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(54) **Flow forming method**

(57) A method of forming a shaped article. The method comprises providing a pre-form 40 comprising a chromium molybdenum vanadium steel alloy, heat treating the pre-form to obtain a surface hardness of between 420 and 480 according to the Vickers hardness test, and, subsequent to the heat treating step, flow forming the pre-form 40 to shape the pre-form.

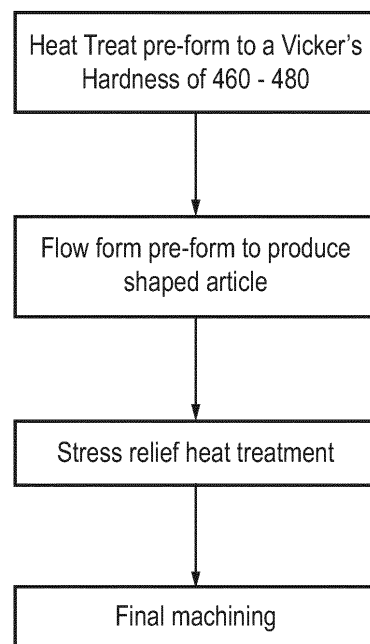


FIG. 4

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EUROPEAN SEARCH REPORT

Application Number
EP 14 18 3234

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	M. JAHZI, G. EBRAHIMI: "The influence of flow-forming parameters and microstructure on the quality of a D6ac steel", JOURNAL OF MATERIALS PROCESSING TECHNOLOGY, no. 103, 2000, pages 362-366, XP055173954, * paragraphs [001.], [03.3]; tables 1,2 *	1-15	INV. C21D9/08 C21D9/28 C21D1/25 B21D22/14 C21D8/10
A	JP H04 89140 A (NISSAN MOTOR) 23 March 1992 (1992-03-23) * abstract *	1-15	
A	US 2010/236122 A1 (FONTE MATTHEW V [US]) 23 September 2010 (2010-09-23) * paragraph [0046]; claim 57; table 2 *	1-15	
			TECHNICAL FIELDS SEARCHED (IPC)
			B21D C21D
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 5 March 2015	Examiner Rischart, Marc
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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ON EUROPEAN PATENT APPLICATION NO.

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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05-03-2015

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
JP H0489140 A	23-03-1992	JP 2542111 B2	09-10-1996
		JP H0489140 A	23-03-1992

US 2010236122 A1	23-09-2010	NONE	

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82