

Title (en)

HOT-ROLLED STEEL SHEET, FORGED STEEL PART AND PRODUCTION METHODS THEREFOR

Title (de)

WARMGEWALZTES STAHLBLECH, STAHLBLECHTEIL UND HERSTELLUNGSVERFAHREN DAFÜR

Title (fr)

TÔLE D'ACIER LAMINÉE À CHAUD, PIÈCE EN ACIER FORGÉ ET PROCÉDÉS DE PRODUCTION ASSOCIÉS

Publication

EP 3604587 A4 20200909 (EN)

Application

EP 17904326 A 20170331

Priority

JP 2017013749 W 20170331

Abstract (en)

[origin: EP3604587A1] A hot rolled steel sheet having a chemical composition consisting of, in mass %, C: 0.020-0.070%, Si: 0.05-1.70%, Mn: 0.60-2.50%, Al: 0.005-0.020%, N: > 0.0030-0.0060%, P ≤ 0.050%, S ≤ 0.005%, Ti: 0.015-0.170%, Nb: 0-0.100%, V: 0-0.300%, Cu: 0-2.00%, Ni: 0-2.00%, Cr: 0-2.00%, Mo: 0-1.00%, B: 0-0.0100%, Ca: 0-0.0100%, Mg: 0-0.0100%, REM: 0-0.1000%, Zr: 0-1.000%, Co: 0-1.000%, Zn: 0-1.000%, W: 0-1.000%, Sn: 0-0.050%, the balance: Fe and impurities, wherein Ca + Mg + REM ≥ 0.0005, a metal microstructure includes, in area %, ferrite: 5-70%, bainite: 30-95%, retained γ ≤ 2%, martensite ≤ 2%, pearlite ≤ 1%, ferrite + bainite ≥ 95%, a number density of the precipitates in ferrite grains is $1.0 \times 10^{16} \text{--} 50.0 \times 10^{16} \text{ cm}^{-3}$, an average circle-equivalent diameter of the TiN precipitates in the steel sheet is 1.0-10.0 μm, an average of minimum distances between adjacent TiN precipitates is 10.0 μm or more, and a standard deviation of nano hardness is 1.00 GPa or less.

IPC 8 full level

C21C 7/04 (2006.01); **C21C 7/06** (2006.01); **C21D 1/02** (2006.01); **C21D 1/19** (2006.01); **C21D 6/00** (2006.01); **C21D 8/02** (2006.01); **C21D 8/04** (2006.01); **C21D 9/46** (2006.01); **C21D 9/48** (2006.01); **C22C 38/00** (2006.01); **C22C 38/02** (2006.01); **C22C 38/04** (2006.01); **C22C 38/06** (2006.01); **C22C 38/14** (2006.01); **C22C 38/58** (2006.01)

CPC (source: EP KR US)

C21C 7/04 (2013.01 - EP); **C21C 7/06** (2013.01 - EP KR); **C21D 1/02** (2013.01 - EP US); **C21D 1/19** (2013.01 - EP); **C21D 6/005** (2013.01 - EP); **C21D 6/008** (2013.01 - EP); **C21D 8/005** (2013.01 - US); **C21D 8/0215** (2013.01 - EP US); **C21D 8/0226** (2013.01 - EP US); **C21D 8/0236** (2013.01 - US); **C21D 8/0263** (2013.01 - EP); **C21D 8/0415** (2013.01 - EP); **C21D 8/0426** (2013.01 - EP); **C21D 8/0463** (2013.01 - EP); **C21D 9/46** (2013.01 - EP KR); **C21D 9/48** (2013.01 - EP); **C22C 38/001** (2013.01 - EP US); **C22C 38/002** (2013.01 - US); **C22C 38/005** (2013.01 - US); **C22C 38/008** (2013.01 - US); **C22C 38/02** (2013.01 - EP US); **C22C 38/04** (2013.01 - EP US); **C22C 38/06** (2013.01 - EP US); **C22C 38/08** (2013.01 - US); **C22C 38/12** (2013.01 - US); **C22C 38/14** (2013.01 - EP US); **C22C 38/16** (2013.01 - US); **C22C 38/32** (2013.01 - US); **C22C 38/42** (2013.01 - KR); **C22C 38/58** (2013.01 - KR); **C21D 2211/001** (2013.01 - US); **C21D 2211/002** (2013.01 - EP US); **C21D 2211/005** (2013.01 - EP US); **C21D 2211/008** (2013.01 - US); **C21D 2211/009** (2013.01 - US)

Citation (search report)

- [A] EP 2987884 A1 20160224 - NIPPON STEEL & SUMITOMO METAL CORP [JP]
- [A] EP 2243851 A1 20101027 - JFE STEEL CORP [JP]
- [A] SANG-CHAE PARK ET AL: "Effect of Al on the Evolution of Non-metallic Inclusions in the Mn-Si-Ti-Mg Deoxidized Steel During Solidification: Experiments and Thermodynamic Calculations", ISIJ INTERNATIONAL, vol. 44, no. 6, 1 January 2004 (2004-01-01), JP, pages 1016 - 1023, XP055718406, ISSN: 0915-1559, DOI: 10.2355/isijinternational.44.1016
- See references of WO 2018179391A1

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

DOCDB simple family (publication)

EP 3604587 A1 20200205; **EP 3604587 A4 20200909**; BR 112019017622 A2 20200324; CN 110475890 A 20191119; JP 6332571 B1 20180530; JP WO2018179391 A1 20190411; KR 20190126100 A 20191108; MX 2019011711 A 20191121; US 2020024679 A1 20200123; WO 2018179391 A1 20181004

DOCDB simple family (application)

EP 17904326 A 20170331; BR 112019017622 A 20170331; CN 201780089327 A 20170331; JP 2017013749 W 20170331; JP 2017559726 A 20170331; KR 20197028709 A 20170331; MX 2019011711 A 20170331; US 201716485360 A 20170331