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(54) Title: A METHOD OF SHAPING AND HARDENING A SHEET STEEL BLANK

(57) Abstract: The properties of products manufactured by press hardening from composite blanks, referred to as tailor- welded blanks (TWB), are improved by cooling the weld at a reduced cooling rate during the hardening of the formed product so that a narrow, soft area is formed alongside the weld.

A method of shaping and hardening a sheet steel blank

Technical field of the invention

The invention relates to a method of shaping and hardening a sheet-steel blank, composed of separate sheets welded together, to give a product by heating the blank to the austenitising range and hot-stamping the blank in a cooled tool pair, then hardening the formed product while it remains in the tool pair.

Background of the invention

In press hardening, a sheet-steel blank is hot-stamped in a cooled tool pair into shape, then the formed product is hardened while it remains in the tool pair. This is now the usual process for producing high-strength products for the vehicle industry. This method results in a tensile strenght of 1400 or 1500 MPa or more. It may be desirable to have a blank composed of two or more sheets having different thicknesses and/or material properties so as to result in different properties in different parts of the finished product and to reduce the weight. The different sheets are usually laser-welded together to form a composite blank usually referred to as a TWB (Tailor-Welded Blank) and this composite blank is then formed and hardened by press hardening.

Object of the invention

One aim of the invention is to improve the properties of a product of this kind. In particular, one aim is to reduce the risk of cracking around the weld in the event of a collision when the product is a high-strength product for vehicles and to reduce the risk of crack formation and other defects and indications of fracture during subsequent cutting across the joint.

Description of the invention

When the shaped product is maintained in the cooled tool pair so that it hardens, according to the invention, the weld between two sheets is cooled at a reduced cooling rate in relation to the areas on either side of the weld so that a narrow, soft area is formed along the weld. The weld and the area immediately around the weld then have a lower martensite content than the rest of the product, resulting in a narrow, soft area with lower yield point and tensile strength and an elongation at break which is considerably higher than it would have been had the weld

been hardened in the same manner as the rest of the product. The weld is critical in the event of a collision, and crack formation at the weld could be devastating to the desired deformation process and could reduce the energy absorption obtained by controlled deformation when the invention is not applied.

The desired reduction of the cooling rate can be achieved by means of a gap between the tool pair and the finished product alongside the weld. It is also possible to have a narrow heated part of the tool pair alongside the weld.

Claims

1. Method of shaping and hardening a sheet-steel blank, composed of separate sheets welded together, to give a product by heating the blank to the austenitising range and hot-stamping the blank in a cooled tool pair, then hardening the formed product while it remains in the tool pair,
   characterised in that the weld between two sheets is cooled at a reduced cooling rate in relation to the areas on either side of the weld so that a narrow, soft area is formed along the weld.

2. Method according to claim 1, **characterised in that** the cooling rate is reduced by maintaining a gap between the tool pair and the finished product.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE2010/000157

A. CLASSIFICATION OF SUBJECT MATTER

IPC: see extra sheet

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC:B21D, C21D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE, DK, FI, NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, PAJ, WPI data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 20080196800 A1 (BEENKEN HEIKO ET AL), 21 August 2008 (2008-08-21); abstract ---	1-2
A	US 5916389 A (LUNDSTRÖM ERLAND), 29 June 1999 (1999-06-29); abstract --- ----------	1-2

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☒ See patent family annex.

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Cited literature, if any, will be enclosed in paper form.

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