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(54) **Title:** ALUMINUM ALLOY COMPOSITIONS AND METHODS FOR DIE-CASTING THEREOF

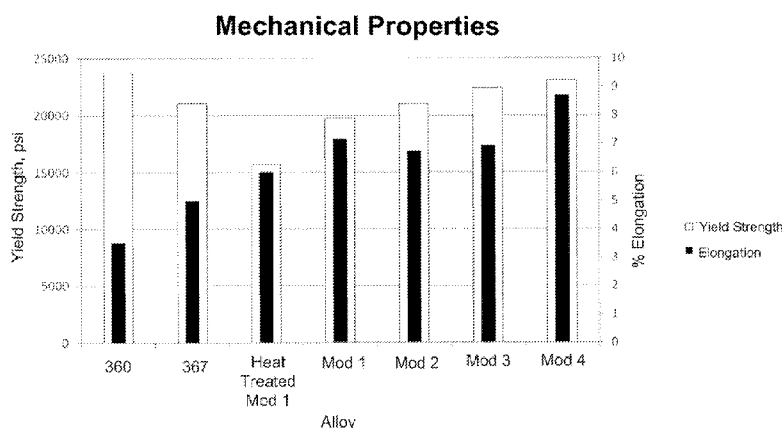


FIG. 2

(57) **Abstract:** Aluminum alloys are provided that have improved fluidity and elongation, as well as freedom of die soldering. The aluminum alloys are particularly suitable for die-casting of structural components. The aluminum alloy includes silicon at from about 8 weight % to about 11 weight %; manganese at from about 0.8 weight % to about 1.9 weight %, iron at from about 0.1 weight % to about 0.5 weight %, magnesium at from about 0.2 weight % to about 0.7 weight %, boron at from about 0.002 weight % to about 0.15 weight %, strontium at from about 0.006 weight % to about 0.017 weight %, less than about 0.25 weight % copper, less than about 0.35 weight % zinc, less than about 0.25 weight % titanium, and a balance of aluminum. Methods related to the aluminum alloys are also provided.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2012/032181**A. CLASSIFICATION OF SUBJECT MATTER*****C22C 21/02(2006.01)i, B22D 21/04(2006.01)i***

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 21/02; B22D 17/00; C22F 1/043; B22D 17/08; C22C 21/04

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Korean utility models and applications for utility models

Japanese utility models and applications for utility models

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

eKOMPASS(KIPO internal) & Keywords: aluminum; diecasting; strontium; boron; manganese; and silicon.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JP 2003-213354 A (NIPPON LIGHT METAL CO LTD et al.) 30 July 2003 See abstract; paragraphs [0002], [0009], [0013]-[0018], [0023]; table 1; and claims 1-3.	1-21
A	JP 09-125181 A (SUMITOMO LIGHT METAL IND LTD) 13 May 1997 See abstract; paragraphs [0008]-[0016]; and claims 1-4.	1-21
A	JP 2009-024265 A (SHOWA DENKO KK) 05 February 2009 See abstract and claims 1-7.	1-21
A	US 2006-0011321 A1 (HUBERT KOCH) 19 January 2006 See abstract; paragraphs [0011]-[0026]; and claims 1-11.	1-21
A	US 2004-0170523 A1 (HUBERT KOCH) 02 September 2004 See abstract; paragraphs [0009]-[0023]; and claims 1-9.	1-21

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents:

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"P" document published prior to the international filing date but later than the priority date claimed

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"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

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"&" document member of the same patent family

Date of the actual completion of the international search

19 OCTOBER 2012 (19.10.2012)

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Information on patent family members

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
JP 2003-213354 A	30.07.2003	DE 60300659 D1	23.06.2005
		DE 60300659 T2	17.11.2005
		EP 1331281 A1	30.07.2003
		EP 1331281 B1	18.05.2005
		JP 04-007488 B2	14.11.2007
		US 2003-0136477 A1	24.07.2003
JP 09-125181 A	13.05.1997	JP 3982849 B2	26.09.2007
JP 2009-024265 A	05.02.2009	AT 422000 T	15.02.2009
		CA 2454509 A1	06.02.2003
		CN 1555423 A	15.12.2004
		CN 1555423 C0	15.12.2004
		DE 60231046 D1	19.03.2009
		EP 1413636 A1	28.04.2004
		EP 1413636 A4	16.11.2005
		EP 1413636 B1	28.01.2009
		EP 1413636 B9	21.10.2009
		JP 04-227014 B2	18.02.2009
		US 2003-0143102 A1	31.07.2003
		US 2006-0027291 A1	09.02.2006
		WO 03-010349 A1	06.02.2003
US 2006-0011321 A1	19.01.2006	AT 516379 T	15.07.2011
		BR PI0502521A	13.02.2007
		CA 2510545 A1	29.12.2005
		CN 1737176 A	22.02.2006
		CN 1737176 C0	22.02.2006
		DK1612286T3	24.10.2011
		EP 1612286 A2	04.01.2006
		EP 1612286 A3	30.05.2007
		EP 1612286 B1	13.07.2011
		ES 2368923 T3	23.11.2011
		JP 2006-016693 A	19.01.2006
		KR 10-2006-0046361 A	17.05.2006
		MX PA05006962A	24.01.2006
		N020053158A	30.12.2005
		N020053158D0	28.06.2005
		PT1612286E	19.09.2011
		SI 1612286T1	28.10.2011
		US 7108042 B2	19.09.2006
US 2004-0170523 A1	02.09.2004	AT 437972 T	15.08.2009
		BR PI0400079A	28.12.2004
		BR PI0400079B1	01.11.2011
		CA 2455426 A1	23.07.2004
		CA 2455426 C	13.12.2011
		CN 1537961 A	20.10.2004
		CN 1537961 C0	06.06.2007

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2012/032181

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
		DE 502004009801 D1	10.09.2009
		DK1443122T3	30.11.2009
		EP 1443122 A1	04.08.2004
		EP 1443122 B1	29.07.2009
		ES 2330332 T3	09.12.2009
		JP 04-970709 B2	13.04.2012
		JP 2004-225160 A	12.08.2004
		KR 10-2004-0068021 A	30.07.2004
		N020040286A	26.07.2004
		PT1443122E	20.10.2009
		SI 1443122T1	31.12.2009
		US 6824737 B2	30.11.2004