

(19) World Intellectual Property Organization
International Bureau



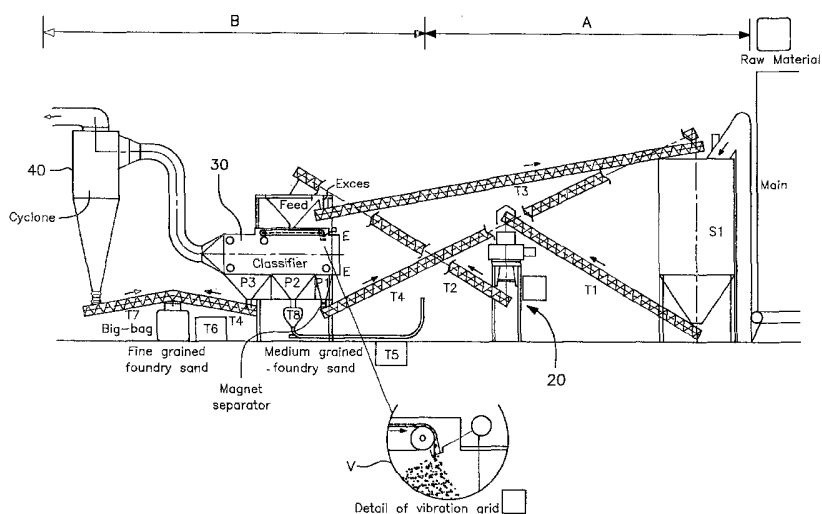
(43) International Publication Date
20 February 2003 (20.02.2003)

PCT

(10) International Publication Number
WO 03/013760 A3

- (51) International Patent Classification⁷: **B22C 1/00**, 5/06, 5/04, B02C 13/18
- (21) International Application Number: PCT/US02/20178
- (22) International Filing Date: 25 June 2002 (25.06.2002)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
09/922,862 7 August 2001 (07.08.2001) US
- (71) Applicant (for all designated States except US): **NORAM TECHNOLOGY, LTD** [GB/GB]; Britannia House, 960 High Road, London, Greater London N12 9FB (GB).
- (72) Inventors; and
- (75) Inventors/Applicants (for US only): **HARRIS, Kenneth** [GB/NO]; Trollhaugen 24, N-1384 Asker (NO). **SPARKS, Robert, E.** [US/US]; 1318 West Adams Avenue, Kirkwood, MO 63122 (US).
- (74) Agents: **STERN, Marvin, R.** et al.; Jacobson Holman, PLLC, The Jenifer Building, 400 Seventh Street, NW, Washington, DC 20004 (US).
- (81) Designated States (national): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZM, ZW.
- (84) Designated States (regional): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).
- Published:
— with international search report
- (88) Date of publication of the international search report:
23 October 2003
- 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: PRODUCTS FOR THE MANUFACTURE OF MOLDS AND CORES USED IN METAL CASTING AND A METHOD FOR THEIR MANUFACTURE AND RECYCLE FROM CRUSHED ROCK



(57) Abstract: A system and method for producing foundry quality sand from non-conventional starting materials through the combination of oolization and classification. Incoming particulate matter is first directed into a controlled energy attrition unit (20) where the particles are made to collide with one another. Such collisions clean and round the particles by chipping away surface projections and coatings without crushing the particles. The particle stream is then directed through a multi-fraction classifier (30) where it is separated into two or more useable grades of foundry sand. An air classifier is preferred for the classification stage.

INTERNATIONAL SEARCH REPORT

International Application No
PCT/US 02/20178

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 B22C1/00 B22C5/06 B22C5/04 B02C13/18

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)

IPC 7 B22C B02C

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. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 4 575 013 A (BARTLEY BRYAN A) 11 March 1986 (1986-03-11) the whole document	1-3,5,9, 10,15-18
Y	EP 0 074 771 B (BARMAC ASS LTD) 23 March 1983 (1983-03-23) claims; figures	1-3,5,9, 10,15-18
Y	EP 0 107 752 A (THAL HELMUT) 9 May 1984 (1984-05-09) claims; figures	1-3,5,9, 10,15-18
Y	DE 30 21 490 A (KLEIN ALB GMBH CO KG) 17 December 1981 (1981-12-17) claims; figure	1-3,5,9, 10,15-18
	--- -/--	

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in 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 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

30 June 2003

Date of mailing of the international search report

10/07/2003

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Hodiamont, S

INTERNATIONAL SEARCH REPORT

International Application No
PCT/US 02/20178

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 099 470 A (COSWORTH RES & DEV LTD) 1 February 1984 (1984-02-01) abstract ---	4
A	WO 94 26438 A (P V SAND A S FREDERICA ;JOERGENSEN PALLE NORUP (DK)) 24 November 1994 (1994-11-24) abstract ---	6
A	DD 100 889 A (PEUKERT) 12 October 1973 (1973-10-12) page 3, paragraph 5 ---	6
A	DATABASE WPI Section Ch, Week 199622 Derwent Publications Ltd., London, GB; Class M22, AN 1996-220218 XP002245838 & RU 2 043 821 C (KAZAN ENGINES PRODN ASSOC), 20 September 1995 (1995-09-20) abstract -----	11-14

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 02/20178

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 4575013	A	11-03-1986	NZ 201418 A	08-08-1986
			AU 562919 B2	25-06-1987
			AU 1730183 A	02-02-1984
			DE 3378105 D1	03-11-1988
			EP 0102742 A2	14-03-1984
			JP 1723593 C	24-12-1992
			JP 4009587 B	20-02-1992
			JP 59087051 A	19-05-1984
			ZA 8305541 A	25-04-1984
EP 0074771	B	23-03-1983	NZ 198307 A	11-04-1986
			AU 557168 B2	11-12-1986
			AU 8796282 A	17-03-1983
			CA 1189045 A1	18-06-1985
			DE 3275505 D1	09-04-1987
			EP 0074771 A2	23-03-1983
			US 4662571 A	05-05-1987
			ZA 8206374 A	27-07-1983
EP 0107752	A	09-05-1984	DE 3226049 A1	12-01-1984
			AT 22824 T	15-11-1986
			EP 0107752 A1	09-05-1984
DE 3021490	A	17-12-1981	DE 3021490 A1	17-12-1981
EP 0099470	A	01-02-1984	AU 1577283 A	22-12-1983
			EP 0099470 A1	01-02-1984
			GB 2122523 A ,B	18-01-1984
			JP 59007457 A	14-01-1984
			ZA 8304310 A	25-07-1984
WO 9426438	A	24-11-1994	WO 9426438 A1	24-11-1994
			AU 4308693 A	12-12-1994
DD 100889	A	12-10-1973	DD 100889 A1	12-10-1973
RU 2043821	C	20-09-1995	RU 2043821 C1	20-09-1995