Title (en)

Thermoformed product and method for producing same

Title (de)

Warmumgeformtes Produkt und Verfahren zu dessen Herstellung

Title (fr)

Produit déformé à chaud et son procédé de fabrication

Publication

EP 2453027 A1 20120516 (DE)

Application

EP 11188717 A 20111110

Priority

- EP 10190719 A 20101110
- EP 11188717 A 20111110

Abstract (en)

The process, comprises subjecting a hot form at 900-1300[deg] C, and cooling in air, where an average austenite grain size after a final hot form is smaller than 50 mu m and the cooling step occurs from the hot form at resting or moving air so that the temperature of 400-600[deg] C with a cooling rate of 0.1-4.0 K/s is passed through. The steel product comprises: carbon (0.03-0.20%); manganese (2-4.%); chromium (0.05-2%); nickel (0.05-1%); phosphorus (0.035%); molybdenum (0.5%); nitrogen (0.02%); aluminum (0.04%); boron (0.005%); titanium (0.10%); silicon (0.8%); and residual iron. The process, comprises subjecting a hot form at 900-1300[deg] C, and cooling in air, where an average austenite grain size after a final hot form is smaller than 50 mu m and the cooling step occurs from the hot form at resting or moving air so that the temperature of 400-600[deg] C with a cooling rate of 0.1-4.0 K/s is passed through. The steel product comprises: carbon (0.03-0.20%); manganese (2-4.%); chromium (0.05-2%); nickel (0.05-1%); phosphorus (0.035%); molybdenum (0.5%); nitrogen (0.02%); aluminum (0.04%); boron (0.005%); titanium (0.10%); silicon (0.8%); and residual iron and/or steel impurities. A weight percentage of carbon, manganese (2.55%), chromium, nickel and molybdenum satisfies the equation as given in the specification. The steel product is formed with the structural components having lower bainite (60-95%), granular or upper bainite (10%), martensite (40%), austenite (20%), and ferrite (2%). An independent claim is included for a hot-pressed steel product.

Abstract (de)

Zur Herstellung eines verbesserten Stahlprodukts wird ein Stahl mit einem Gewichtsanteil von: 0.03 bis 0.20 % Kohlenstoff (C), 2.00 % bis 4.00 % Mangan (Mn), 0.05 bis 2.00 % Chrom (Cr), 0.05 bis 1.00% Nickel (Ni), bis zu 0.035% Phosphor (P), bis zu 0.5% Molybdän (Mo), bis zu 0.02% Stickstoff (N), bis zu 0.04% Aluminium (Al), bis zu 0.005% Bor (B), bis zu 0.10% Titan (Ti), bis zu 0.8% Silizium (Si), der Rest Eisen sowie stahlübliche Beimengungen, einer Warmumformung bei 900 bis 1300°C unterzogen und danach an Luft abkühlt, wobei die mittlere Austenitkorngrösse nach dem letzten Warmumformungschritt kleiner ist als 50 µm und wobei die Abkühlung aus der Umformhitze an ruhender oder bewegter Luft so geschieht, dass der Temperaturbereich zwischen 800 und 500°C mit einer Kühlrate von 0.1 bis 8.0 K/s durchlaufen wird. Die prozentualen Gewichtsanteile x(i) von Kohlenstoff, Mangan, Chrom, Nickel und Molybdän erfüllen dabei die folgende Bedingung: 700 < Bs = 1 #¢ ¹ # ¢ 103 - 270 # x C - 90 # x Mn - 70 # x Cr - 37 # x Ni - 83 # x Mo < 800

IPC 8 full level

C21D 6/00 (2006.01); **C22C 38/04** (2006.01); **C22C 38/08** (2006.01); **C22C 38/18** (2006.01)

CPC (source: EP)

C21D 6/00 (2013.01); **C21D 6/004** (2013.01); **C21D 6/005** (2013.01); **C22C 38/02** (2013.01); **C22C 38/04** (2013.01); **C22C 38/08** (2013.01); **C22C 38/18** (2013.01); **C22C 38/44** (2013.01); **C22C 38/58** (2013.01); C21D 2211/001 (2013.01); C21D 2211/002 (2013.01); C21D 2211/008 (2013.01)

Citation (applicant)

- WO 2007017161 A1 20070215 - TENARIS CONNECTIONS AG [LI], et al
- EP 0845544 A1 19980603 - ASCOMETAL SA [FR]
- EP 0775756 A1 19970528 - ASCOMETAL SA [FR]
- JP 2007284774 A 20071101 - JFE BARS & SHAPES CORP
- GB 2297094 A 19960724 - BRITISH STEEL PLC [GB], et al
- CN 1477226 A 20040225 - UNIV TSINGHUA [CN]
- W. STEVEN, A.J. HAYNES, JISI, vol. 183, 1956, pages 349 - 359

Citation (search report)

- [XY] JP 2007284774 A 20071101 - JFE BARS & SHAPES CORP
- [Y] EP 2103704 A1 20090923 - SWISS STEEL AG [CH]

Designated contracting state (EPC)

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

Designated extension state (EPC)

BA ME

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DOCDB simple family (application)

EP 10190719 A 20101110; EP 11188717 A 20111110; PL 11188717 T 20111110