

Title (en)

A PROCESS FOR MANUFACTURING A MARTENSITIC STAINLESS STEEL PART FROM A SHEET

Title (de)

VERFAHREN ZUR HERSTELLUNG EINES MARTENSITISCHEN ROSTFREIEN STAHLTEILS AUS EINEM BLECH

Title (fr)

PROCÉDÉ DE FABRICATION D'UNE PIÈCE EN ACIER INOXYDABLE MARTENSITIQUE À PARTIR D'UNE TÔLE

Publication

**EP 3445878 B1 20200408 (FR)**

Application

**EP 17713465 A 20170321**

Priority

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- IB 2017051636 W 20170321

Abstract (en)

[origin: WO2017182896A1] Process for manufacturing a martensitic stainless steel part, according to which a stainless steel sheet is prepared having the composition:  $0.005\% \leq C \leq 0.3\%$ ;  $0.2\% \leq Mn \leq 2.0\%$ ;  $traces \leq Si \leq 1.0\%$ ;  $traces \leq S \leq 0.01\%$ ;  $traces \leq P \leq 0.04\%$ ;  $10.5\% \leq Cr \leq 7.0\%$ ;  $traces \leq Ni \leq 4.0\%$ ;  $traces \leq Mo \leq 2.0\%$ ;  $Mo + 2 \times W \leq 2.0\%$ ;  $traces \leq Cu \leq 3\%$ ;  $traces \leq Ti \leq 0.5\%$ ;  $traces \leq Al \leq 0.2\%$ ;  $traces \leq O \leq 0.04\%$ ;  $0.05\% \leq Nb \leq 1.0\%$ ;  $0.05\% \leq Nb + Ta \leq 1.0\%$ ;  $0.25\% \leq (Nb + Ta) / (C + N) \leq 8$ ;  $traces \leq V \leq 0.3\%$ ;  $traces \leq Co \leq 0.5\%$ ;  $traces \leq Cu + Ni + Co \leq 5.0\%$ ;  $traces \leq Sn \leq 0.05\%$ ;  $traces \leq B \leq 0.1\%$ ;  $traces \leq Zr \leq 0.5\%$ ;  $Ti + V + Zr \leq 0.5\%$ ;  $traces \leq H \leq 5 \text{ ppm}$ ;  $traces \leq N \leq 0.2\%$ ;  $(Mn + Ni) \geq (Cr - 0.3 - 80 \times [(C + N)^2])$ ;  $traces \leq Ca \leq 0.002\%$ ;  $traces \leq \text{rare earth elements and/or Y} \leq 0.06\%$ ; the remainder being iron and impurities; the temperature  $M_s$  being  $\geq 200^\circ\text{C}$ ; the temperature  $M_f$  being  $\geq -50^\circ\text{C}$ ; the microstructure being composed of ferrite and/or tempered martensite and from 0.5% to 5% by volume of carbides; the size of the ferritic grains being from 1 to  $80 \mu\text{m}$ ; an austenization is carried out, in order to obtain a microstructure containing at most 0.5% of carbides and at most 20% of residual ferrite; the sheet is transferred to a first shaping tool, the sheet remaining at a temperature above  $M_s$  and retaining at most 0.5% of carbides and at most 20% of residual ferrite; a first shaping or cutting step is carried out, the sheet remaining at a temperature above  $M_s$  and retaining at most 0.5% of carbides and at most 20% of residual ferrite; the sheet is transferred to a second shaping tool; a second shaping step is carried out during which the sheet remains at a temperature above  $M_s$  and retains at most 0.5% of carbides and at most 20% of residual ferrite; - if  $T_{Pn}$  is the temperature reached by the sheet at the end of the last shaping step and  $\Sigma t_i$  is the sum of the durations of the transfer and shaping steps,  $(T_{P0} - T_{Pn}) / \Sigma t_i$  is at least  $0.5^\circ\text{C/s}$ ; - and the sheet is left to cool into a final part having a microstructure containing at most 0.5% of carbides and at most 20% of residual ferrite.

IPC 8 full level

**C21D 1/673** (2006.01); **C21D 6/00** (2006.01); **C21D 7/13** (2006.01); **C22C 38/00** (2006.01); **C22C 38/20** (2006.01); **C22C 38/22** (2006.01); **C22C 38/24** (2006.01); **C22C 38/26** (2006.01); **C22C 38/28** (2006.01); **C22C 38/30** (2006.01); **C22C 38/32** (2006.01); **C22C 38/38** (2006.01)

CPC (source: EP KR RU US)

**C21D 1/673** (2013.01 - EP KR US); **C21D 6/00** (2013.01 - RU); **C21D 6/002** (2013.01 - EP KR US); **C21D 6/004** (2013.01 - EP KR US); **C21D 6/005** (2013.01 - EP KR US); **C21D 6/007** (2013.01 - EP US); **C21D 6/008** (2013.01 - EP US); **C21D 7/13** (2013.01 - EP KR US); **C21D 8/00** (2013.01 - RU); **C22C 38/001** (2013.01 - EP US); **C22C 38/002** (2013.01 - EP US); **C22C 38/004** (2013.01 - US); **C22C 38/005** (2013.01 - EP US); **C22C 38/008** (2013.01 - EP US); **C22C 38/02** (2013.01 - EP KR US); **C22C 38/04** (2013.01 - EP US); **C22C 38/06** (2013.01 - EP US); **C22C 38/26** (2013.01 - RU); **C22C 38/28** (2013.01 - RU); **C22C 38/30** (2013.01 - RU); **C22C 38/32** (2013.01 - RU); **C22C 38/38** (2013.01 - RU); **C22C 38/40** (2013.01 - RU); **C22C 38/42** (2013.01 - EP KR US); **C22C 38/44** (2013.01 - EP KR US); **C22C 38/46** (2013.01 - EP US); **C22C 38/48** (2013.01 - EP KR US); **C22C 38/50** (2013.01 - EP KR US); **C22C 38/52** (2013.01 - EP US); **C22C 38/54** (2013.01 - EP US); **C22C 38/58** (2013.01 - KR); **C21D 2211/004** (2013.01 - EP KR US); **C21D 2211/005** (2013.01 - EP KR US); **C21D 2211/008** (2013.01 - EP KR US)

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