

Title (en)

Process for heat treating metallic articles and heat treated article

Title (de)

Verfahren zur Wärmebehandlung metallischer Werkstücke sowie wärmebehandeltes Werkstück

Title (fr)

Procédé pour le traitement thermique d'articles métalliques et article traité thermiquement

Publication

EP 1333105 B1 20080402 (DE)

Application

EP 02002530 A 20020204

Priority

EP 02002530 A 20020204

Abstract (en)

[origin: EP1333105A1] Process for heat treating metallic workpieces comprises: heating workpieces to a first temperature in a vacuum or in a neutral or reducing gas atmosphere; carburizing the workpieces at the first temperature reached at the end of the heating up phase; cooling the workpieces to a second temperature; boriding the workpieces; cooling the workpieces to third temperature; and quenching the workpieces. Process for heat treating metallic workpieces comprises: heating the workpieces to a first temperature in a vacuum or in a neutral or reducing gas atmosphere during the heating up phase; carburizing the workpieces at the first temperature reached at the end of the heating up phase and at a first pressure for a first time period in a gas atmosphere containing a hydrocarbon during an enriching phase next to the heating up phase; cooling the workpieces to a second temperature; boriding the workpieces; cooling the workpieces to a third temperature; and quenching the workpieces from the third temperature to a temperature of less than 150 degreesC. Independent claims are also included for the following: (a) a device for carrying out the heat treating process; and (b) a heat treated workpiece. Preferred Features: The workpieces are heated in the first step to 800-1100 degreesC and cooled to 800-950 degreesC. The workpieces are cooled to room temperature during quenching. During boriding, the gas atmosphere contains boron trichloride, boron trifluoride and/or diboran.

IPC 8 full level

C23C 8/34 (2006.01)

CPC (source: EP US)

C21D 9/0062 (2013.01 - EP US); **C23C 8/34** (2013.01 - EP US); **F27B 5/04** (2013.01 - EP US); **F27B 5/12** (2013.01 - EP US); **F27B 5/13** (2013.01 - EP US)

Citation (examination)

"ASM Handbook, Heat Treating, Vol. 4," 2001, ASM INTERNATIONAL, USA

Cited by

US10196730B2; WO2011029565A1; US9518318B2; US10488115B2; US10648050B2

Designated contracting state (EPC)

AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE TR

DOCDB simple family (publication)

EP 1333105 A1 20030806; **EP 1333105 B1 20080402**; AT E391193 T1 20080415; DE 50212014 D1 20080515; US 2003145907 A1 20030807; US 2006118209 A1 20060608; US 2006119021 A1 20060608; US 7559995 B2 20090714

DOCDB simple family (application)

EP 02002530 A 20020204; AT 02002530 T 20020204; DE 50212014 T 20020204; US 32855502 A 20021223; US 33903206 A 20060125; US 33903306 A 20060125