

## Title (en)

METHOD OF PRODUCING GRAIN-ORIENTED ELECTRICAL STEEL SHEET HAVING EXCELLENT IRON LOSS PROPERTIES

## Title (de)

VERFAHREN ZUR HERSTELLUNG VON KORNIORIENTIERTEM ELEKTROMAGNETISCHEM STAHLBLECH MIT HERVORRAGENDEN KERNVERLUSTEIGENSCHAFTEN

## Title (fr)

PROCÉDÉ DE PRODUCTION D'UNE TÔLE D'ACIER ÉLECTROMAGNÉTIQUE À GRAINS ORIENTÉS PRÉSENTANT D'EXCELLENTE CARACTÉRISTIQUES DE PERTE DE COEUR

## Publication

**EP 2757165 A1 20140723 (EN)**

## Application

**EP 12832398 A 20120914**

## Priority

- JP 2011203349 A 20110916
- JP 2012073608 W 20120914

## Abstract (en)

In the production of a grain-oriented electrical steel sheet by hot rolling a steel slab comprising C: 0.001#1/40.10 mass%, Si:1.0#1/45.0 mass%, Mn:0.01#1/40.5 mass%, sol. Al: 0.003#1/40.050 mass%, N: 0.0010#1/40.020 mass%, one or two selected from S and Se: 0.005#1/40.040 mass% in total, cold rolling, primary recrystallization annealing, and final annealing, a heating rate S1 between a temperature T1 (°C): 500+2 x (NB - NA) and a temperature T2 (°C): 600 +2 x (NB - NA) in a heating process of the primary recrystallization annealing is set to not less than 80 °C/sec, and an average heating rate S2 from the temperature T2 to 750 °C is set to 0.1#1/40.7 times of S1, whereby a grain-oriented electrical steel sheet having a low iron loss over a full length of a product coil is obtained. In the equations, NA represents N amount (massppm) precipitated after the final cold rolling and NB represents N amount (massppm) precipitated after the primary recrystallization annealing.

## IPC 8 full level

**C21D 8/12** (2006.01); **C22C 38/00** (2006.01); **C22C 38/60** (2006.01); **H01F 1/16** (2006.01)

## CPC (source: EP US)

**C21D 8/1261** (2013.01 - EP US); **C21D 8/1272** (2013.01 - EP US); **C22C 38/001** (2013.01 - EP US); **C22C 38/002** (2013.01 - EP US); **C22C 38/008** (2013.01 - EP 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 - EP US); **C22C 38/12** (2013.01 - EP US); **C22C 38/14** (2013.01 - EP US); **C22C 38/16** (2013.01 - EP US); **C22C 38/34** (2013.01 - EP US); **C22C 38/60** (2013.01 - EP US); **H01F 1/16** (2013.01 - EP US); **C21D 8/1222** (2013.01 - EP US); **C21D 8/1233** (2013.01 - EP US); **C21D 8/1266** (2013.01 - EP US); **C21D 2201/05** (2013.01 - EP US)

## Cited by

EP2770075A4; EP2902508A4; US11145446B2; US9290824B2; US9805851B2; EP3653754A4

## 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 2757165 A1 20140723**; **EP 2757165 A4 20150701**; **EP 2757165 B1 20170215**; CN 103781920 A 20140507; CN 103781920 B 20150520; JP 2013064178 A 20130411; JP 5434999 B2 20140305; KR 101600724 B1 20160307; KR 20140044928 A 20140415; RU 2014115200 A 20151027; RU 2572947 C2 20160120; US 2014338794 A1 20141120; WO 2013039193 A1 20130321

## DOCDB simple family (application)

**EP 12832398 A 20120914**; CN 201280043648 A 20120914; JP 2011203349 A 20110916; JP 2012073608 W 20120914; KR 20147005984 A 20120914; RU 2014115200 A 20120914; US 201214344805 A 20120914