



Europäisches Patentamt
European Patent Office
Office européen des brevets



(11) **EP 1 359 232 A3**

(12) **EUROPEAN PATENT APPLICATION**

(88) Date of publication A3:
02.01.2004 Bulletin 2004/01

(51) Int Cl.7: **C22C 21/00**, C22C 21/12,
C22F 1/057

(43) Date of publication A2:
05.11.2003 Bulletin 2003/45

(21) Application number: **03015053.6**

(22) Date of filing: **30.01.1998**

(84) Designated Contracting States:
**AT BE CH DE DK ES FI FR GB GR IE IT LI LU MC
NL PT SE**

(30) Priority: **31.01.1997 US 36329**

(62) Document number(s) of the earlier application(s) in
accordance with Art. 76 EPC:
98903777.5 / 0 981 653

(71) Applicant: **Pechiney Rolled Products, LLC**
Ravenswood, WV 26164 (US)

(72) Inventors:
• **Cho, Alex**
Richmond, VA 23233 (US)
• **Skillingberg, Michael**
Richmond, VA 23225 (US)
• **Greene, Richard**
Hinsdale, IL 60521 (US)
• **Niedzinski, Michael**
Park Ridge, IL 60068 (US)

(74) Representative: **Mougeot, Jean-Claude**
PECHINEY,
217, cours Lafayette
69451 Lyon Cedex 06 (FR)

(54) **Method of improving fracture toughness in aluminium-lithium alloys**

(57) An aluminum-lithium alloy is processed with controlled amounts of copper, lithium, manganese and zirconium to produce a product having improved fracture toughness in the short longitudinal (S-L) direction and acceptable strength in the short transverse (ST) direction.

EP 1 359 232 A3



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 03 01 5053

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
Y	"ALUMINUM AND ALUMINUM ALLOYS" , METALS AND ALLOYS IN THE UNIFIED NUMBERING SYSTEM, XX, XX, VOL. ED-7, PAGE(S) 30 XP002131452 * alloy A92097 *	1-15	C22C21/00 C22C21/12 C22F1/057
Y	US 4 648 913 A (BRETZ PHILIP E ET AL) 10 March 1987 (1987-03-10) * col.4, 1.44-48 and 56-59; col.5, 1.5-9, 26-30 and 58-63; col.6, 1.6-21 and 41-45; col.7, 1.14-16 *	1-15	
A	US 5 462 712 A (LANGAN TIMOTHY J ET AL) 31 October 1995 (1995-10-31) * abstract; table II *	1-15	
A	WO 93 23584 A (REYNOLDS METALS CO) 25 November 1993 (1993-11-25) * abstract; Table 1, alloy F *	1-15	
A	PETERS AND P-J WINKLER M: "Aluminium-Lithium" , ALUMINIUM-LITHIUM CONFERENCE, DGM INFORMATIONSGESELLSCHAFT VERLAG, DE, VOL. 1, PAGE(S) 203-208 XP002131453		TECHNICAL FIELDS SEARCHED (Int.Cl.7) C22C
The present search report has been drawn up for all claims			
Place of search MUNICH		Date of completion of the search 15 October 2003	Examiner Bjoerk, P
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 03 01 5053

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

15-10-2003

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 4648913	A	10-03-1987	AU 573683 B2	16-06-1988
			AU 3809485 A	03-10-1985
			BR 8501422 A	26-11-1985
			CA 1228490 A1	27-10-1987
			DE 3586264 D1	06-08-1992
			DE 3586264 T2	03-06-1993
			EP 0157600 A2	09-10-1985
			JP 60221543 A	06-11-1985
			NO 851267 A	30-09-1985
			US 4897126 A	30-01-1990
			US 5135713 A	04-08-1992
			US 4797165 A	10-01-1989
			US 4844750 A	04-07-1989
			US 4806174 A	21-02-1989

US 5462712	A	31-10-1995	US 5259897 A	09-11-1993
			US 5455003 A	03-10-1995
			US 5512241 A	30-04-1996
			AT 129751 T	15-11-1995
			AU 631137 B2	19-11-1992
			AU 4056889 A	23-03-1990
			BR 8907606 A	30-07-1991
			DE 68924710 D1	07-12-1995
			DE 68924710 T2	11-04-1996
			DK 26491 A	18-04-1991
			EP 0432184 A1	19-06-1991
			ES 2018386 A6	01-04-1991
			IL 91249 A	29-12-1994
			IL 108872 A	29-06-1995
			JP 4500239 T	16-01-1992
			JP 3222124 B2	22-10-2001
			KR 153288 B1	16-11-1998
			NO 910609 A ,B,	04-04-1991
			NO 961755 A	04-04-1991
NZ 230325 A	26-09-1990			
PT 91459 A ,B	08-03-1990			
WO 9002211 A1	08-03-1990			

WO 9323584	A	25-11-1993	US 5389165 A	14-02-1995
			CA 2135790 A1	25-11-1993
			DE 69325804 D1	02-09-1999
			DE 69325804 T2	20-01-2000
			EP 0642598 A1	15-03-1995
			JP 7508075 T	07-09-1995
			WO 9323584 A1	25-11-1993

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82