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Declarations under Rule 4.17:

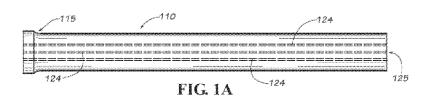
- as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))
- as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))

Published:

- with international search report (Art. 21(3))
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(54) Title: ULTRASONIC PROBES WITH GAS OUTLETS FOR DEGASSING OF MOLTEN METALS



(57) Abstract: Ultrasonic probes containing a plurality of gas delivery channels are disclosed, as well as ultrasonic probes containing recessed areas near the tip of the probe. Ultrasonic devices containing these probes, and methods for molten metal degassing using these ultrasonic devices, also are disclosed.



INTERNATIONAL SEARCH REPORT

International application No PCT/US2014/065912

A. CLASSIFICATION OF SUBJECT MATTER INV. C22B9/05 C22B21/06 ADD.								
According to International Patent Classification (IPC) or to both national classification and IPC								
	SEARCHED							
Minimum documentation searched (classification system followed by classification symbols) C22B								
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched								
Electronic d	ata base consulted during the international search (name of data bas	se and, where practicable, search terms use	ed)					
EPO-Internal, WPI Data								
C. DOCUMENTS CONSIDERED TO BE RELEVANT								
Category*	Citation of document, with indication, where appropriate, of the rele	Relevant to claim No.						
А	US 2012/042751 A1 (RUNDQUIST VIC ET AL) 23 February 2012 (2012-02- the whole document	1-14						
А	WO 2011/127402 A1 (RUNDQUIST VICTUS); GILL KEVIN S [US]) 13 October 2011 (2011-10-13) the whole document	1-14						
А	US 5 656 236 A (WAITE PETER D [C/ 12 August 1997 (1997-08-12) the whole document 	A] ET AL)	1-14					
Further documents are listed in the continuation of Box C. X 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 prior date and not in conflict with the application but cited to understate the principle or theory underlying the 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 combined with one or more other such documents, such combined with one or more other such documents, such combined with one or more other such documents. "E" later document published after the international filing date or prior date and not in conflict with the application but cited to understate 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 combined with one or more other such documents, such combined with one or more other such documents, such combined with one or more other such documents. "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. "Y" document or particula			ation but cited to understand nvention laimed invention cannot be ered to involve an inventive e laimed invention cannot be bowner the document is a documents, such combination e art					
	actual completion of the international search 9 February 2015	Date of mailing of the international search report $16/06/2015$						
Name and r	nailing 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 Swiatek, Ryszard						

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
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Patent document cited in search report		Publication date		Patent family member(s)		Publication date
US 2012042751	A1	23-02-2012	AU CA CN EP JP KR US US	2012323256 2850023 103889598 2747906 2015501205 20150000458 2012042751 2014123812 2013055778	A1 A2 A A A1 A1	16-05-2013 18-04-2013 25-06-2014 02-07-2014 15-01-2015 02-01-2015 23-02-2012 08-05-2014 18-04-2013
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International application No. PCT/US2014/065912

INTERNATIONAL SEARCH REPORT

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						
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.: 1-14						
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: 1-14

Ultrasonic device comprising a probe comprising two or more gas delivery channels

2. claims: 15-24

Ultrasonic device comprising a recessed region near the tip of the probe
