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- (81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM,

AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

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(54) Title: GAS AND PARTICULATE DELIVERY SYSTEM AND METHOD FOR METALLURGICAL VESSEL

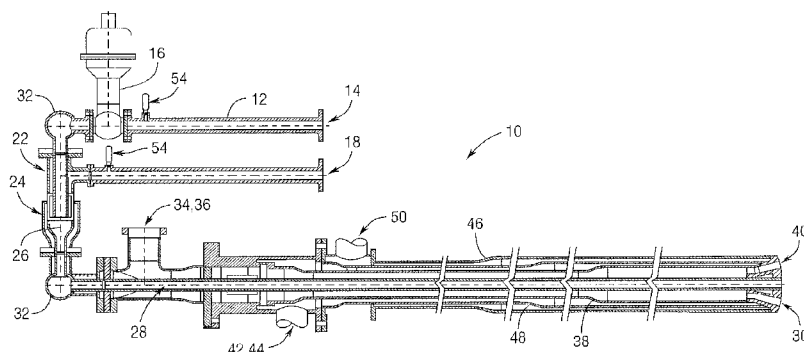


Fig. 1

(57) Abstract: A method and an apparatus for charging a particulate, for example lime, with a carrier gas, for example oxygen, through a lance into a metallurgical vessel or furnace. The apparatus comprises a metallurgical lance having an inner barrel communicating with the tip of the lance and a lance header, an outer tube having one end in open communication with the inner particulate barrel at the header and a second end sealed on the outside of a particulate inlet tube. The particulate inlet tube extends a first portion coaxially within the outer tube, and a second portion extends outside the outer tube. The second portion includes a shut-off valve. An auxiliary gas tube is in communication with the outer tube upstream of the particulate inlet tube opening within the outer tube.



**INTERNATIONAL SEARCH REPORT**

International application No  
PCT/US2012/035845

A. CLASSIFICATION OF SUBJECT MATTER  
INV. C22B9/10 C21C5/52 C21C7/00 F27D3/18  
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)  
C22B C21C F27D

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.
X	US 2009/013827 A1 (WOLFE LARRY D [US] ET AL) 15 January 2009 (2009-01-15) cited in the application the whole document	1-6
X	GB 2 121 936 A (SUMITOMO METAL IND) 4 January 1984 (1984-01-04) the whole document	1-6
A	DE 197 48 389 A1 (PLIBRICO GMBH [DE]) 6 May 1999 (1999-05-06) the whole document	1-6
A	JP 7 157816 A (KAWASAKI STEEL CO) 20 June 1995 (1995-06-20) abstract	1-6
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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 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

3 August 2012

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# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US2012/035845

## 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.:

1-6

### 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

International application No  
PCT/US2012/035845

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	GB 837 539 A (ARBED) 15 June 1960 (1960-06-15) the whole document -----	1-6

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2012/035845

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2009013827	A1	15-01-2009	CA 2640471 A1 16-08-2007
			EP 1984526 A1 29-10-2008
			US 2009013827 A1 15-01-2009
			WO 2007092006 A1 16-08-2007
-----			
GB 2121936	A	04-01-1984	AU 574326 B2 07-07-1988
			AU 1390183 A 27-10-1983
			CA 1211630 A1 23-09-1986
			GB 2121936 A 04-01-1984
			JP 58185707 A 29-10-1983
			US 4541617 A 17-09-1985
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DE 19748389	A1	06-05-1999	NONE
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JP 7157816	A	20-06-1995	NONE
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GB 837539	A	15-06-1960	NONE
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**FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210**

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

1. claims: 1-6

Method for charging particulates through a lance system

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2. claims: 7-14

Metallurgical lance

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