

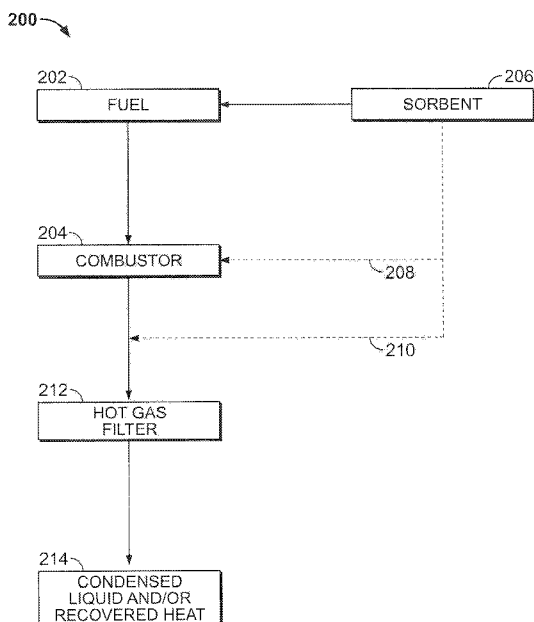


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[Continued on next page]

(54) Title: METHOD AND APPARATUS TO INCREASE INDUSTRIAL COMBUSTION EFFICIENCY



(57) Abstract: Methods and apparatus to improve industrial combustion efficiency are disclosed. Sorbent (206) is provided to a combustor (204; 306) and/or to flue gas exiting the combustor (204; 306) after a combustion process. The flue gas enters a hot gas filter (212; 320) AND / OR the flue gas is cooled to generate a condensate after the flue gas exits the combustor (204; 306).

FIG. 2





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))

— upon request of the applicant, before the expiration of the time limit referred to in Article 21(2)(a)

(88) Date of publication of the international search report:
13 October 2016

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2016/050514

A. CLASSIFICATION OF SUBJECT MATTER
 INV. F23J7/00 F23J15/00 F23J15/02
 ADD.
 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)
 F23J
 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

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 98/03249 A1 (FLS MILJOE A S [DK]; BOSCAK VLADIMIR [DK]) 29 January 1998 (1998-01-29)	1,5-9, 13-15, 18,19, 21,22, 26,27
Y	page 1, line 7 - line 15; figures 1-3 page 2, line 13 - page 3, line 24 page 5, line 19 - page 7, line 8 page 8, line 9 - page 9, line 26 page 9, line 34 - page 12, line 28 page 13, line 12 - page 14, line 14 -----	10-12,23
Y	US 4 309 386 A (PIRSH EDWARD A) 5 January 1982 (1982-01-05) column 1, line 11 - line 14; figure 1 column 2, line 41 - line 55 column 2, line 62 - column 4, line 28 ----- -/--	10-12,23

Further documents are listed in the continuation of Box C.

See patent family annex.

* Special categories of cited documents :

<p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier application or patent but published on or after the international filing date</p> <p>"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)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p>	<p>"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</p> <p>"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</p> <p>"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</p> <p>"&" document member of the same patent family</p>
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Date of the actual completion of the international search 29 July 2016	Date of mailing of the international search report 09/08/2016
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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, Fax: (+31-70) 340-3016	Authorized officer Hauck, Gunther
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INTERNATIONAL SEARCH REPORT

International application No

PCT/IB2016/050514

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	KR 2012 0047586 A (KOREA IND TECH INST [KR]; DONGHWA ENTEC CO LTD [KR]; HANMO CORP [KR];) 14 May 2012 (2012-05-14)	1,2, 4-10, 13-16, 18-22, 24-27
Y	paragraph [0001]; figures 1,2 paragraph [0021] - paragraph [0034] -----	3,17
Y	EP 2 335 804 A1 (ALSTOM TECHNOLOGY LTD [CH]) 22 June 2011 (2011-06-22) paragraphs [0001] - [0003]; figures 1,2,4 paragraphs [0005], [0006] paragraph [0024] - paragraph [0029] paragraph [0038] paragraph [0045] - paragraph [0047] paragraphs [0052], [0054] -----	3,17
X	EP 0 703 412 A2 (FOSTER WHEELER ENERGY CORP [US]) 27 March 1996 (1996-03-27) column 1, line 3 - line 12; figure 1 column 2, line 29 - column 4, line 10 column 5, line 5 - line 39 column 6, line 4 - line 8 -----	1,5-8, 13,14, 19,21, 22,26,27
X	WO 2013/060991 A1 (VEOLIA PROPLETE [FR]) 2 May 2013 (2013-05-02) page 1, lines 4,5; figures 1-3 page 3, line 4 - page 4, line 29 page 5, line 21 - line 30 page 10, line 1 - page 12, line 16 page 13, line 6 - page 15, line 17 page 15, line 25 - page 16, line 16 -----	1,5,6, 9-11,19, 21
A	US 5 198 201 A (JOHNSON ARTHUR F [US]) 30 March 1993 (1993-03-30) column 1, lines 16-18; figures 1,2 column 3, line 46 - column 4, line 33 column 4, line 52 - column 5, line 23 column 6, line 31 - line 58 -----	4,16, 18-20

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IB2016/050514

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:

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 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.:

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.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

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

1. claims: 5, 6, 9-12, 14-16, 20, 21, 23, 26, 27(completely); 1-4, 7, 8, 13, 17-19, 22, 24, 25(partially)

Method and corresponding apparatus for combustion, a sorbent being provided upstream a hot gas filter

2. claims: 1-4, 7, 8, 13, 17-19, 22, 24, 25(all partially)

Method and corresponding apparatus for combustion, a sorbent being provided upstream a condensing unit

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/IB2016/050514

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