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KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

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- *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*

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(54) Title: HIGH STRENGTH, HIGH TOUGHNESS STEEL ALLOY

(57) **Abstract:** A high strength, high toughness steel alloy is disclosed having the following weight percent composition. Element C 0.30-0.55 Mn 0.6-1.75 Si 0.9-2.8 Cr 0.6-2.5 Ni 2.70-7.0 Mo + ½ W 0.25-1.3 Cu 0.30-1.25 Co 0.01 max. V + (5/9) x Nb 0.10-1.0 Ti 0.01 max. Al 0.015 max. Ca 0.005 max. The alloy further includes a grain refining element selected from the group consisting of 0.0001- 0.01% Mg, 0.001-0.025% Y, and a combination thereof. The balance of the alloy is iron and usual impurities. Also disclosed is a hardened and tempered steel article having very high strength and fracture toughness and formed from the alloy set forth above. The alloy article according to this aspect of the invention is further characterized by being tempered at a temperature of about 500°F to 600°F.



INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER		
INV. C22C38/00	C22C38/04	C22C38/34
C22C38/44	C21D6/00	C21D1/18
C22C38/58		
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 C21D		
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 practicable, search terms used) EPO-Internal, WPI Data		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
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X	US 2009/291013 A1 (FEDCHUN VLADIMIR A [US] ET AL) 26 November 2009 (2009-11-26) claims 1-21 example 1 paragraph [0112] - paragraph [0171]	1-30
A	WO 2011/111873 A1 (NIPPON STEEL CORP [JP]; HIRAKAMI DAISUKE [JP]; CHIDA TETSUSHI [JP]; TA) 15 September 2011 (2011-09-15) claims 1-18 tables 1-3	1-30
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☒ 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 application or patent 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 31 January 2014		Date of mailing of the international search report 10/02/2014
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016		Authorized officer Vlassi, Eleni

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