

Title (en)  
Ductile steel with high yield strength and process for manufacturing same

Title (de)  
Duktiler Stahl mit hoher Elastizitätsgrenze und Verfahren zu dessen Herstellung

Title (fr)  
Acier ductile à haute limite élastique et procédé de fabrication de cet acier

Publication  
**EP 0881306 A1 19981202 (FR)**

Application  
**EP 98201503 A 19980508**

Priority  
BE 9700413 A 19970512

Abstract (en)  
Multiphase hot-rolled steel exhibiting transformation induced plasticity has a structure comprising ferrite and bainite or a mixture of bainite and martensite, with retained austenite. It contains by weight: 0.05-0.5% carbon, 0.50-2.5% manganese and 0.30-0.80% silicon. Also claimed is preparation of the steel from an ingot of this formula, which is heated at 1150-1300 degrees C for 135-200 minutes, roughly rolled while cooling to between 900 and 1150 degrees C, then finish rolled while cooling to or below the austenite transformation temperature. The resulting steel band is cooled slowly to just above the pearlite formation temperature, then rapidly to below that temperature. It is wound onto a spool below the temperature of bainite formation but above that of martensite formation, thus forming some bainite in the microstructure. Finally it is quenched to stop the bainite formation and prevent precipitation of iron carbide.

Abstract (fr)  
L'invention est relative à un acier multiphasé laminé à chaud montrant une transformation induite de plasticité ("TRIP") comprenant de la ferrite, de la bainite ou un mélange de bainite et de martensite, et de l'austénite résiduelle et dont la composition chimique contient du carbone, du manganèse et du silicium contenant essentiellement, calculé en % en poids : carbone, 0,05 % à 0,5 %, manganèse, 0,50 % à 2,5 %, silicium, 0,30 % à 0,80 % et à un procédé pour la fabrication d'une tôle d'un tel acier. <IMAGE>

IPC 1-7  
**C21D 8/02**; **C21D 8/04**; **C22C 38/04**

IPC 8 full level  
**C21D 8/02** (2006.01); **C22C 38/04** (2006.01); **C22C 38/12** (2006.01); **C22C 38/14** (2006.01)

CPC (source: EP)  
**C21D 8/0226** (2013.01); **C22C 38/04** (2013.01); **C22C 38/12** (2013.01); **C22C 38/14** (2013.01); **C21D 8/0263** (2013.01); **C21D 2211/002** (2013.01)

Citation (search report)  
• [X] US 5328528 A 19940712 - CHEN HUANG-CHUAN [TW]  
• [X] EP 0295500 A1 19881221 - NIPPON STEEL CORP [JP]  
• [X] EP 0586704 A1 19940316 - NIPPON STEEL CORP [JP]  
• [X] EP 0707087 A1 19960417 - NIPPON STEEL CORP [JP]  
• [A] US 5470529 A 19951128 - NOMURA SHIGEKI [JP], et al  
• [A] US 4033789 A 19770705 - HAMBURG EMIL G, et al  
• [A] BANO X ET AL: "ACIERS LAMINES A CHAUD A TRES HAUTE RESISTANCE POUR MISE EN FORME A FROID", CAHIERS D'INFORMATIONS TECHNIQUES DE LA REVUE DE METALLURGIE, vol. 92, no. 10/11, 1 October 1995 (1995-10-01), pages 1271 - 1280, XP000556050  
• [A] YASUHARU SAKUMA ET AL: "MECHANICAL BEHAVIOR OF AN INTERCRITICALLY ANNEALED AND ISOTHERMALLY TRANSFORMED LOW C ALLOY STEEL WITH FERRITE-BAINITE-AUSTENITE MICROSTRUCTURES", JOURNAL OF HEAT TREATING, vol. 8, no. 2, 1 January 1990 (1990-01-01), pages 109 - 120, XP000174227

Cited by  
JP2006506530A; JP2001073040A; JP2006506529A; CN109468444A; CN109778062A; EP1365037A4; EP1396549A1; BE1013359A3; EP1072689A1; FR2796966A1; CN110475889A; FR2847274A1; AU2003294048B2; CN101886161A; KR101010595B1; US11279994B2; US6328826B1; US6821364B2; US7090731B2; WO2004048630A1; WO2007048497A1; WO0171047A1; US8435363B2; US9157138B2

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

DOCDB simple family (publication)  
**EP 0881306 A1 19981202**; BE 1011149 A3 19990504

DOCDB simple family (application)  
**EP 98201503 A 19980508**; BE 9700413 A 19970512