

Title (en)
CASE HARDENED STEEL WITH HIGH TEMPERING TEMPERATURE, METHOD FOR OBTAINING SAME AND PARTS FORMED WITH SAID STEEL

Title (de)
EINSATZSTAHL MIT HOHER ANLASSTEMPERATUR, HERSTELLUNGSVERFAHREN FÜR DIESEN STAHL UND WERKSTÜCKE AUS DIESEM STAHL

Title (fr)
ACIER DE CEMENTATION A TEMPERATURE DE REVENU ELEVEE, PROCEDE POUR SON OBTENTION ET PIECES FORMEES AVEC CET ACIER

Publication
EP 1097248 A1 20010509 (FR)

Application
EP 99926549 A 19990628

Priority
• FR 9901543 W 19990628
• FR 9808247 A 19980629

Abstract (en)
[origin: FR2780418A1] A case hardening steel, with specified contents of nickel, manganese, copper, cobalt, chromium, molybdenum and vanadium, is new. A novel case hardening steel has the composition (by wt.) 0.06-0.18% C, 0.5-1.5% Si, 0.2-1.5% Cr, 1-3.5% Ni, 1.1-3.5% Mo, \ 1.6% Mn, \ 0.4% V, \ 2% Cu, \ 4% Co, balance Fe and impurities, with the proviso that Ni + Mn + 1.5 Cu + 0.5 Co = 2.5 to 5 wt. % and Cr + Mo + V = 2.4 to 3.7 wt. %. Independent claims are also included for the following: (i) production of case hardened parts by producing the above steel in an arc furnace, subjecting cast ingots to reheating and hot working, carrying out a homogenization and grain refining heat treatment, case hardening and heat treating according to use; (ii) a steel part having the above composition; and (iii) a steel part made by the above process. Preferred Features: The steel has the composition 0.09-0.16 % C, 0.7-1.3 % Si, 0.5-1.2% Cr, 2-3 % Ni, 1.5-2.5% Mo, 0.2-0.7 % Mn, 0.15-0.35 % V, 0.3-1.1 % Cu, \ 1.5 % Co, \ 0.020 % P, \ 0.010 % S, \ 0.1 % each of Al, Ce, Ti, Zr, Ca and Nb, balance Fe and impurities. Arc furnace melting may be carried out by vacuum induction melting and may be followed by consumable electrode remelting. The homogenization and grain refining heat treatment step comprises normalizing at above the Ac3 point, air cooling and soft tempering at below the Ac1 point. Case hardening is carried out at low pressure and is followed by cooling to ambient temperature, reheating to 900 -1050 deg C, oil or gas quenching and tempering at up to 350 deg C.

IPC 1-7
C22C 38/44; **C22C 38/42**; **C22C 38/46**

IPC 8 full level
C21D 6/00 (2006.01); **C22C 38/44** (2006.01); **C22C 38/46** (2006.01); **C23C 8/22** (2006.01); **F02M 61/16** (2006.01); **C21D 1/18** (2006.01); **C21D 1/28** (2006.01)

CPC (source: EP US)
C21D 6/004 (2013.01 - EP US); **C22C 38/44** (2013.01 - EP US); **C22C 38/46** (2013.01 - EP US); **C23C 8/22** (2013.01 - EP US); **F02M 61/166** (2013.01 - EP US); **C21D 1/18** (2013.01 - EP US); **C21D 1/28** (2013.01 - EP US)

Cited by
CN110578086A

Designated contracting state (EPC)
AT BE CH DE DK ES FI FR GB GR IT LI LU SE

DOCDB simple family (publication)
US 6699333 B1 20040302; AR 019175 A1 20011226; AT E216739 T1 20020515; BR 9912226 A 20010508; CA 2335911 A1 20000106; CA 2335911 C 20090901; DE 69901345 D1 20020529; DE 69901345 T2 20021219; DK 1097248 T3 20020701; EP 1097248 A1 20010509; EP 1097248 B1 20020424; ES 2175985 T3 20021116; FR 2780418 A1 19991231; FR 2780418 B1 20000908; WO 0000658 A1 20000106

DOCDB simple family (application)
US 72092701 A 20010226; AR P990103120 A 19990629; AT 99926549 T 19990628; BR 9912226 A 19990628; CA 2335911 A 19990628; DE 69901345 T 19990628; DK 99926549 T 19990628; EP 99926549 A 19990628; ES 99926549 T 19990628; FR 9808247 A 19980629; FR 9901543 W 19990628