### (19) World Intellectual Property Organization

International Bureau





(43) International Publication Date 21 June 2007 (21.06.2007)

(10) International Publication Number WO 2007/068687 A3

- (51) International Patent Classification: B22D 11/055 (2006.01) B22D 11/043 (2006.01)
- (21) International Application Number:

PCT/EP2006/069582

(22) International Filing Date:

12 December 2006 (12.12.2006)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data: MI2005A002367

13 December 2005 (13.12.2005) IT

- (71) Applicant (for all designated States except US): DANIELI & C. OFFICINE MECCANICHE S.P.A. [IT/IT]; Via Nazionale 41, 1-33042 Buttrio (IT).
- (72) Inventors; and
- (75) Inventors/Applicants (for US only): KAPAJ, Nuredin [AL/IT]; Via Podgora, 25, 1-33100 Udine (IT). POLONI, Alfredo [IT/IT]; Via G. Paolini 29, 1-34070 Fogliano Redipuglia (IT). ZOMERO, Gianni [IT/IT]; Via Alpi, 22, 1-33030 Pasian Di Prato (IT).
- (74) Agents: CINQUANTINI, Bruno et al.; Corso di Porta Vittoria 9, 1-20122 Milan (IT).

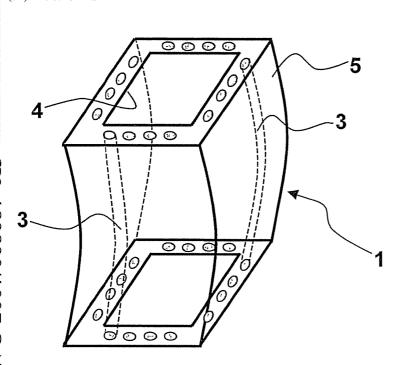
- (81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LV, LY, MA, MD, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW
- (84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

#### **Published:**

- with international search report
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments
- (88) Date of publication of the international search report: 16 August 2007

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.

(54) Title: CRYSTALLIZER



(57) **Abstract:** A curved crystallizer for continuous casting of blooms or billets comprises a suitable cooling system capable of providing an optimum transfer of the heat from the liquid metal inside the crystallizer towards the outside. The crystallizer according to the present invention satisfies the need to prevent the generation of critical stresses in the cast product during its passage from said crystallizer to the casting machine arranged downstream thereof, and also the need to implement a complete casting plant, comprising the crystallizer and casting machine, which is extremely compact in terms of its height.



## INTERNATIONAL SEARCH REPORT

International application No PCT/EP2006/069582

# A. CLASSIFICATION OF SUBJECT MATTER INV. B22D11/055 B22D11/043

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)

#### B22D

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 , WPI Data

C. DOCUM	NTS CONSIDERED TO BE RELEVANT	
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No
Υ	EP 0 071 401 A (NIPPON STEEL CORP [JP]) 9 February 1983 (1983-02-09)	1
X	page 2, line 34 - page 3, line 16; figures 2,6,7	2-4
Υ	GB 2 177 956 A (* KABEL-UND METALLWERKE GUTEHOFFNUNGSHUTTE AKTIENGESELLSCHAFT) 4 February 1987 (1987-02-04)	1
Х	page 2, line 66 - line 81; figure 1	2-4
А	US 6 367 539 B1 (POLONI ALFREDO ET AL) 9 April 2002 (2002-04-09) claims 1,5,25-27; figure 5b	2,3

Purther 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 document but published on or after the international filing date  "L' document which may throw doubts on pnoπty clarm(s) or which is cited to establish the publication date of another citation or other special reason (as specified)  "O' document referπng 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  1X" 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  1Y' 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  18' document member of the same patent family
Date of the actual completion of the international search  21 June 2007	Date of mailing of the international search report 29/06/2007
Name and mailing address of the ISA/  European Patent Office, P B 5818 Patentlaan 2  NL - 2280 HV Rljswijk  Tel (+31-70) 340-2040, Tx 31 651 epo nl,  Fax (+31-70) 340-3016	Authorized officer  Hodi amont, Susanna

## INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2006/069582

Patent document cited in search report		Publication date	Patent family member(s)			Publication date
EP 0071401	Α	09-02-1983	AU	8617182	Α	17-03-1983
			BR	8204323	A	19-07-1983
			JP	58023254	U	14-02-1983
			ZA	8205285	A	31-08-1983
GB 2177956	Α	04-02-1987	AT	401487	В	25-09- <b>-</b> 1996
			AT	199386	A	15-02-1996
			CZ	8605531	A 3	15-12-*1993
			DE	3526736	Al	29-01- <b>-</b> 1987
			FR	2585272	Al	30-01-1987
			IT	1214698	В	18-01-1990
			JP	62050048	A	04-03-1987
			SE	8603217	A	27-01-1987
			SK	553186	A 3	04-02-1998
			YU	130986	Al	28-02-1989
US 6367539	в1	09-04-2002	AT	264722	Т	15-05-•2004
			AU	756341	В2	09-012003
			AU	1792400	A	01-082000
			DE	60010036	Dl	27-052004
			DE	60010036	Т2	31-03- <b>-2005</b>
			ΕP	1140390	Al	10-102001
			ES	2219294	Т3	01-122004
			Wo	0041828	Al	20-07-•2000
			IT	UD990001	Al	13-07-2000