

Title (en)
PROCESS FOR MANUFACTURING COLD-ROLLED AND ANNEALED STEEL SHEETS WITH VERY HIGH STRENGTH, AND SHEETS THUS PRODUCED

Title (de)
VERFAHREN ZUR HERSTELLUNG KALTGEWALZTER UND GEGLÜHTER STAHLBLECHE VON SEHR HOHER FESTIGKEIT UND IN DIESEM VERFAHREN HERGESTELLTE BLECHE

Title (fr)
PROCEDE DE FABRICATION DE TÔLES D'ACIER LAMINEES A FROID ET RECUITES A TRES HAUTE RESISTANCE, ET TÔLES AINSI PRODUITES

Publication
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Application
EP 08805523 A 20080428

Priority
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• FR 2008000609 W 20080428

Abstract (en)
[origin: EP1990431A1] A high-strength, cold rolled, annealed steel sheet (I) has composition (by weight, excluding iron, processing impurities and various optional components) 0.10-0.25% carbon, 1-3% manganese, at least 0.010% aluminum, up to 2.990% silicon (provided that Si + Al is 1-3%), up to 0.015% sulfur, up to 0.1% phosphorus and up to 0.008% nitrogen. The microstructure is 15-90% bainite, the remainder being martensite and residual austenite. A cold rolled, annealed steel sheet (I), with strength more than 1200 MPa, has composition (by weight, excluding iron and processing impurities) (i) 0.10-0.25% carbon, 1-3% manganese, at least 0.010% aluminum, up to 2.990% silicon (provided that Si + Al is 1-3%), up to 0.015% sulfur, up to 0.1% phosphorus and up to 0.008% nitrogen and optionally (ii) 0.05-0.15% vanadium, up to 0.25% molybdenum, up to 1.65% chromium (provided that Cr + (3 x Mo) is at least 0.3%) and up to 0.040% titanium (provided that Ti/N is at least 4). The microstructure is 15-90% bainite, the remainder being martensite and residual austenite. Independent claims are included for: (1) the production of (I) with elongation at break more than 8% from a steel as above, by (A) casting a semi-finished product from the steel; (B) heating to more than 1150[deg] C; (C) rolling to give a hot-rolled sheet; (D) coiling the sheet; (E) cleaning the sheet; (F) cold rolling the sheet at a degree of reduction of 30-80%; and (G) reheating the sheet at 5-15[deg] C per second to a temperature of Ac3 to Ac3 plus 20[deg] C, maintaining the temperature for 50-150 seconds, cooling at more than 25[deg] C per second to a temperature between B s and M s minus 20[deg] C, maintaining this temperature for 150-350 seconds and cooling at less than 30[deg] C per second to ambient temperature; and (2) the production of (I) with elongation at break more than 10% by a variant of the process, involving steps (A) - (G) as above except that (1) the steel contains more than 0.005% molybdenum, more than 0.005% chromium and no boron and consists of 65-90% bainite, the remainder being islets of martensite and residual austenite, and (2) in the reheating step (G) the sheet is cooled from the temperature of Ac3 to Ac3 plus 20[deg] C at more than 40[deg] C per second to a temperature between M s plus 30[deg] C and M s minus 30[deg] C (the holding time at this temperature and further cooling being as above).

IPC 8 full level
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CPC (source: EP KR US)
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Citation (opposition)
Opponent : Tata Steel Ijmuiden B.V.
• EP 1676932 A1 20060705 - KOBE STEEL LTD [JP], et al
• JP 2004190050 A 20040708 - KOBE STEEL LTD
• SUGIMOTO ET AL., ISIJ INTERNATIONAL, vol. 40, no. 9, 2000, pages 902 - 908, XP009048166
• IMOSE: "Heating and cooling technology in the continuous annealing", TRANSACTIONS ISIU, vol. 25, 1985, pages 911 - 932, XP055276436

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