



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

<b>(51) International Patent Classification <sup>7</sup> :</b>  <b>B01D 39/20, C02F 1/28</b>	<b>A3</b>	<b>(11) International Publication Number:</b> <b>WO 00/04977</b>  <b>(43) International Publication Date:</b> 3 February 2000 (03.02.00)
<b>(21) International Application Number:</b> PCT/US99/14999 <b>(22) International Filing Date:</b> 2 July 1999 (02.07.99)  <b>(30) Priority Data:</b> 60/091,593            2 July 1998 (02.07.98)            US 60/132,309            3 May 1999 (03.05.99)            US  <b>(71) Applicant:</b> THE PROCTER & GAMBLE COMPANY [US/US]; One Procter & Gamble Plaza, Cincinnati, OH 45202 (US).  <b>(72) Inventors:</b> UNIVERSITY OF KENTUCKY; Room A144, ASTeCC Building, Lexington, KY 40506 (US). JAG- TOYEN, Marit; 3677 Amick Way, Lexington, KY 40509 (US). TREMBLAY, Mario, E.; 7897 Woodglen Drive, West Chester, OH 45069 (US). FISHTER, Steve, G.; 310 Broad- way, Harrison, OH 45030 (US). COLLIAS, Dimitris, I.; 4683 Cedar Village Drive, Mason, OH 45040 (US). DER- BYSHIRE, Francis, J.; 2021 Shadybrook Lane, Lexington, KY 40502 (US).  <b>(74) Agents:</b> REED, David, T. et al.; The Procter & Gamble Company, 5299 Spring Grove Avenue, Cincinnati, OH 45217-1087 (US).	<b>(81) Designated States:</b> AE, AL, AM, AT, AT (Utility model), AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, CZ (Utility model), DE, DE (Utility model), DK, DK (Utility model), EE, EE (Utility model), ES, FI, FI (Utility model), GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SK (Utility model), SL, TJ, TM, TR, TT, UA, UG, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).  <b>Published</b> <i>With international search report.</i> <i>Before the expiration of the time limit for amending the claims</i> <i>and to be republished in the event of the receipt of amendments.</i>  <b>(88) Date of publication of the international search report:</b> 4 May 2000 (04.05.00)	
<b>(54) Title:</b> CARBON FIBER FILTERS  <b>(57) Abstract</b>  Disclosed is a filter comprised of activated carbon fibers, wherein said filter has a Virus Removal Index (hereafter "VRI") of at least about 99 %, as measured in accordance with the test method described in the specification. The filter may comprise unbound fibers, or the fibers may be bound with a binder to form a composite of fibers. Also disclosed is a method of removing viruses from a liquid, the method comprising contacting the liquid with a filter comprising activated carbon fibers wherein said filter has a VRI of at least about 99 %. Also described is an article of manufacture comprising: (a) a filter comprising activated carbon fibers, wherein said filter has a VRI of at least about 99 %; and (b) instructions which inform a user that the filter may be used to remove viruses from a liquid.		

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INTERNATIONAL SEARCH REPORT

International Application No  
PCT/US 99/14999

**A. CLASSIFICATION OF SUBJECT MATTER**  
IPC 7 B01D39/20 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 B01D 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)

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4 576 929 A (SHIMAZAKI KENJI) 18 March 1986 (1986-03-18) cited in the application column 2, line 65 -column 11, line 29 ----	1, 4, 15, 16
A	US 5 705 269 A (LIEBERMAN ALEXANDER I ET AL) 6 January 1998 (1998-01-06) cited in the application column 2, line 50 -column 4, line 47 ----	1-3
A	WO 95 06507 A (MITSCHKE PETER) 9 March 1995 (1995-03-09) claims ----	1
A	EP 0 366 539 A (OSAKA GAS CO LTD) 2 May 1990 (1990-05-02) cited in the application -----	

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Date of the actual completion of the international search <b>9 March 2000</b>	Date of mailing of the international search report <b>17/03/2000</b>
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# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 99/14999

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 4576929    A	18-03-1986	JP 1031450 B	26-06-1989
		JP 1547177 C	28-02-1990
		JP 60137811 A	22-07-1985
		EP 0149187 A	24-07-1985
		US 4696742 A	29-09-1987
US 5705269    A	06-01-1998	NONE	
WO 9506507    A	09-03-1995	DE 9312898 U	04-11-1993
		AT 164094 T	15-04-1998
		AU 7691594 A	22-03-1995
		DE 59405491 D	23-04-1998
		EP 0716624 A	19-06-1996
		ES 2117800 T	16-08-1998
EP 0366539    A	02-05-1990	JP 2118121 A	02-05-1990
		KR 9710733 B	30-06-1997
		US 5997613 A	07-12-1999