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(71) Applicant (for AE, AG, AU, BB, BZ, CA, CY, GB, GD, GH, GM, IE, IL, KE, LC, LK, LS, MN, MW, NZ, OM, PG, SC, SD, SG, SL, SZ, TT, TZ, UG, VC, ZA, ZM, ZW only):
UNILEVER PLC [GB/GB]; Unilever House, Blackfriars, London EC4P 4BQ (GB).

(71) Applicant (for AL, AM, AT, AZ, BA, BE, BF, BG, BJ, BR, BY, CF, CG, CH, CI, CM, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, FR, GA, GE, GN, GQ, GR, GW,

HR, HU, ID, IS, IT, JP, KG, KP, KR, KZ, LR, LT, LU, LV, MA, MC, MD, MG, MK, ML, MR, MX, MZ, NE, NI, NL, NO, PH, PL, PT, RO, RU, SE, SI, SK, SN, SY, TD, TG, TJ, TM, TN, TR, UA, UZ, VN, YU only): **UNILEVER NV** [NL/NL]; Weena 455, NL-3013 AL Rotterdam (NL).

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

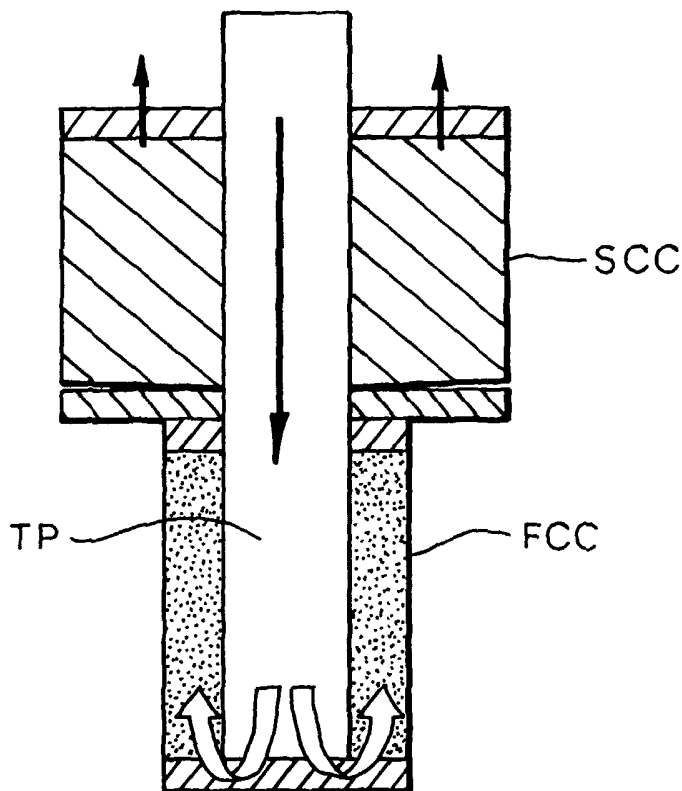
(72) Inventors: **MISTRY, Mahendrakumar, Maganlal**; Hindustan Lever Ltd, Research Centre, Chakala, Andheri (East), Maharashtra (IN). **MUKHERJEE, Nikhileshwar**; Hindustan Lever Ltd, Research Centre, Chakala, Andheri (East), Maharashtra (IN). **RAVIKUMAR, Dhulipala**; Hindustan Lever Ltd, Research Centre, Chakala, Andheri (East), Maharashtra (IN).

(74) Agents: **GRIFFITHS, Helen, Sarah** et al.; Unilever PLC, Patent Department, Colworth House, Sharnbrook, Bedford, Bedfordshire MK44 1LQ (GB).

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(54) Title: FILTER CARTRIDGE



(57) Abstract: The invention provides a filter cartridge for the treatment of water which comprises an inlet for the water to be treated, the inlet communicating with a downwardly extending hollow passage (TP) adapted for gravity flow of water there through, the hollow (TP) passage being connected at its lower end to at least one filter media, and an outlet for exiting treated water from the filter media; whereby water flows through the hollow passage (TP) and enters the lowermost end of the filter media (FCC) to travel upwards through the filter media so that entrapped air in the filter media may be released upwards and out of the filter cartridge during the passage of water through the filter media in the upward direction. The flow of water in the upward direction facilitates the release of entrapped air in the system of the invention. This provides for controlled uniform flow of water through the filter cartridge, which generates quality water even after extensive use.



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FILTER CARTRIDGE**Field of the Invention**

5 The present invention relates to a filter cartridge for use in gravity-fed water filtration systems.

Background and Prior Art

10 The use of filter cartridges in water filtration systems including gravity fed filters is well known.

Generally, such filter cartridges are cylindrically shaped and contain water purification resins. US 5273650 discloses
15 a water filter cartridge for use in a water filtration system which comprises a generally cylindrical ceramic pre-filter having a chamber containing a purification resin. An exit cap having a porous disc is attached at a first end of the pre-filter. Water to be filtered passes radially
20 through the pre-filter into the chamber. The water then passes through the purification resin and the porous disc and exits the water filter cartridge through an opening in the exit cap. Although simple to construct, such resin
25 varieties of contaminants which are usually found in water, ranging from chemical contaminants, particulate contaminants and even bacteriostatic/pathogenic materials.

US 5,562,824 discloses a gravity percolation water purifier
30 assembly. The assembly includes a cover storage container having a dispensing spigot. A flanged filtration chamber is

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supported within the cover to receive untreated water. A porous filter cartridge is sealed to an outlet port. The purifier cartridge used in the assembly is threaded to the outlet port and supports multiple treatment chambers

5 containing beds of water treatment media including multivalent iodine, granular activated carbon and a halogen scavenger. In this device, the first of the filter media (a resin chamber) is provided immediately under the filter inlet so that upon entering the filter cartridge during

10 gravity flow downwards the water to be treated first encounters the resin filter media. Thereafter, the water traverses through further filter beds to achieve the desired filtration.

15 While such multiple filter media based filter cartridges do provide for a wide variety of filter media to be employed to achieve the desired water characteristics, a problem associated with this type of filter cartridge is non-uniform flow and therefore non-uniform filtration through the

20 cartridge.

The present inventors have found that providing a resin bed immediately under the water inlet of the filter cartridge contributes immensely towards the problems of non-uniform

25 flow encountered in the filter cartridges of the type described above. This is because air in the resin bed is forced downwards when contacted with the flowing water to be treated. Not only does the air face resistance against its natural tendency to move up but it is further forced to take

30 a "U" turn before it can move upwards with the water flow. This therefore is a treacherous path that the air is forced

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to follow which finally causes air-entrapment or air voids in the filter media. If the volume of the resin in the cartridges is high, the problem gets compounded further, leading to air voids which lead to obstruction of the free
5 flow of the water through the cartridge and also channelling of the water in the cartridge. This results in uneven exposure of the water to be treated to the resin bed and consequential problems with quality and uniformity of water filtration.

10

Summary of The Invention

The present invention provides a filter cartridge for the treatment of water which comprises an inlet for the water to
15 be treated, the inlet communicating with a downwardly extending hollow passage adapted for gravity flow of water there through, the hollow passage being connected at its lower end to at least one filter media, and an outlet for exiting treated water from the filter media;

20 whereby water flows through the hollow passage and enters the lowermost end of the filter media to travel upwards through the filter media so that entrapped air in the filter media may be released upwards and out of the filter cartridge during the passage of water through the filter
25 media in the upward direction.

The invention solves the problem of entrapped air in the filter media which has been encountered in prior art filter cartridges. The hollow passage in the construction
30 according to the invention provides for a gravity flow of water into the cartridge which avoids any filter media

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immediately at the entrance of the water into the cartridge. This facilitates effective free downward flow of the water to be filtered in the cartridge without any pressure drop. In the construction according to the invention, the filter
5 media are encountered by the water in the filter cartridge only during the upward flow of the water. In this way, any entrapped air in the filter media is released upwards naturally without facing resistance from any counter-current of water. Instead the flow of water in the upward direction
10 actually facilitates the release of entrapped air in the system of the invention. The construction according to the invention provides for controlled uniform flow of water through the filter cartridge, which generates quality water even after extensive use.

15

Detailed Description Of The Invention

The filter cartridge according to the invention preferably comprises a plurality of filter media. The selection and
20 disposition of the filter media depends upon the specific end requirements. A variety of filter media can be used including those for filtration of suspended contaminants such as porous fibre, paper, granular activated carbon, cast granular activated carbon and the like. Additionally, the
25 cartridge can involve other filter media for filtration of bacteria and other pathogens, and the various filter media can be maintained in communication by separator filter pads.

A preferred filter cartridge according to the invention
30 comprises an inlet for the water to be treated, the inlet communicating with a substantially vertical tubular hollow

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passage for gravity flow of water therethrough, the tubular hollow passage being connected at its lower end to a first annular resin chamber which is concentrically disposed with respect to the tubular hollow passage, the first annular resin chamber being connected to a second annular chamber provided over the first annular resin chamber and concentrically disposed with respect to the tubular hollow member, the second annular chamber comprising activated carbon filter media;

whereby water to be treated enters the filter cartridge through the tubular hollow passage, is forced vertically upwards from the lower end of the tubular hollow passage through the first annular resin chamber and thereafter through the second annular activated carbon chamber, and exits from the filter cartridge through a water outlet.

Description Of Preferred Embodiment

The invention will now be further described with reference to the following non-limiting Example, in which:

Figure 1 is a sectional view of an embodiment of a filter cartridge in accordance with the present invention and

Figure 2 is a sectional view of a filter cartridge according to the prior art.

Figures 1 and 2 are schematic representations and are not to scale.

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As illustrated in Figure 1, water to be treated enters the filter cartridge through a hollow central tubular passage (TP) cartridge which is kept free of any filter media. Thereafter it traverses through an "U" path into a first annular concentric chamber (FCC) constituting a resin bed. hereafter after traversing through the resin bed the water is allowed to travel upward into the second annular activated carbon chamber (SCC), which is again a concentric chamber connected to the annular resin chamber.

10

By way of this construction, the water in the filter cartridge is allowed to displace any entrapped air in the filter media in the upward direction. This solves the problems of air entrapment and consequential blockage of the flow path of water through the cartridge experienced in the prior art and the accompanying problems of channelling of water and non-uniform.

15

Figure 2 is a sectional view of a prior art filter which comprises a resin bed (RB) through which the water to be treated is passed in the downward direction. The water then takes a U turn and passes in the upward direction through an annular chamber filled with activated carbon (AC), before exiting the filter through the exit provided.

20

25

Experiments were conducted to determine the flow rate of the filtered water as it passed through the filter cartridges as described in Figures 1 and 2 respectively, under identical conditions of gravity water head. The two filter cartridges were filled with equal volumes of resin.. They were also filled with equal volumes of activated carbon. The

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performance of the filter cartridges was quantified by determining the flow rate for a total of 54 litres.

5 The data on the performance of the filter cartridge of the invention as described in Figure 1 is compared with the performance of a prior art filter cartridge as described in Figure 2. The results are summarized in Table 1.

Table 1

Cumulative amount of water passed (litres)	Average flow rate of the water (ml/min) through filter cartridge of Fig. 1	Average flow rate of the water (ml/min) through filter cartridge of Fig. 2
6	118	53
30	96	31
54	90	20

10

It is evident from Table 1 that the flow rate achieved with the filter cartridge of the invention described in Figure 1 is much higher and more sustained over a large volume of water flow as compared to the prior art filter cartridge described in Figure 2. The quality of water purified with the Figure 1 filter cartridge was comparable to that with the Figure 2 filter cartridge.

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CLAIMS

1. A filter cartridge for the treatment of water which comprises an inlet for the water to be treated, the inlet communicating with a downwardly extending hollow passage adapted for gravity flow of water there through, the hollow passage being connected at its lower end to at least one filter media, and an outlet for exiting treated water from the filter media;

10

whereby water flows through the hollow passage and enters the lowermost end of the filter media to travel upwards through the filter media so that entrapped air in the filter media may be released upwards and out of the filter cartridge during the passage of water through the filter media in the upward direction.

15

2. A filter cartridge according to claim 1 which comprises a plurality of filter media.

20

3. A filter cartridge for the treatment of water which comprises an inlet for the water to be treated, the inlet communicating with a substantially vertical tubular hollow passage for gravity flow of water therethrough, the tubular hollow passage being connected at its lower end to a first annular resin chamber which is concentrically disposed with respect to the tubular hollow passage, the first annular resin chamber being connected to a second annular chamber provided over the first annular resin chamber and concentrically disposed with respect to the tubular hollow member, the second

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annular chamber comprising activated carbon filter
media;

5 whereby water to be treated enters the filter cartridge
through the tubular hollow passage, is forced vertically
upwards from the lower end of the tubular hollow passage
through the first annular resin chamber and thereafter
through the second annular activated carbon chamber, and
exits from the filter cartridge through a water outlet.

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Fig.1.

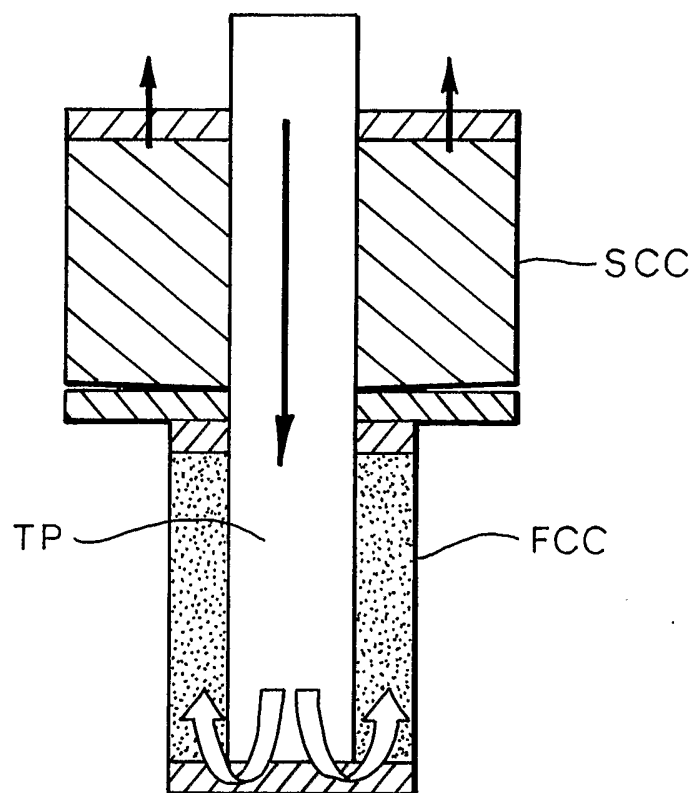
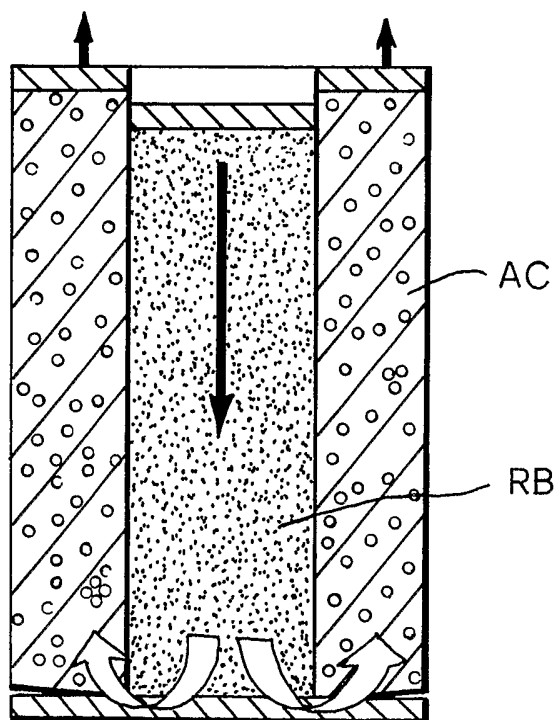


Fig.2.



INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 C02F1/28

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)

IPC 7 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, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 1 106 578 A (BRITA GMBH) 13 June 2001 (2001-06-13) column 6, line 1 -column 7, line 8; claims 1,2,5-7,12; figures 1-3 ---	1-3
A	US 4 948 505 A (GIORDANO EDWARD C ET AL) 14 August 1990 (1990-08-14) the whole document ---	1-3
A	US 4 814 078 A (PETERSON SAMUEL F ET AL) 21 March 1989 (1989-03-21) the whole document --- -/--	1-3

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Liebig, T

INTERNATIONAL SEARCH REPORT

International Application No

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	PATENT ABSTRACTS OF JAPAN vol. 1997, no. 11, 28 November 1997 (1997-11-28) & JP 09 174050 A (KURITATSUKU KK), 8 July 1997 (1997-07-08) abstract -----	1-3

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Information on patent family members

International Application No

PCT/EP 03/08641

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