

Title (en)

PROCESS AND APPARATUS FOR HARDENING THE SURFACE LAYER OF COMPONENTS HAVING A COMPLICATED SHAPE

Title (de)

VERFAHREN UND VORRICHTUNG ZUM RANDSCHICHTHÄRTEN FORMKOMPLIZIERTER BAUTEILE

Title (fr)

PROCÉDÉ ET DISPOSITIF DE TREMPÉ SUPERFICIELLE DE PIÈCES DE FORME COMPLIQUÉE

Publication

EP 2087141 B1 20190828 (DE)

Application

EP 07818860 A 20071010

Priority

- EP 2007008787 W 20071010
- DE 102006050799 A 20061027

Abstract (en)

[origin: WO2008049513A1] The invention relates to the hardening of the surface layer of parts of machines, plants and apparatuses and also tools. Objects for which the application is possible and advantageous are components which are subjected to severe fatigue or wear stresses and are composed of hardenable steels and have a complicated shape and whose surface has to be hardened selectively on the functional surfaces or whose functional surface has a multidimensional shape. The process for hardening the surface layer of components having a complicated shape is carried out by means of a plurality of energy input zones. According to the invention, it is characterized in that the energy input zones are conducted on different curved parts separately in space and time and by means of cooperatively working transport systems so that superposition of the individual temperature fields forms a uniform temperature field which completely covers the functional surface of the component and within which each surface element of the later hardening zone of the component attains the selected austenite formation temperature interval $T_{SUB,a} < T < T_{SUB,b}$ at least once and the time interval t_{SUB} between the maximum temperatures $T_{SUB,max}$ of the individual temperature fields is from 3.1 to 3.n smaller than the time $t_{SUB,MS}$ which is required to go below the martensite start temperature M_S during the cooling phase. The apparatus by means of which the process of the invention can be carried out is, according to the invention, characterized in that the energy configuring units are connected to one or more energy sources for optical or electromagnetic radiation and are each fixed to separate but cooperatively operating transport systems.

IPC 8 full level

C21D 1/09 (2006.01); **C21D 10/00** (2006.01)

CPC (source: EP US)

C21D 1/09 (2013.01 - EP US); **C21D 10/00** (2013.01 - EP US); **C21D 10/005** (2013.01 - EP US); **C21D 11/00** (2013.01 - EP US)

Designated contracting state (EPC)

AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IS IT LI LT LU LV MC MT NL PL PT RO SE SI SK TR

DOCDB simple family (publication)

WO 2008049513 A1 20080502; **WO 2008049513 A8 20081030**; CN 101605914 A 20091216; CN 101605914 B 20131120; DE 102006050799 A1 20080508; EP 2087141 A1 20090812; EP 2087141 B1 20190828; HU E047935 T2 20200528; JP 2010507726 A 20100311; JP 5717341 B2 20150513; PL 2087141 T3 20200331; US 2010126642 A1 20100527; US 9187794 B2 20151117

DOCDB simple family (application)

EP 2007008787 W 20071010; CN 200780048814 A 20071010; DE 102006050799 A 20061027; EP 07818860 A 20071010; HU E07818860 A 20071010; JP 2009533686 A 20071010; PL 07818860 T 20071010; US 31211507 A 20071010