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[Continued on next page]

(54) Title: REPLACEABLE FILTER ELEMENTS INCLUDING PLURAL FILTER MEDIA AND RELATED FILTRATION SYSTEMS, TECNIQUES AND METHODS

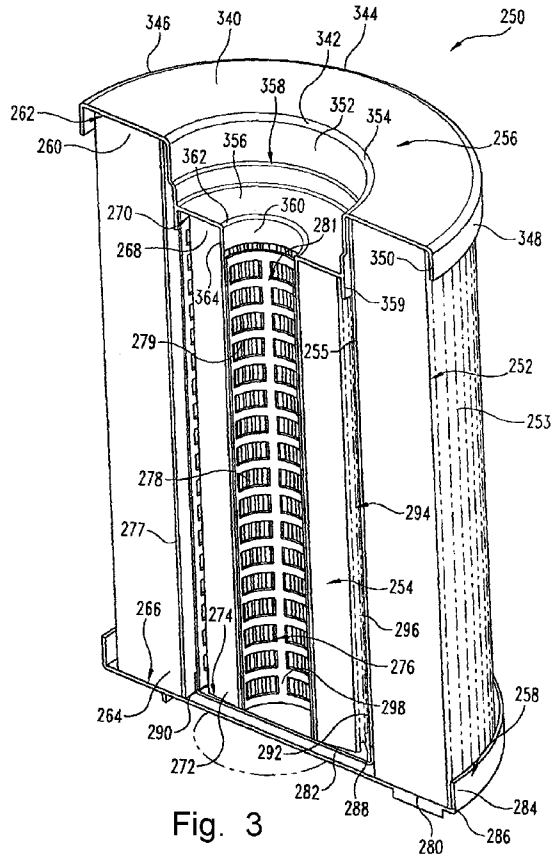

Fig. 3

(57) Abstract: A vehicle includes a fuel tank and a power/ propulsion unit that includes and an engine. Additionally, the system includes a fuel system coupled to a fuel tank for providing fuel to the engine. A fluid conduit couples the fuel tank to the fueling system. The fueling system includes two liquid filtering subsystems and a fuel pump. One filtering subsystem is on the suction side of the fuel pump and the other is on the pressure side. There can be outer and inner filter media: the media remove particulates or water from the fluid.

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28 August 2008

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 07/14397

A. CLASSIFICATION OF SUBJECT MATTER
IPC(8) - B01D 25/00 (2007.10)
USPC - 210/323.2, 435
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 25/02 (2007.10)
USPC: 210/323.2, 435

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
IPC(8): B01D 24/00; (2008.01)
USPC: 210/ 295, 314, 315, 342, 457

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
PubWEST(USPT,PGPB,EPAB,JPAB); GooglePatent GoogleScholar
Search Terms: filter, fuel, cap, spring

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 6,939,464 B1 (JIANG et al.) 6 September 2005 (06.09.2005) entire document, especially Abstract, Fig. 4 and col 4, ln 16-end	1-40 and 46-59
Y	US 6,174,438 B1 (HODGKINS et al.) 16 January 2001 (16.01.2001) entire document, especially col 6, ln 3-45	1-40 and 46-59
Y	US 5,084,170 A (JANIK et al.) 28 January 1992 (28.01.1992) entire document, especially Fig. 8 and col 5, ln 1-10 and 50-55	1-12, 14-19, 30-40 and 52-59
Y	US 6,692,639 B1 (SPEARMAN et al.) 17 February 2004 (12.02.2004) entire document, especially Fig. 6 and col 4, ln 40-45	13-29 and 37-39
Y	US 2002/0162781 A1 (DEMIRDOGEN) 7 November 2002 (07.11.2002) entire document, especially Fig. 2 and para[0018]	20, 21, 25 and 26
Y	US 6,235,194 B1 (JOUSSET) 22 May 2001 (22.05.2001) entire document, especially Fig. 2	22

☐ 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	Date of mailing of the international search report
27 January 2008 (27.01.2008)	14 MAR 2008
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

Form PCT/ISA/210 (second sheet) (April 2007)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 07/14397

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 inventions or groups of inventions which are not so linked as to from a single general inventive concept under PCT Rule 13.1.

Group I: claims 1-12, 30-40 and 46-59 are directed to a filter element, comprising: an outer filter media operable to coalesce water entrained in a flow of fluid and capture particles entrained in the flow of fluid; an inner filter media operable to separate the coalesced water from the flow of fluid and further capture particulates entrained in the flow of fluid; and an upper end cap and a lower end cap located between opposing ends of the outer filter media and the inner filter media.

- - see extra sheet - -

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.:
1-40 and 46-59

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.:

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
Information on patent family members

International application No.
PCT/US 07/14397

Continued from Box No. III:

Group II: claims 13-29 are directed to a filter element, comprising: an inner filter media; an outer filter media spaced radially apart from the inner filter media such that a gap exists between an inner surface area of the outer filter media and an outer surface of the inner filter media; a first upper end cap connected with a first upper portion of the outer filter media; a second upper end cap segment connected with a second upper portion of the inner filter media; an internal seal connected with a portion of the first upper end cap segment and the second upper end cap segment thereby forming a fluid tight seal between the first upper end cap segment and the second upper end cap segment; and a lower end cap connected with a first lower portion of the outer filter media and a second lower portion of the inner filter media.

Group III: claims 41-45 are directed to a method, comprising; directing a flow of fluid to a filter; coalescing the flow of fluid to form water droplets that flow toward a lower portion of the filter using a first filter media; allowing the coalesced water droplets to flow toward the lower portion of the filter by introducing the flow of fluid into a gap formed between the first filter media and a second filter media; separating the remaining water droplets from the flow of fluid with the second filter media; and directing the flow of fluid from the second filter media into an internal fluid chamber of the filter where it is directed out of the filter.

The inventions listed as Groups I-III 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 technical features for the following reasons:

Groups II and III do not include the inventive concept of a filter element, comprising: an outer filter media operable to coalesce water entrained in a flow of fluid and capture particles entrained in the flow of fluid; an inner filter media operable to separate the coalesced water from the flow of fluid and further capture particulates entrained in the flow of fluid; and an upper end cap and a lower end cap located between opposing ends of the outer filter media and the inner filter media of Group I.

Groups I and III do not include the inventive concept of a filter element, comprising: an inner filter media; an outer filter media spaced radially apart from the inner filter media such that a gap exists between an inner surface area of the outer filter media and an outer surface of the inner filter media; a first upper end cap connected with a first upper portion of the outer filter media; a second upper end cap segment connected with a second upper portion of the inner filter media; an internal seal connected with a portion of the first upper end cap segment and the second upper end cap segment thereby forming a fluid tight seal between the first upper end cap segment and the second upper end cap segment; and a lower end cap connected with a first lower portion of the outer filter media and a second lower portion of the inner filter media of Group II.

Groups I and II do not include the inventive concept of a method, comprising; directing a flow of fluid to a filter; coalescing the flow of fluid to form water droplets that flow toward a lower portion of the filter using a first filter media; allowing the coalesced water droplets to flow toward the lower portion of the filter by introducing the flow of fluid into a gap formed between the first filter media and a second filter media; separating the remaining water droplets from the flow of fluid with the second filter media; and directing the flow of fluid from the second filter media into an internal fluid chamber of the filter where it is directed out of the filter of Group III.

None of these technical features are common to the other groups, nor do they correspond to a special technical feature in the other groups. Therefore, unity of invention is lacking.