

Title (en)

MODULATED ELECTROMAGNETIC STIRRING OF METALS AT ADVANCED STAGE OF SOLIDIFICATION

Title (de)

MODULIERTES ELEKTROMAGNETISCHES RÜHREN VON METALLEN IM FORTGESCHRITTENEN STADIUM DES ERSTARRENS

Title (fr)

BRASSAGE ÉLECTROMAGNÉTIQUE MODULÉ DE MÉTAUX À UN STADE AVANCÉ DE SOLIDIFICATION

Publication

EP 2268431 A1 20110105 (EN)

Application

EP 08783247 A 20080722

Priority

- CA 2008001333 W 20080722
- US 7695408 A 20080325

Abstract (en)

[origin: WO2009117803A1] A method and apparatus for electromagnetic stirring of molten metals at an advanced stage of solidification, as may be used in continuous casting of steel billets and blooms, are disclosed. At least first and second stirrers are provided for generating first and second rotating magnetic fields of a differing frequency about an axis of solidifying molten metal. The stirrers are arranged about the molten metal in sufficiently close proximity to each other so that their respective magnetic fields superpose to produce a modulated magnetic field. The magnetic fields of the respective stirrers may either have common or opposing rotational directions. The modulated stirring produced by the magnetic fields results in oscillating primary and secondary flows and hence turbulence within the melt bulk in the region wherein temperature of the melt on its central axis is below the liquidus level and at least 10% of substantially solidified material is formed. Turbulent flow created by this stirring method disrupts formation of crystalline structures in the melt bulk and mixes solute enriched melt of the central region with the bulk volume which subsequently results in improvements of the solidification structure and overall internal quality of the cast products.

IPC 8 full level

B01F 13/08 (2006.01); **B22D 11/115** (2006.01); **B22D 27/02** (2006.01)

CPC (source: EP US)

B01F 33/451 (2022.01 - EP US); **B22D 11/115** (2013.01 - EP US); **B22D 11/122** (2013.01 - EP US)

Cited by

WO2019175884A1

Designated contracting state (EPC)

AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MT NL NO PL PT RO SE SI SK TR

Designated extension state (EPC)

AL BA MK RS

DOCDB simple family (publication)

WO 2009117803 A1 20091001; AR 071042 A1 20100519; BR PI0822471 A2 20150616; CA 2719299 A1 20091001; CN 101980808 A 20110223; EP 2268431 A1 20110105; EP 2268431 A4 20170712; JP 2011515225 A 20110519; KR 20100139059 A 20101231; MX 2010010410 A 20101206; RU 2010143386 A 20120427; RU 2453395 C1 20120620; UA 102094 C2 20130610; US 2009242165 A1 20091001

DOCDB simple family (application)

CA 2008001333 W 20080722; AR P090101049 A 20090325; BR PI0822471 A 20080722; CA 2719299 A 20080722; CN 200880128214 A 20080722; EP 08783247 A 20080722; JP 2011501068 A 20080722; KR 20107023626 A 20080722; MX 2010010410 A 20080722; RU 2010143386 A 20080722; UA A201012415 A 20080722; US 7695408 A 20080325