

## Title (en)

METHOD OF PRODUCTION OF A PROFILED WIRE MADE OF HYDROGEN-EMBRITTLMENT-RESISTANT STEEL HAVING HIGH MECHANICAL PROPERTIES

## Title (de)

VERFAHREN ZUR HERSTELLUNG EINES PROFILIERTEN DRAHTES, HERGESTELLT AUS EINEM GEGENÜBER WASSERSTOFFVERSPRÖDUNG BESTÄNDIGEN STAHL MIT HOHEN MECHANISCHEN EIGENSCHAFTEN

## Title (fr)

PROCÉDÉ DE FABRICATION D'UN FIL DE FORME EN ACIER À HAUTES CARACTÉRISTIQUES MÉCANIQUES RÉSISTANT À LA FRAGILISATION PAR L'HYDROGÈNE

## Publication

**EP 2576849 B1 20190501 (FR)**

## Application

**EP 11719592 A 20110323**

## Priority

- FR 1002286 A 20100531
- FR 2011000167 W 20110323

## Abstract (en)

[origin: CA2801355A1] This profiled wire, of NACE grade, made of low-alloy carbon steel intended to be used in the offshore oil exploitation sector, is characterized in that it has the following chemical composition, expressed in percentages by weight of the total mass: 0.75 < % C < 0.95; 0.30 < % Mn < 0.85; Cr = 0.4%; V = 0.16%; Si = 1.40% and preferably = 0.15%; and optionally no more than 0.06% Al, no more than 0.1% Ni and no more than 0.1% Cu, the balance being iron and the inevitable impurities arising from smelting the metal in the liquid state, and in that the steel is obtained, from hot-rolled rod stock cooled down to room temperature, and then having a diameter of about 5 to 30 mm, by subjecting this starting rod firstly to a thermomechanical treatment comprising two successive steps carried out in order, namely an isothermal quench, giving it a homogeneous perlite microstructure, followed by a mechanical transformation operation carried out cold with an overall degree of work-hardening (or reduction ratio) of between 50 and 80% at most, so as to give the wire its definitive shape, and in that the profiled wire thus obtained is then subjected to a restoration heat treatment of short duration carried out below Ac1 (preferably between 410 and 710°C), giving it the desired final mechanical properties.

## IPC 8 full level

**C21D 9/52** (2006.01); **C21D 1/20** (2006.01); **C21D 9/58** (2006.01); **C22C 38/02** (2006.01); **C22C 38/04** (2006.01)

## CPC (source: CN EP KR US)

**C21D 1/18** (2013.01 - US); **C21D 1/20** (2013.01 - CN KR US); **C21D 6/002** (2013.01 - US); **C21D 6/004** (2013.01 - US); **C21D 6/005** (2013.01 - EP US); **C21D 6/008** (2013.01 - US); **C21D 8/06** (2013.01 - EP US); **C21D 8/065** (2013.01 - CN EP US); **C21D 9/52** (2013.01 - EP US); **C21D 9/525** (2013.01 - CN EP KR US); **C21D 9/58** (2013.01 - EP US); **C21D 9/64** (2013.01 - CN EP US); **C22C 38/001** (2013.01 - EP US); **C22C 38/02** (2013.01 - CN EP KR US); **C22C 38/04** (2013.01 - CN EP KR US); **C22C 38/06** (2013.01 - CN EP US); **C22C 38/08** (2013.01 - CN EP US); **C22C 38/12** (2013.01 - CN EP US); **C22C 38/16** (2013.01 - CN EP US); **C22C 38/18** (2013.01 - CN EP US); **C22C 38/20** (2013.01 - EP US); **C22C 38/22** (2013.01 - EP US); **C22C 38/24** (2013.01 - EP US); **C22C 38/32** (2013.01 - EP US); **C22C 38/40** (2013.01 - EP US); **C22C 38/42** (2013.01 - EP US); **C22C 38/44** (2013.01 - EP US); **C22C 38/46** (2013.01 - EP US); **C22C 38/54** (2013.01 - EP US); **C21D 2211/009** (2013.01 - EP US)

## Citation (examination)

- JP 2001271138 A 20011002 - NIPPON STEEL CORP
- US 5213637 A 19930525 - MALLÉN HERRERO JOSE [FR], et al & WO 9116461 A1 19911031 - COFLEXIP [FR], et al

## Citation (opposition)

Opponent : NV Bekaert SA

- US 5407744 A 19950418 - MALLÉN HERRERO JOSE [FR], et al
- US 3950190 A 19760413 - LAKE PETER B
- JP 2001271138 A 20011002 - NIPPON STEEL CORP
- MENECES NUNES R. ET AL: "ASM Metals Handbook. Heat Treating", vol. 4, 1990, ASM INTERNATIONAL, article "Larson-Miller equation", XP055674874

## Designated contracting state (EPC)

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## Designated extension state (EPC)

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## DOCDB simple family (application)

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RU 2012157550 A 20110323; SI 201131760 T 20110323; SI 201132094 T 20110323; TR 201910939 T 20110323; UA A201214881 A 20110323;  
US 201113700913 A 20110323; US 201514832599 A 20150821; ZA 201209055 A 20121129