

(19) World Intellectual Property Organization  
International Bureau



(43) International Publication Date  
22 May 2008 (22.05.2008)

PCT

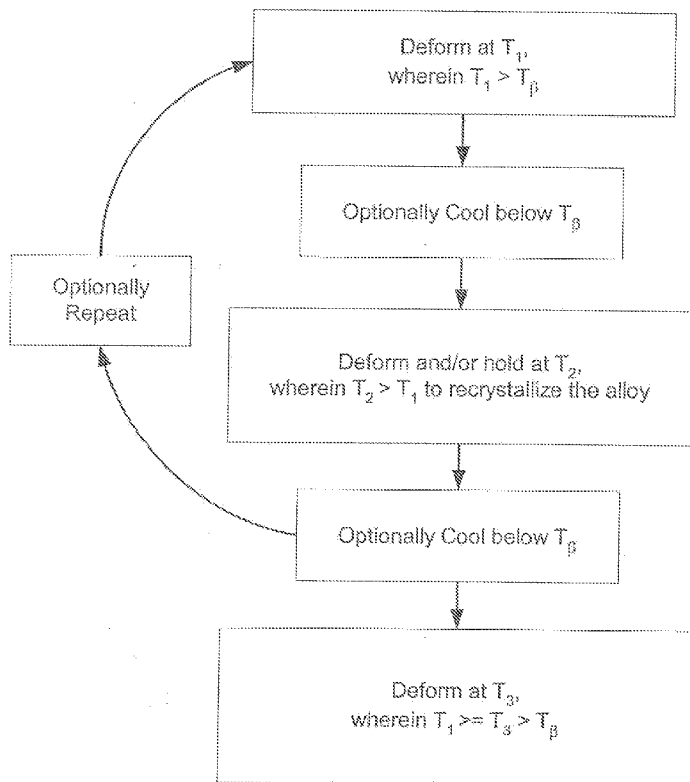
(10) International Publication Number  
**WO 2008/060637 A3**

- (51) International Patent Classification:  
C22C 14/00 (2006.01) C22F 1/18 (2006.01)
- (21) International Application Number:  
PCT/US2007/060478
- (22) International Filing Date: 12 January 2007 (12.01.2007)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:  
11/360,065 23 February 2006 (23.02.2006) US
- (71) Applicant (for all designated States except US): ATI  
PROPERTIES, INC. [US/US]; 1600 N.E. Old Salem  
Road, Albany, OR 97321 (US).
- (72) Inventors; and
- (75) Inventors/Applicants (for US only): ARNOLD,

- Matthew, J. [US/US]; 8619 Castlebay Drive, Char-  
lotte, NC 28277 (US). DAVIS, Mark, R. [US/US]; 5812  
Polk Mountain Drive, Marshville, NC 28103 (US).
- (74) Agent: VICCARO, Patrick, J.; Allegheny Technologies  
Incorporated, 1000 Six Ppg Place, Pittsburgh, PA 15222  
(US).
- (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, ME, 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),

[Continued on next page]

(54) Title: METHODS OF BETA PROCESSING TITANIUM ALLOYS



(57) Abstract: Various non-limiting embodiments of the present invention relate to methods of processing alpha + beta or near-beta titanium alloys wherein the alloys are subjected to deformation above the beta transus temperature ( $T_{\beta}$ ) of the alloys. The method of processing an alpha + beta or a near-beta titanium alloy comprises deforming a body of the alloy at a first temperature ( $T_1$ ) that is above the  $T_{\beta}$  of the alloy; recrystallizing at least a portion of the alloy by deforming and/or holding the body at a second temperature ( $T_2$ ) that is greater than  $T_1$ ; and deforming the body at a third temperature ( $T_3$ ), wherein  $T_1 > T_3 > T_{\beta}$ ; wherein essentially no deformation of the body occurs at a temperature below  $T_{\beta}$  during the method of processing the titanium alloy.

WO 2008/060637 A3



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).

— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

**Published:**

— *with international search report*

**(88) Date of publication of the international search report:**

3 July 2008

**INTERNATIONAL SEARCH REPORT**

International application No  
PCT/US2007/060478

**A. CLASSIFICATION OF SUBJECT MATTER**  
INV. C22C14/00 C22F1/18

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)  
C22C C22F

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, COMPENDEX, 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 3 489 617 A (WUERFEL WALTER W) 13 January 1970 (1970-01-13) cited in the application column 1, lines 14-23 column 1, line 63 - column 2, line 14 column 2, lines 51-71 column 3, lines 28-31 column 3, lines 40-53 examples A,B,I,II	1-31
X	US 5 026 520 A (BHOWAL PRABIR R [US] ET AL) 25 June 1991 (1991-06-25) cited in the application column 4, lines 15-66	1-31
A	US 2004/099350 A1 (MANTIONE JOHN V [US] ET AL) 27 May 2004 (2004-05-27) the whole document	1-31
	-/--	

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 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

6 May 2008

Date of mailing of the international search report

19/05/2008

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  
  
Brown, Andrew

## INTERNATIONAL SEARCH REPORT

International application No

PCT/US2007/060478

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 1 612 289 A (GEN ELECTRIC [US]) 4 January 2006 (2006-01-04) the whole document -----	1-31
A	US 5 032 189 A (EYLON DANIEL [US] ET AL) 16 July 1991 (1991-07-16) the whole document -----	1-31

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No PCT/US2007/060478
---

Patent document cited in search report	Publication date	Publication date	Patent family member(s)	Publication date
US 3489617	A	13-01-1970	FR 1561636 A	28-03-1969
US 5026520	A	25-06-1991	DE 4023962 A1	25-04-1991
			FR 2653449 A1	26-04-1991
			GB 2237289 A	01-05-1991
			JP 2983598 B2	29-11-1999
			JP 3140447 A	14-06-1991
US 2004099350	A1	27-05-2004	NONE	
EP 1612289	A	04-01-2006	US 2005284549 A1	29-12-2005
US 5032189	A	16-07-1991	NONE	