Title: CRANKCASE VENTILATION FILTER CARTRIDGES AND ASSEMBLIES

Abstract: Crankcase ventilation filter assemblies are described and shown. Components, features and methods of assembly and use are described. Many of the principles relate to preferred cartridge configurations for engagement with selected housings. Selected optional features described can be used to provide indication to a service provider that a proper cartridge is not positioned appropriately in the housing for use.

Published:
— with international search report (Art. 21(3))
— before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))

Date of publication of the international search report:
2 May 2013
INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER
INV. B01D46/24 F01M13/04
ADD.
According to International Patent Classification (IPC) into both national classification and IPC

B. FIELDS SEARCHED
Minimum documentation searched (classification system followed by classification symbols)
B01D F01M

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 practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
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<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
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<td>abstract; figures 4-6, 12, 15, 15a paragraphs [0057], [0073], [0155] - [0159] ----</td>
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<td>Y</td>
<td>figures 2, 3, 5 ----</td>
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[ ] Further documents are listed in the continuation of Box C. [ ] See patent family annex.

* 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 of patent but published on or after the international filing date
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Date of the actual completion of the international search
7 March 2013

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15/03/2013

Name and mailing address of the ISA/
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Sembri tzki, Thorsten

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<table>
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## 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).

## 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:

see additional sheet

1. □ All required additional search fees were timely paid by the applicant, this international search report covers all searchable items.

2. □ As all searchable claims could be searched without effort justifying an 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.:

   31-36

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.
This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-9, 15-30, 44-46, 50-61, 73-87

Claims 1-9 and 15-30, 44-46, 50-61, 73-87, as far as they refer back to claims 2-9, refer to a crankcase ventilation filter cartridge and assembly wherein the cartridge comprises two housing seal members on an upper end piece and wherein additionally a spacer arrangement is present on the end piece which provides a space between the base and the cover of the filter housing when the filter cartridge is installed.

The problem to be solved can therefore be regarded as to provide a sufficient seal by the use of two seal members and to avoid false mounting by provision of a defined space between the filter base and the filter housing.

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2. claims: 10-14

The claims refer to a crankcase ventilation filter cartridge and assembly wherein the cartridge comprises two housing seal members on an upper end piece and wherein a third housing seal is present. The problem underlying these claims concerns the further improvement of the sealing effect.

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3. claims: 31-36

The claims refer to a crankcase ventilation filter cartridge and assembly wherein the cartridge comprises two housing seal members on an upper end piece and wherein an indexing arrangement and/or projections are foreseen on the lower end piece. These features refer to the problem to install a correct cartridge in a correct position within the base housing.

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4. claims: 37, 38

The claims refer to a crankcase ventilation filter cartridge and assembly wherein the cartridge comprises two housing seal members on an upper end piece and wherein a certain drain is provided. These claims concern the problem to guide liquid away from the filter medium.

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5. claims: 39-43, 47-49

The claims refer to a crankcase ventilation filter cartridge and assembly wherein the cartridge comprises two housing seal members on an upper end piece and wherein the first end piece comprises a tubular projection having a tip and a projection/receiver arrangement. This additional combination
of features concerns the problem to connect the filter cartridge to the housing cover.

6. claims: 62-72

The claims refer to a crankcase ventilation filter cartridge and assembly wherein the cartridge comprises a single housing seal member on an upper end piece and wherein a spacer arrangement is present on the end piece which provides a space between the base and the cover of the filter housing when the filter cartridge is installed. The problem to be solved can therefore be regarded as to avoid false mounting by provision of a defined space between the filter base and the filter housing of a usual crankcase filter.
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