

Title (en)

HYDROGEN-EMBRITTEMENT-RESISTANT STEEL ROD WITH HIGH MECHANICAL CHARACTERISTICS

Title (de)

FORMDRAHT AUS STAHL MIT HOHEN MECHANISCHEN EIGENSCHAFTEN UND BESTÄNDIGKEIT GEGEN WASSERSTOFF-  
VERSPRÖDUNG

Title (fr)

FIL DE FORME EN ACIER À HAUTES CARACTÉRISTIQUES MÉCANIQUES RESISTANT À LA FRAGILISATION PAR L'HYDROGÈNE

Publication

**EP 4234749 A2 20230830 (FR)**

Application

**EP 23173405 A 20110323**

Priority

- EP 19166357 A 20110323
- EP 11719592 A 20110323
- FR 2011000167 W 20110323
- FR 1002286 A 20100531

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 perlitic 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  $A_{c1}$  (preferably between  $410$  and  $710^{\circ}C$ ), giving it the desired final mechanical properties.

Abstract (fr)

Fil de forme en acier au carbone faiblement allié à hautes caractéristiques mécaniques et résistant à la fragilisation à l'hydrogène, destiné à être utilisé comme constituant de conduites flexibles pour le secteur de l'exploitation pétrolière off shore. Le fil présente la composition chimique suivante, exprimée en pourcentages pondéraux de la masse totale,  $0,75 < C \% < 0,95$  et  $0,30 < Mn \% < 0,85$  avec  $Cr \leq 0,4\%$ ;  $V \leq 0,16\%$ ;  $Si \leq 1,40\%$  et de préférence  $\geq 0,15\%$ , et éventuellement pas plus de  $0,06\%$  d'Al, pas plus de  $0,1\%$  de Ni, et pas plus de  $0,1\%$  de Cu, le reste étant du fer et les inévitables impuretés venant de l'élaboration du métal à l'état liquide; le fil de forme a une structure perlitique avec des traces possibles de ferrite, sans bainite ni martensite; le fil de forme a une résistance à la rupture d'au moins 1300 MPa.

IPC 8 full level

**C22C 38/46** (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 (applicant)

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- US 5407744 A 19950418 - MALLÉN HERRERO JOSE [FR], et al
- FR 9100328 W 19910419
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- EP 1063313 A1 20001227 - SUMITOMO ELECTRIC INDUSTRIES [JP]
- EP 1273670 A1 20030108 - KOBE STEEL LTD [JP], et al

Designated contracting state (EPC)

AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR

Designated extension state (EPC)

BA ME

DOCDB simple family (publication)

**FR 2960556 A3 20111202**; **FR 2960556 B3 20120511**; AU 2011260159 A1 20130110; AU 2011260159 B2 20140529; BR 112012030715 A2 20161101; BR 112012030715 B1 20190319; CA 2801355 A1 20111208; CA 2801355 C 20160510; CN 102959100 A 20130306; CN 105714198 A 20160629; CN 105714198 B 20180206; DK 2576849 T3 20190729; DK 3527677 T3 20230925; EP 2576849 A1 20130410; EP 2576849 B1 20190501; EP 3527677 A1 20190821; EP 3527677 B1 20230628; EP 4234749 A2 20230830; EP 4234749 A3 20240117; ES 2739394 T3 20200130; ES 2956022 T3 20231211; FI 3527677 T3 20230912; HU E044508 T2 20191028; HU E062854 T2 20231228; JP 2013534966 A 20130909; JP 6174485 B2 20170802; KR 101982390 B1 20190527; KR 20130033377 A 20130403; KR 20150086561 A 20150728; KR 20160145203 A 20161219; MX 2012013947 A 20130411; MX 341738 B 20160831; PL 2576849 T3 20191129; PL 3527677 T3 20231204; PT 2576849 T 20190730; PT 3527677 T 20230907; RU 2012157550 A 20140720; RU 2533573 C2 20141120; SI 2576849 T1 20190930; SI 3527677 T1 20231130; TR 201910939 T4 20190821; UA 107705 C2 20150210; US 2013186521 A1 20130725;

US 2015361535 A1 20151217; US 9249486 B2 20160202; US 9617625 B2 20170411; WO 2011151532 A1 20111208;  
ZA 201209055 B 20130701

DOCDB simple family (application)

**FR 1002286 A 20100531**; AU 2011260159 A 20110323; BR 112012030715 A 20110323; CA 2801355 A 20110323;  
CN 201180032134 A 20110323; CN 201610101596 A 20110323; DK 11719592 T 20110323; DK 19166357 T 20110323;  
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