

Title (en)
METHOD OF MANUFACTURING OF A NITRIDED PACKAGING STEEL

Title (de)
VERFAHREN ZUR HERSTELLUNG EINES AUFGESTICKTEN VERPACKUNGSSTAHL

Title (fr)
PROCÉDÉ DE FABRICATION D'UN ACIER D'EMBALLAGE NITRURÉ

Publication
EP 3186401 B1 20190612 (DE)

Application
EP 15732735 A 20150702

Priority
• DE 102014112286 A 20140827
• EP 2015065055 W 20150702

Abstract (en)
[origin: CA2954713A1] The invention relates to a method for producing a nitrided packaging steel with a carbon content of 10 to 1000 ppm and an amount of uncombined nitrogen, dissolved in the steel, of more than 100 ppm, wherein the nitriding is performed in two stages, to be specific a first stage, in which a molten steel is nitrided to a nitrogen content of at most 160 ppm by introducing a nitrogen-containing gas and/or a nitrogen-containing solid into the molten steel, and a second stage, in which a flat steel product produced from the nitrided molten steel by cold rolling is treated with a nitrogen-containing gas in order to increase further the amount of uncombined nitrogen in the flat steel product. The second nitriding stage is in this case performed in an annealing furnace, in which the flat steel product is at the same time annealed in a recrystallizing manner. The packaging steels produced by this method are distinguished by great strength, in excess of 600 MPa, and good elongation to fracture, regularly in excess of 5%, as well as by good forming properties. The invention also relates to a nitrided packaging steel in the form of a flat steel product.

IPC 8 full level
C21D 8/02 (2006.01); **C21D 8/04** (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 38/42** (2006.01); **C23C 8/26** (2006.01); **C23C 8/80** (2006.01); **C23F 17/00** (2006.01)

CPC (source: CN EP KR US)
C21D 8/02 (2013.01 - CN EP US); **C21D 8/0205** (2013.01 - CN EP KR US); **C21D 8/0236** (2013.01 - CN EP KR US); **C21D 8/0257** (2013.01 - CN EP KR US); **C21D 8/04** (2013.01 - CN EP KR US); **C21D 8/0405** (2013.01 - CN EP KR US); **C21D 8/0436** (2013.01 - CN EP KR US); **C21D 8/0457** (2013.01 - CN EP KR US); **C21D 8/0473** (2013.01 - EP US); **C21D 9/48** (2013.01 - CN EP KR); **C22C 38/001** (2013.01 - EP KR US); **C22C 38/002** (2013.01 - EP US); **C22C 38/004** (2013.01 - EP KR US); **C22C 38/02** (2013.01 - EP US); **C22C 38/04** (2013.01 - EP US); **C22C 38/06** (2013.01 - EP US); **C22C 38/42** (2013.01 - EP US); **C23C 8/26** (2013.01 - US); **C23C 8/80** (2013.01 - US); **C23F 17/00** (2013.01 - US)

Citation (examination)
WO 2013183274 A1 20131212 - JFE STEEL CORP [JP] & EP 2860124 A1 20150415 - JFE STEEL CORP [JP]

Citation (opposition)
Opponent : ArcelorMittal
• US 3219494 A 19651123 - HARTNER HOWARD E, et al
• WO 2005056841 A1 20050623 - NIPPON STEEL CORP [JP], et al
• EP 0764725 A1 19970326 - LORRAINE LAMINAGE [FR]
• EP 1065286 A1 20010103 - LORRAINE LAMINAGE [FR]
• EP 2330223 A1 20110608 - NIPPON STEEL CORP [JP]
• KR 20130055916 A 20130529 - POSCO [KR]
• JP H1121627 A 19990126 - NIPPON STEEL CORP, et al
• JP H08260059 A 19961008 - NIPPON STEEL CORP
• JP S5827930 A 19830218 - KAWASAKI STEEL CO
• EP 0216399 A1 19870401 - HOOGOEVENS GROEP BV [NL]
• PAUL JOHNSON: "ASM Handbook. 10th ed.", 1991, article "Furnace atmospheres", pages: 542 - 567, XP055711737

Cited by
EP3736348B1; EP3875611A1; DE102020112485B3; WO2021224026A1; EP3221477B1

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)
DE 102014112286 A1 20160303; AU 2015309232 A1 20170202; AU 2015309232 B2 20180614; BR 112017002172 A2 20171121; BR 112017002172 B1 20210908; CA 2954713 A1 20160303; CA 2954713 C 20200512; CN 106661655 A 20170510; CN 106661655 B 20180928; EP 3186401 A1 20170705; EP 3186401 B1 20190612; ES 2734402 T3 20191205; JP 2017534748 A 20171124; JP 6357274 B2 20180711; KR 102439567 B1 20220902; KR 20170046642 A 20170502; RS 59266 B1 20191031; US 10920309 B2 20210216; US 2017253957 A1 20170907; WO 2016030056 A1 20160303

DOCDB simple family (application)
DE 102014112286 A 20140827; AU 2015309232 A 20150702; BR 112017002172 A 20150702; CA 2954713 A 20150702; CN 201580045222 A 20150702; EP 15732735 A 20150702; EP 2015065055 W 20150702; ES 15732735 T 20150702; JP 2017501648 A 20150702; KR 20177002337 A 20150702; RS P20191157 A 20150702; US 201515506911 A 20150702