter chamber through the siphon discharge mechanism.

7. A water purification device as claimed in any one of the preceding claims wherein the filter comprises an activated carbon block filter media.

8. A water purification device as claimed in any one of the preceding claims wherein the filter comprises a single or multiple layers of pleated or non-pleated fabric filter, where the fabric comprises of nonwoven polymeric fibres.

9. A water purification device as claimed in any one of the preceding claims wherein the filter is a composite filter having layers of non-woven fabric and bound activated carbon element

10. A process for purification of water by a device claimed claims 1 comprising:

    i. filling water into fill cup with a porthole to create an air pressure in tube;
    ii. discharging the liquid biocide from the biocide dispensing box into the water purification chamber;

    such that the water from the water purification chamber after passing through the filter collects in the pure water discharge chamber.

Fig.1.

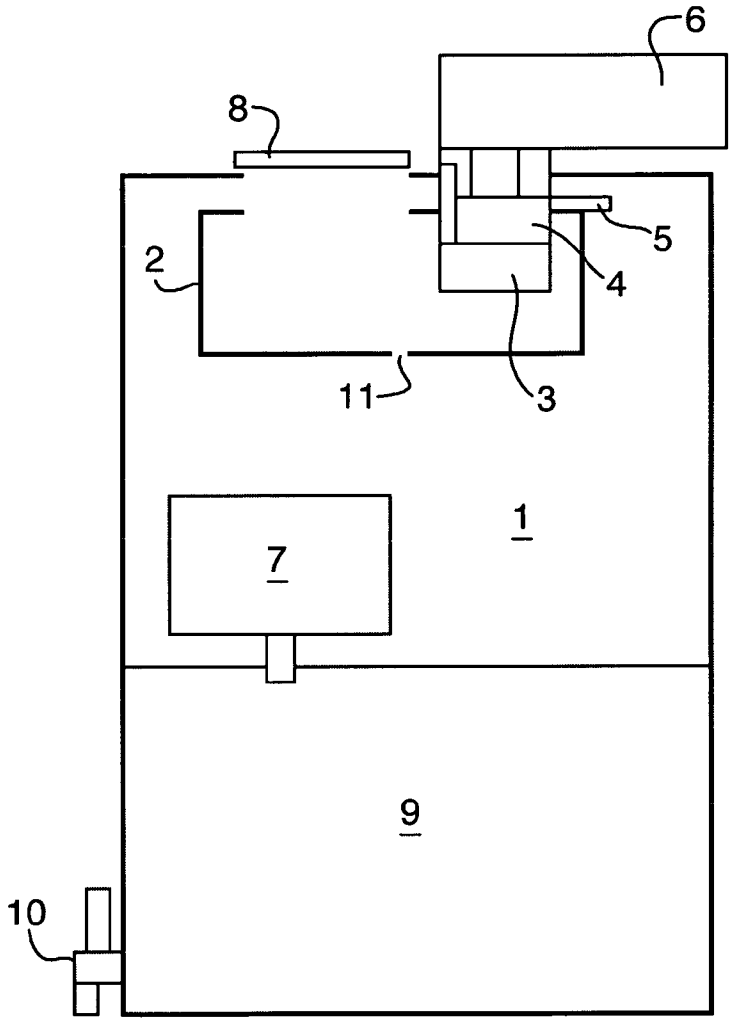


Fig.2.

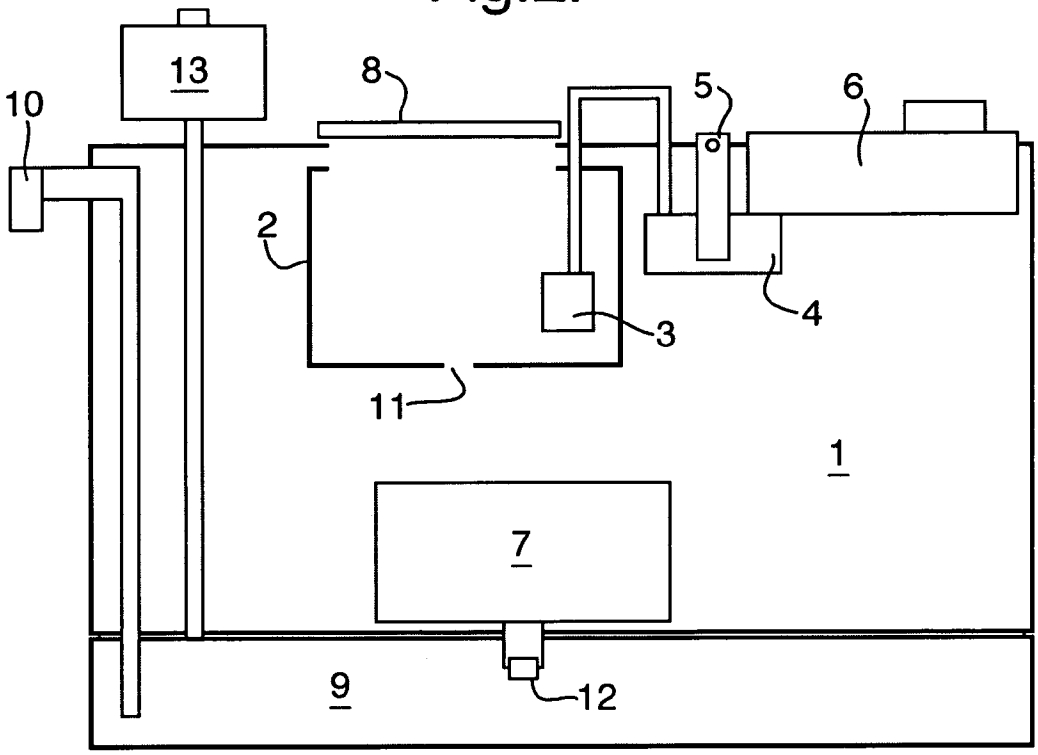


Fig.3.

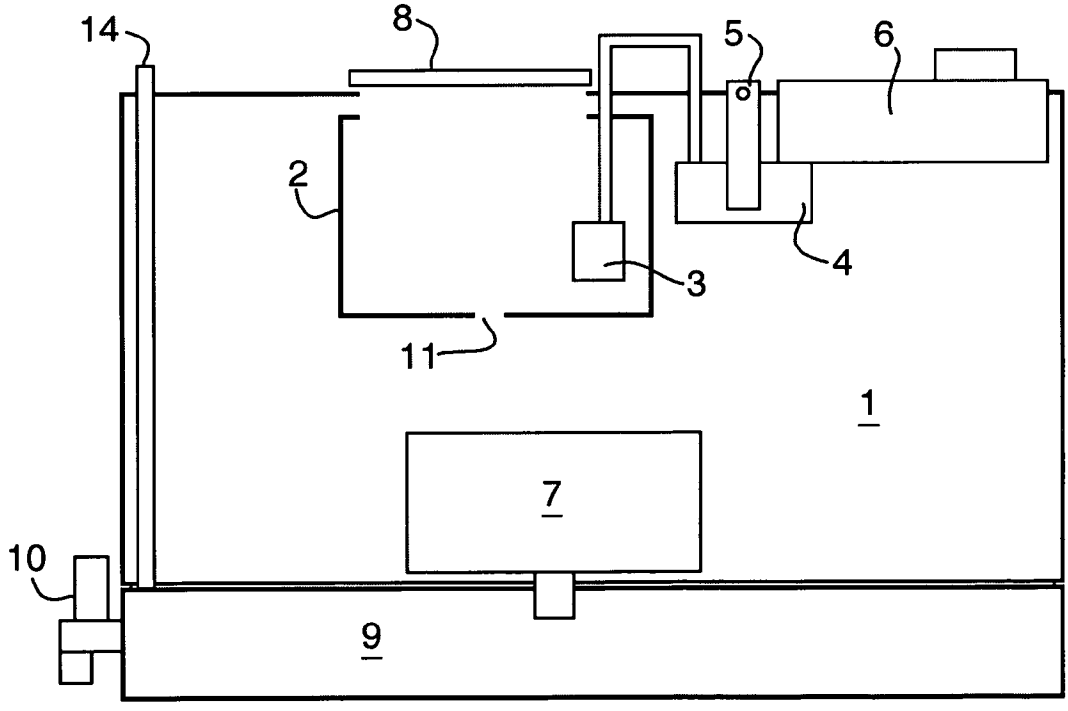
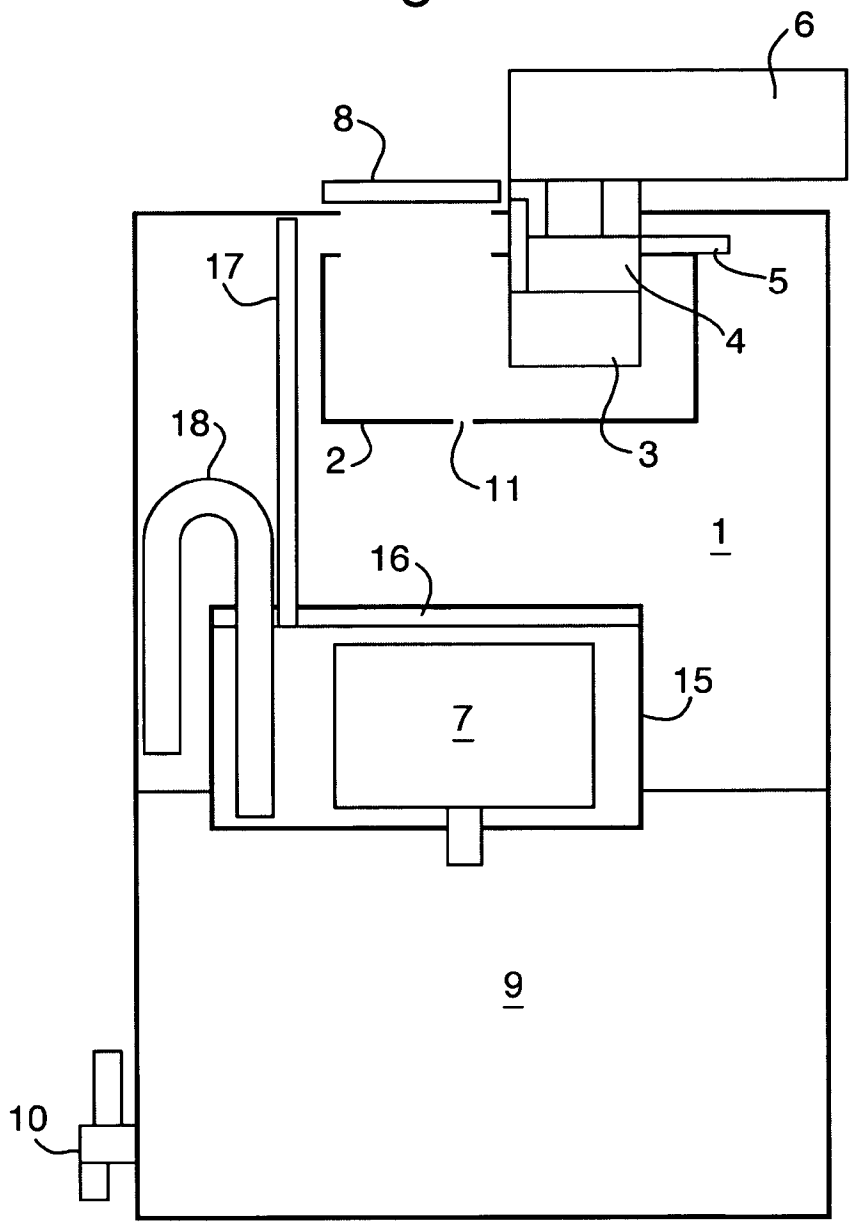


Fig.4.



INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2010/062959

A. CLASSIFICATION OF SUBJECT MATTER
INV. C02F1/00
ADD. C02F1/68 C02F1/76

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
C02F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data, COMPENDEX

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2008/083896 A1 (UNILEVER NV [NL]; UNILEVER PLC [GB]; UNILEVER HINDUSTAN [IN]; AGARWAL) 17 July 2008 (2008-07-17) cited in the application figures 1,3,4 claims 1-14 page 1, line 5 - line 7 page 11, line 23 - page 12, line 2	1-10

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
29 November 2010	13/12/2010

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Janssens, Christophe

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2010/062959

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2008083896 A1	17-07-2008	EA 200900988 A1	30-12-2009
		EP 2104647 A1	30-09-2009