

Title (en)
METHOD OF STRENGTHENING METAL MATERIAL AND APPARATUS THEREFOR

Publication
EP 0338682 A3 19910918 (EN)

Application
EP 89302878 A 19890322

Priority
JP 6726488 A 19880323

Abstract (en)
[origin: EP0338682A2] A method of strengthening a metal material of a cast product consisting of a unidirectionally solidified structure of crystals extending long in a direction of casting, and an apparatus for realizing this method. The cast product (12) is passed through a zigzag path formed by contact with circumferential surfaces of rotatable rolls (16, 18, 22, 26, 28, 31), so that repeatedly bending deformation is applied to the cast product to thereby harden the cast product. The repeatedly bending deformation grows dislocation in crystals of the cast product competitively, so that free movement in dislocation of crystals cannot be made any more. As a result of the growth competition of crystals, a strengthened metal material is obtained.

IPC 1-7
C21D 7/02; **C22F 1/00**

IPC 8 full level
C22F 1/04 (2006.01); **C21D 7/02** (2006.01); **C21D 8/00** (2006.01); **C22F 1/00** (2006.01)

CPC (source: EP)
C21D 7/02 (2013.01); **C22F 1/00** (2013.01)

Citation (search report)
• [Y] US 3256725 A 19660621 - STEFAN KELLER JULIUS
• [A] DE 481133 C 19290909 - SIEMENS AG
• [A] US 4665970 A 19870519 - OHNO ATSUMI [JP]
• [Y] PATENT ABSTRACTS OF JAPAN vol. 9, no. 142 (M-388)(1865), 18 June 1985; & JP - A - 6021163 (OO SHII SHII K.K.) 02.02.1985

Cited by
CN111515284A; CN106061883A; DE102014201096A1; US10077192B2; DE102013223883A1; DE102014219174A1; DE102012202640A1; US9209009B2; US9776876B2; DE102014222883A1; WO2016074939A1; US10301181B2; EP2620411A1; DE102012200992A1; DE102014200058A1; US9073756B2; WO2015104126A1; DE102014203814A1; US10202282B2

Designated contracting state (EPC)
DE FR GB

DOCDB simple family (publication)
EP 0338682 A2 19891025; **EP 0338682 A3 19910918**; JP H01242762 A 19890927

DOCDB simple family (application)
EP 89302878 A 19890322; JP 6726488 A 19880323