



(51) International Patent Classification:
B01D 29/50 (2006.01)

(21) International Application Number:

PCT/US2013/028601

(22) International Filing Date:

1 March 2013 (01.03.2013)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

61/671,613 13 July 2012 (13.07.2012) US
13/771,357 20 February 2013 (20.02.2013) US

(71) Applicant: **CUMMINS FILTRATION IP, INC.**
[US/US]; 500 Jackson Street, Columbus, IN 47201 (US).

(72) Inventors: **KNIGHT, Jessie, A.**; 7101 Turnberry Road, Madison, WI 53719 (US). **TOFSLAND, Kenneth, M.**; 308 Johnson Ct., Stoughton, WI 53589 (US). **TERRES, Mark, M.**; 1643 Fox Run, Shakopee, MN 55379 (US). **SCHWARTZ, Scott, W.**; 4644 Pierceville Road, Cottage Grove, WI 53527 (US). **BRAUN, Thomas, J.**; 1525

Moline Street, Stoughton, WI 53589 (US). **KENDALL, Andrea, L.**; 2160 State Hwy. 73, Cambridge, WI 53523 (US).

(74) Agents: **BROWN, Marshall, J.** et al.; Foley & Lardner LLP, 3000 K Street, NW, 6th Floor, Washington, DC 20007-5109 (US).

(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, BN, 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, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, 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, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ,

[Continued on next page]

(54) Title: DUAL FLOW FILTER ELEMENT

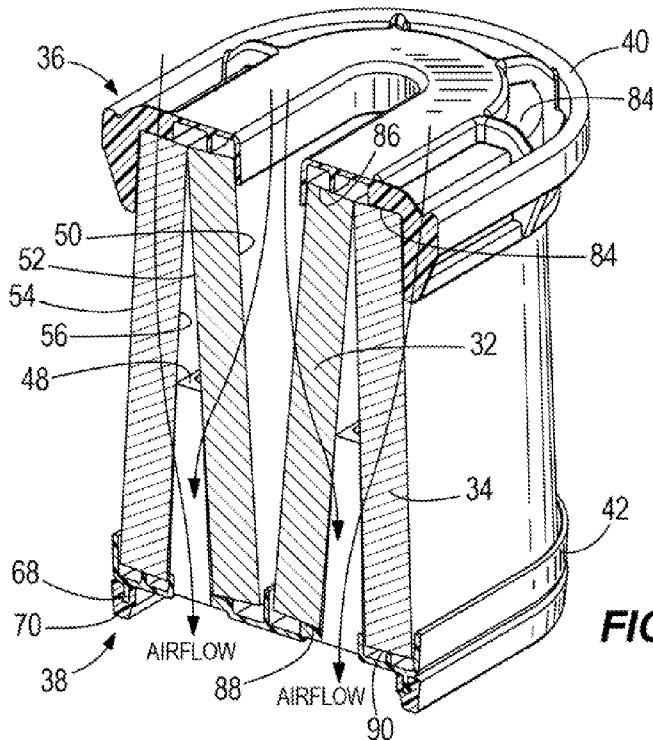


FIG. 2

(57) Abstract: A dual flow filter element includes inner and outer closed loop filter media and inlet and outlet end caps, and having a given shape-in-shape configuration. A support frame extends axially from one of the end caps toward the other end cap and terminates at a termination position between one-fourth and three-fourths of the axial distance between the inlet and outlet ends. Combinations using pleated filter media include a first group of pleat tip ends which are exposed, and a second group of pleat tip ends which are fully potted. One embodiment includes axially offset inner and outer closed loop filter media.





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, RS, 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))*

(88) Date of publication of the international search report:

19 June 2014

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 13/28601

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - B01D 29/50 (2013.01)

USPC - 210/337, 342

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(8) - B01D 29/50 (2013.01)

USPC - 210/337, 342

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
USPC - 210/323.1, 338, 487 (text search - see terms below)

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

PatBase; Google Scholar; Google Patents

Search Terms: filter, element, media, loop, concentric, coaxial, nest, racetrack, oval, inner, cartridge, outer, taper, narrow, V-shape, angled, end, cap, barb, pleat, potted, frame, support, extend, tip, leg, protrusion, extension, retain, gasket,... etc.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- Y	US 2009/0038276 A1 (Gunderson et al.) 12 February 2009 (12.02.2009), fig 1, 2 and 3, para [0011] and [0012]	1-2, 4-6 and 29-30 ----- 3, 25 and 46
X --- Y	US 2002/0152732 A1 (Kallsen et al.) 24 October 2002 (24.10.2002), fig 11, 18 and 27, para [0046] and [0070]	22-24, 26-28, 43-45 ----- 15-21, 25, 36-42, 46
Y	US 2005/0023210 A1 (Connor et al.) 03 February 2005 (03.02.2005), fig 2, 3 and 4, para [0014] and [0018]	3, 7-16 and 31-35
Y	US 2010/0243554 A1 (Herrin et al.) 30 September 2010 (30.09.2010), fig 2, 5 and 16, para [0034] and [0036]-[0037]	7-21, 31-42
A	US 2010/0313533 A1 (Muenkel) 16 December 2010 (16.12.2010), entire document	1-46
A	US 2011/0233133 A1 (Wacker et al.) 29 September 2011 (29.09.2011), entire document	1-46
A	FR 1288229 A (Bousquet et al.) 24 March 1962 (24.03.1962), entire document, especially Figs. 1-2	1-46

 Further documents are listed in the continuation of Box C.

* 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 application or patent 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

16 April 2013 (16.04.2013)

Date of mailing of the international search report

13 MAY 2013

Name and mailing address of the ISA/US

Mail Stop PCT, Attn: ISA/US, Commissioner for Patents
P.O. Box 1450, Alexandria, Virginia 22313-1450

Facsimile No. 571-273-3201

Authorized officer:

Lee W. Young

PCT Helpdesk: 571-272-4300
PCT OSP: 571-272-7774