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61/831,689 6 June 2013 (06.06.2013) US(71) Applicant: CUMMINS FILTRATION IP, INC.
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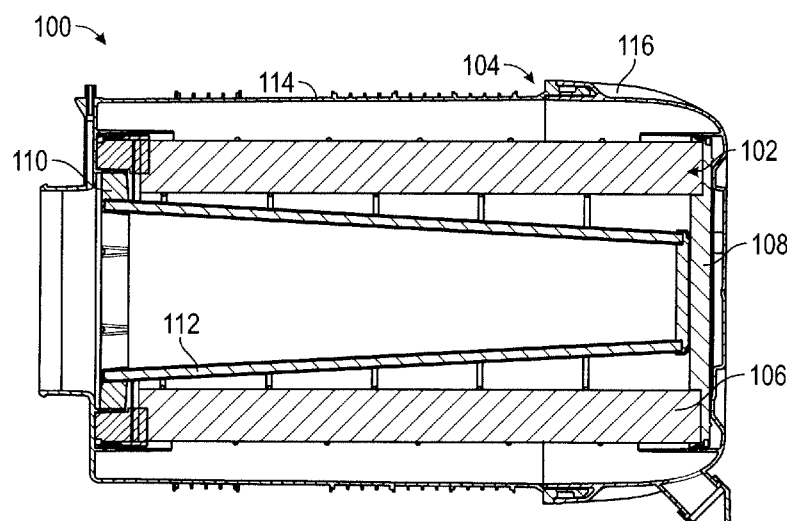
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Published:

- with international search report (Art. 21(3))
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(54) Title: AIR FILTER WITH IMPROVED PERFORMANCE OR POSITIONING

**FIG. 1**

(57) **Abstract:** Radial seal filter assemblies and filter cartridges are described. According to various embodiments, a filter includes a housing that extends along an axis between first and second axial ends. A primary filter element is disposed in the housing and axially extends between first and second axial ends that respectively are adjacent the first and second axial ends of the housing, the primary filter element has a hollow interior and a first axial length. A secondary filter element is disposed in the hollow interior of the primary filter element, the secondary filter element having a second axial length, the second axial length being longer than the first axial length of the primary filter element. The filter further includes an end cap disposed on the second axial end of the primary filter element.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 14/41097

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - B01D 46/24 (2014.01)

CPC - B01D 46/0024

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 46/24 (2014.01)

CPC: B01D 46/0024

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

IPC(8): F02M 35/024, B01D 46/02, B01D 46/52, B01D 35/00 (2014.01); USPC: 95/273, 55/498, 55/482, 55/502, 55/504, 55/510, 55/521; CPC: B01D 46/0004, B01D 46/0095, B01D 46/521, B01D 46/2411, B01D 46/2414, B01D 2279/60, B01D 2265/026 (search term limited)

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

PatBase (All); Google (Web, Patents, Scholar)

Search terms: primary filter, safety filter, end cap, transparen*, seethru, inspection, see through, clear, combustion, transparent, polymer, plastic, visual inspection, visual, window, opening, aperture, rib*, spacer*, center*

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y --- A	US 2004/0134171 A1 (SCOTT et al) 15 July 2004 (15.07.2004), entire document, especially Title, Fig 1-3, para [0080], [0088], [0091]-[0093], [0097], [0133]-[0137] and [0173]	1-8 and 17-22 --- 9-16
Y	US 4,278,455 A (NARDI) 14 July 1981 (14.07.1981), entire document, especially Fig 1-2, col 1, ln 7-26 and col 3, ln 23-29	1-8
Y --- A	WO 2012/116314 A1 (KATO et al) 30 August 2012 (30.08.2012), entire document, especially Fig 2-3	17-22 --- 9-16
Y --- A	US 6,383,244 B1 (WAKE et al) 07 May 2002 (07.05.2002), entire document, especially Fig 1-2	4 --- 9-16
Y	WO 84/04050 A1 (PERROTTA) 25 October 1984 (25.10.1984), entire document, especially Fig 1, pg 4, ln 14-18	5 and 21
A	US 6,986,805 B2 (GIESEKE et al) 17 January 2006 (17.01.2006), entire document, especially Fig 1-3	9-16
A	US 6,039,778 A (COULONVAUX) 21 March 2000 (21.03.2000), entire document, especially Fig 2 and 4	9-16

☐ 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

14 November 2014 (14.11.2014)

Date of mailing of the international search report

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 14/41097

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:
This application contains the following species of the generic invention which are not so linked as to form a single general inventive concept under PCT Rule 13.1.

Group I: Claims 1-22 directed to a filter comprising a housing, primary and secondary filter elements, and an end cap on the second axial end of the primary filter element.

Group II: Claims 23-25 directed to a filter cartridge comprising primary and secondary filter media, an end cap on the second end of the primary filter element, and another end cap coupled to the first end of the primary filter element.

The groups of inventions listed as Groups I-II do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons:

-*-Continued in Supplemental Box-*-

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:
1-22

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 14/41097

-*-Box III - Observations where unity of invention is lacking-*

Special Technical Features (Distinct Technical Features):

Group I requires the technical features of a housing and the secondary filter element being disposed in the hollow interior of the primary filter element, not required by Group II.

Group II includes the technical features of an end cap coupled to the first end of a first primary filter element and the secondary filter element being received in the first end cap and covering the opening, not required by Group I.

Common Technical Features (Features Do Not Make a Contribution Over the Prior Art):

Groups I-II share the technical features of: a) two filtering elements, wherein the second filtering element is nested with respect to the first filtering element, and b) an open end cap coupled to the first filtering element. However, these technical features do not represent a contribution over prior art because the shared technical feature is anticipated by US 6,986,805 B2 to Gieseke et al. (hereinafter 'Gieseke').

Gieseke teaches two filtering elements (primary filter element 25 and secondary filter element 26; col 4, ln 18-29; Fig 3), wherein the second filtering element is nested within the first (col 4, ln 18-29; Fig 3) and an open end cap (first end cap 41 with open end 35; col 6, ln 43-48) coupled to the first filtering element (primary element 25 includes first end cap 41; col 6, ln 43-45).

As the common technical features were known in the art at the time of the invention, these cannot be considered a common technical features that would otherwise unify the groups.

Therefore, Groups I-II lack unity under PCT Rule 13.