



(11) **EP 4 234 123 A3**

(12) **EUROPEAN PATENT APPLICATION**

(88) Date of publication A3:
27.09.2023 Bulletin 2023/39

(51) International Patent Classification (IPC):
B22D 21/00 ^(2006.01) **B22D 21/04** ^(2006.01)
C22C 21/08 ^(2006.01)

(43) Date of publication A2:
30.08.2023 Bulletin 2023/35

(52) Cooperative Patent Classification (CPC):
C22C 21/08; B22D 21/04

(21) Application number: **23175753.5**

(22) Date of filing: **06.05.2019**

(84) Designated Contracting States:
**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB
GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO
PL PT RO RS SE SI SK SM TR**

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(30) Priority: **07.05.2018 US 201862667930 P**

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(62) Document number(s) of the earlier application(s) in
accordance with Art. 76 EPC:
19773328.0 / 3 589 766

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(54) **AL-MG-SI-MN-FE CASTING ALLOYS**

(57) New aluminum casting (foundry) alloys are disclosed. The new aluminum casting alloys generally include from 2.5 to 5.0 wt. % Mg, from 0.70 to 2.5 wt. % Si, wherein the ratio of Mg/Si (in weight percent) is from 1.7 to 3.6, from 0.40 to 1.50 wt. % Mn, from 0.15 to 0.60 wt. % Fe, optionally up to 0.15 wt. % Ti, optionally up to

0.10 wt. % Sr, optionally up to 0.15 wt. % of any of Zr, Sc, Hf, V, and Cr, the balance being aluminum and unavoidable impurities. The new aluminum casting alloys may be high pressure die cast, such as into automotive components. The new aluminum alloys may be supplied in an F or a T5 temper, for instance.

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DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	GB 1 384 264 A (HONSEL WERKE AG) 19 February 1975 (1975-02-19) * page 1, column 1, line 9 - line 30 * * Charge 856; table 2 * * page 4, column 1, line 1 - line 10 * * page 7, column 1, line 33 - column 2, line 54 * * Charge 944; table 6 * * page 12, column 1, line 1 - line 13 * -----	1	INV. B22D21/00 B22D21/04 C22C21/08
X	JP 2002 146463 A (NIPPON LIGHT METAL CO) 22 May 2002 (2002-05-22) * paragraph [0001] - paragraph [0013] * * paragraph [0014] - paragraph [0019] * * No. 2; table 1 * * claims 1-2 * -----	1	TECHNICAL FIELDS SEARCHED (IPC) B22D C22C
X	M. POLTAVTSEVA ET AL: "Long term corrosion behavior of clad aluminum materials under different atmospheric conditions", MATERIALS AND CORROSION, vol. 64, no. 8, 11 March 2013 (2013-03-11) , pages 723-730, XP055718463, ISSN: 0947-5117, DOI: 10.1002/maco.201206962 * Section 2.1; page 724 * * Core 6025; table 1 * ----- -/--	1	
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 21 August 2023	Examiner Neibecker, Pascal
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			

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DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	OTARAWANNA S ET AL: "The thickness of defect bands in high-pressure die castings", MATERIALS CHARACTERIZATION, ELSEVIER, NEW YORK, NY, US, vol. 60, no. 12, 1 December 2009 (2009-12-01), pages 1432-1441, XP026737306, ISSN: 1044-5803, DOI: 10.1016/J.MATCHAR.2009.06.016 [retrieved on 2009-07-04] * Section 2; page 1433 * * AlMg5Si2Mn; table 1 *	1	
X	HU ZUQI ET AL: "Research on the microstructure, fatigue and corrosion behavior of permanent mold and die cast aluminum alloy", MATERIALS AND DESIGN, vol. 55, 18 October 2013 (2013-10-18), pages 353-360, XP028806821, ISSN: 0261-3069, DOI: 10.1016/J.MATDES.2013.10.012 * Section 2; page 354 * * table 1 *	1	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC)
Place of search The Hague			Date of completion of the search 21 August 2023
Examiner Neibecker, Pascal			
CATEGORY OF CITED DOCUMENTS			
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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	? ? ? ?*? ? ? ?* ? ? ? ?*? ? ?*? ? ET AL: "Effect of Si and Zn on mechanical properties and microstructure of squeeze cast Al-5%Mg alloy", , 31 December 1989 (1989-12-31), pages 1-7, XP093075179, Retrieved from the Internet: URL:https://www.jstage.jst.go.jp/article/jilm1951/39/7/39_7_494/_pdf/-char/ja [retrieved on 2023-08-21] * abstract * * No. 8; table 1 * -----	1	
			TECHNICAL FIELDS SEARCHED (IPC)
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
The Hague		21 August 2023	Neibecker, Pascal
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			

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

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5 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
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21-08-2023

10	Patent document cited in search report	Publication date	Patent family member(s)	Publication date
	GB 1384264 A	19-02-1975	NONE	
15	JP 2002146463 A	22-05-2002	JP 3724362 B2 JP 2002146463 A	07-12-2005 22-05-2002
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