

Title (en)

METHOD FOR CONTROLLED COOLING OF FORGED PARTS MADE OF MICROALLOYED STEEL

Title (de)

VERFAHREN ZUM KONTROLLIERTEN KÜHLEN VON GESCHMIEDETEN TEILEN AUS EINEM MIKROLEGIERTEN STAHL

Title (fr)

PROCÉDÉ DE REFROIDISSEMENT CONTRÔLÉ DE PIÈCES FORGÉES EN ACIER MICROALLOYÉ

Publication

**EP 3854889 A1 20210728 (EN)**

Application

**EP 20382044 A 20200124**

Priority

EP 20382044 A 20200124

Abstract (en)

The invention relates to a method for controlled cooling of forged parts made of microalloyed steel, comprising the following sequence of actions: forming a part made of microalloyed steel by means of conventional forging; depositing the part, at a temperature comprised within the range of 1100-1300 °C, on a conveyor element (1); linearly moving the conveyor element (1) for first cooling, in open air, of the part; introducing the part into a closed chamber (2) for second cooling which is controlled and slowed down by means of air currents; removing the part from the closed chamber (2) for third cooling of the part, in open air; introducing the part inside a sudden cooling chamber (3) for sudden cooling of the entirety of the surface of the part by direct contact with a liquid coolant; and removing the part and transporting to a machining area.

IPC 8 full level

**C21D 1/02** (2006.01); **B21J 1/06** (2006.01); **C21D 1/60** (2006.01); **C21D 1/613** (2006.01); **C21D 1/62** (2006.01); **C21D 1/667** (2006.01); **C21D 1/767** (2006.01); **C21D 1/84** (2006.01); **C21D 8/00** (2006.01); **C21D 9/30** (2006.01); **C22C 38/02** (2006.01); **C22C 38/04** (2006.01); **C22C 38/12** (2006.01)

CPC (source: EP)

**B21J 1/06** (2013.01); **C21D 1/02** (2013.01); **C21D 1/60** (2013.01); **C21D 1/613** (2013.01); **C21D 1/62** (2013.01); **C21D 1/667** (2013.01); **C21D 1/84** (2013.01); **C21D 8/005** (2013.01); **C21D 9/30** (2013.01); **C22C 38/02** (2013.01); **C22C 38/04** (2013.01); **C22C 38/12** (2013.01); **C21D 2211/005** (2013.01); **C21D 2211/009** (2013.01); **C21D 2221/10** (2013.01)

Citation (applicant)

- EP 2103696 A1 20090923 - JFE STEEL CORP [JP]
- EP 3128038 A1 20170208 - NIPPON STEEL & SUMITOMO METAL CORP [JP]
- US 2012241058 A1 20120927 - HUBER MARKUS [DE], et al

Citation (search report)

- [I] CN 1554781 A 20041215 - DONGFENG AUTOMOBILE CO LTD [CN]
- [A] CN 202671601 U 20130116 - SICHUAN HAOTE PETROLEUM EQUIPMENT CO LTD
- [A] JP H11293390 A 19991026 - SUMITOMO METAL IND
- [AD] EP 2103696 A1 20090923 - JFE STEEL CORP [JP]
- [A] JP 2007000883 A 20070111 - SANYO SPECIAL STEEL CO LTD
- [A] CN 102586558 A 20120718 - NANJING INST TECHNOLOGY, et al
- [A] KAYNAR AHMET ET AL: "Investigation on the behaviour of medium carbon and vanadium microalloyed steels by hot forging test", MATERIALS AND DESIGN, vol. 51, 13 May 2013 (2013-05-13), pages 819 - 825, XP028676089, ISSN: 0261-3069, DOI: 10.1016/J.MATDES.2013.04.102
- [A] "Heat Treating of Irons and Steels", 1 January 2014, ASM INTERNATIONAL, ISBN: 978-1-62708-168-9, article H. TAHIRA ET AL: "Forge and Direct Heat Treatment Processes and Technologies", pages: 241 - 252, XP055707470, DOI: 10.31399/asm.hb.v04d.a0005994
- [A] WEIJUN HUI ET AL: "Enhancing the Mechanical Properties of Vanadium-Microalloyed Medium-Carbon Steel by Optimizing Post-Forging Cooling Conditions", MATERIALS AND MANUFACTURING PROCESSES., vol. 31, no. 6, 25 April 2016 (2016-04-25), US, pages 770 - 775, XP055707972, ISSN: 1042-6914, DOI: 10.1080/10426914.2015.1070416

Cited by

CN114210911A

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

Designated extension state (EPC)

BA ME

DOCDB simple family (publication)

**EP 3854889 A1 20210728**; MX 2021000938 A 20210726

DOCDB simple family (application)

**EP 20382044 A 20200124**; MX 2021000938 A 20210122