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AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY,
BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM,
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HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR,
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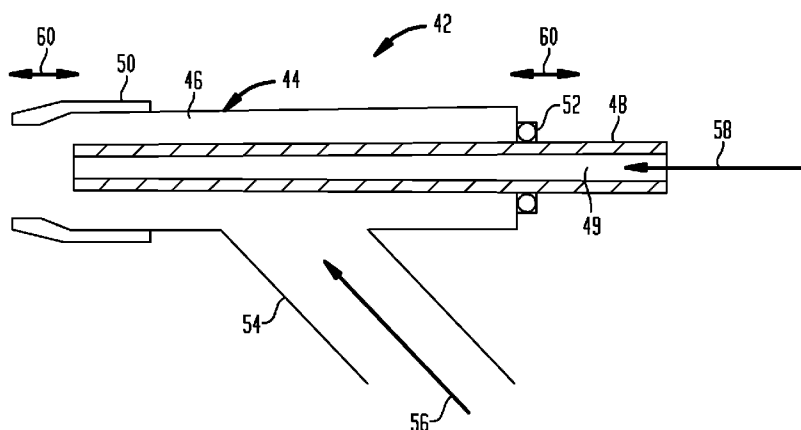
- with international search report (Art. 21(3))
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(54) Title: APPARATUS AND METHOD FOR INJECTING OXYGEN INTO A FURNACE

FIG. 2



(57) Abstract: In order to overcome the problems that earlier apparatus and methods have experienced, a fluid injection apparatus for a furnace comprises: -a housing having a space therein and a discharge orifice (53) in communication with the space and a combustion chamber of the furnace (10); a lance (48) for oxygen disposed in the space and in communication with the discharge orifice (53), said lance (48) in particular being adjustably moveable within the space to control a flow of the oxygen and the air; and an inlet duct (54) for air in communication with the space external to the lance (53). A corresponding method of introducing oxygen-enriched air into a regenerative furnace (10) is proposed, the method comprising: injecting oxygen to a top portion of a regenerator (18, 20) for the furnace (10) or to a combustion chamber of the furnace (10); and entraining air into the oxygen during the injecting and prior to the oxygen entering the regenerator (18, 20) or the combustion chamber, with hot ambient air (75) being provided from a region at an exterior of and proximate to the furnace (10) into the entraining air for mixing with the oxygen.



INTERNATIONAL SEARCH REPORT

International application No
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A. CLASSIFICATION OF SUBJECT MATTER
 INV. C03B5/235 C03B5/237 F23L7/00 F23L15/02 F27B3/22
 F27B3/26 C21B7/16 C21C5/52 F27D99/00 F23D14/22
 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)
 C03B F27B F27D F23L F28D F23C C21B C21C F23D

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

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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X	US 6 171 100 B1 (JOSHI MAHENDRA L [US] ET AL) 9 January 2001 (2001-01-09) column 9, lines 63-65; figure 3 -----	1-9
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X	US 5 199 866 A (JOSHI MAHENDRA L [US] ET AL) 6 April 1993 (1993-04-06) column 4, lines 53-56; figure 1a ----- -/--	1-9

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	"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
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"O" document referring to an oral disclosure, use, exhibition or other means	"&" document member of the same patent family
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Date of the actual completion of the international search 20 March 2014	Date of mailing of the international search report 13/05/2014
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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 Flügel, Alexander
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International application No
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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 101 56 376 A1 (MESSER GRIESHEIM GMBH [DE]) 5 June 2003 (2003-06-05) paragraphs [0017], [0018]; figure * -----	1-9
X	WO 2007/048429 A1 (AIR LIQUIDE [FR]; KOEDER HORST [DE]) 3 May 2007 (2007-05-03) claim 1; figure 1 -----	1-9
X	US 5 724 901 A (GUY CHRISTOPHE [CA] ET AL) 10 March 1998 (1998-03-10) claim 1; figure 1 -----	1-9
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X	WO 2012/062776 A1 (AIR LIQUIDE [FR]; NOGAMI MASAHIRO [JP]) 18 May 2012 (2012-05-18) claim 9; figure 1 -----	1-9
X	US 5 567 141 A (JOSHI MAHENDRA L [US] ET AL) 22 October 1996 (1996-10-22) claim 5; figure 2 -----	1-9
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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2013/074153

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Information on patent family members

International application No

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/EP2013/074153

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.:

1-9

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: 1-9

Fluid injection apparatus comprising a housing having a space and a discharge orifice, a lance suitable for oxygen within said space, and an inlet duct suitable for air in communication with said space

2. claims: 10-15

Method for introducing oxygen enriched air into a regenerative furnace by injection oxygen into a combustion chamber or into a top portion of a regenerator and entraining air into said oxygen before the mixture enters the combustion chamber or the regenerator
