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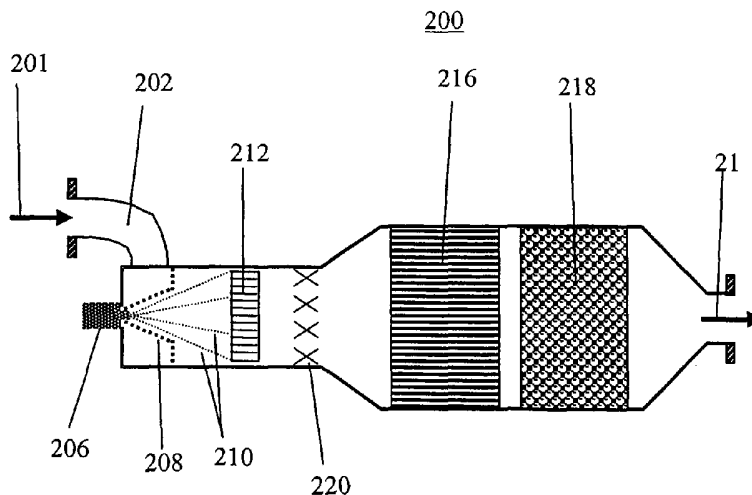
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[Continued on next page]

(54) Title: PRE-COMBUSTORS FOR INTERNAL COMBUSTION ENGINES AND SYSTEMS AND METHODS THEREFOR



(57) Abstract: Described here are systems and methods for treating fuel injected exhaust streams. In general, the systems (200) comprise a fuel injector (206), a pre-combustor(212), and a fuel combustor (216). The methods described herein include methods for regenerating a NOx trap or a DPF (218), and methods for generating a substantially uniform fuel air mixture at a fuel combustor inlet, or a substantially uniform temperature at a fuel combustor outlet. The methods of regenerating a NOx trap typically comprise the steps of injecting fuel into an exhaust stream, passing the stream through a pre-combustor, operating the pre-combustor to at least partially combust the injected fuel, reacting the fuel and exhaust stream mixture within a fuel combustor to generate a reducing gas mixture, and introducing the reducing gas mixture into a NOx trap, whereby the NOx trap is regenerated. Similar methods for regenerating a diesel particulate filter are also described. Control strategies are also provided.

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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

INTERNATIONAL SEARCH REPORT

International application No
PCT/ 2005/023304

A. CLASSIFICATION OF SUBJECT MATTER INV. F01N3/20 F01N3/08 F01N3/023 F01N3/025				
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) F01N F23C				
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) EPO-Internal, PAJ				
C. DOCUMENTS CONSIDERED TO BE RELEVANT				
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.		
X	US 2004/050037 A1 (BETTA RALPH DALLA ET AL) 18 March 2004 (2004-03-18)	1-9, 17, 18, 23, 36-41		
Y	paragraph [0065] - paragraph [0066] paragraph [0081]; figures 2,3,5	23		
X	WO 2004/046514 A (CATALYTICA ENERGY SYSTEMS INC [US]; DALLA BETTA RALPH A [US]; CIZERON) 3 June 2004 (2004-06-03) paragraph [0091] - paragraph [0093]; figure 11	1, 2, 8, 35-37		
Y	DE 100 42 010 A1 (ROBERT BOSCH GMBH) 14 March 2002 (2002-03-14) column 3, ...line 62 - column 4, line 55; figures 1-3	23		
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<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C.				
<input checked="" type="checkbox"/> See patent family annex.				
* Special categories of cited documents :				
<table style="width: 100%; border: none;"> <tr> <td style="width: 50%; border: none;"> "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document 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 </td> <td style="width: 50%; border: none;"> "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 </td> </tr> </table>			"A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document 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
"A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document 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			
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Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Authorized officer Zebst, M			

INTERNATIONAL SEARCH REPORT

International application No

PCT 2005/023304

(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	PATENT ABSTRACTS OF JAPAN vol. 1998, no. 04, 31 March 1998 (1998-03-31) & JP 09 317440 A (NIPPON SOKEN INC), 9 December 1997 (1997-12-09) abstract -----	21, 25

INTERNATIONAL SEARCH REPORT

International application No. _____
PCT/US2005/023304

Box 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 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:

see additional 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 an additional fee, this Authority did not invite payment of any additional fee.
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.:

1-25, 35-41

Remark on Protest

- The additional search fees were accompanied by the applicant's protest.
- No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

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

1. claims: 1-25, 35-41

System for treating a fuel injected exhaust stream and
method for generating a substantially uniform fuel air
mixture in an exhaust stream

2. claims: 26-34

Method for regenerating a Nox trap

3. claims: 42-50

Method for regenerating a particulate filter

4. claims: 51-57

Method for generating a substantially uniform temperature
at a fuel combustor outlet

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT 52005/023304

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2004050037	A1	18-03-2004	NONE

WD 2004046514	A	03-06-2004	AU 2003295681 A1 15-06-2004
			BR 0316367 A 04-10-2005
			CN 1723341 A 18-01-2006
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			IT MI20011809 A1 26-02-2002
			US 2002062643 A1 30-05-2002

JP 09317440	A	09-12-1997	NONE
