

Title (en)  
WIRE ROD AND STEEL WIRE USING SAME

Title (de)  
WALZDRAHT UND STAHL DRAHT DAMIT

Title (fr)  
TIGE DE FIL MÉTALLIQUE ET FIL D'ACIER L'UTILISANT

Publication  
**EP 2832878 A4 20160427 (EN)**

Application  
**EP 13767810 A 20130325**

Priority  
• JP 2012077003 A 20120329  
• JP 2013058566 W 20130325

Abstract (en)  
[origin: EP2832878A1] A wire rod contains C, Si, Mn, N, Al, P, and S in predetermined contents with the remainder being iron and inevitable impurities. The Al and N contents meet a condition specified by Expression (1) as follows:  $[Al] \times 10^{-2} - 2.1 \times 10 \times [N] + 0.255 \geq 1$ , where [Al] and [N] are contents (in mass percent) of Al and N, respectively. The wire rod has a microstructure including 95 percent by area or more of a pearlite. The wire rod has an AlN content of 0.005% or more and a percentage of AlN particles having a diameter d<sub>GM</sub> of 10 to 20 μm of 50% or more (in number percent) in an extreme value distribution of maximum values of the diameters d<sub>GM</sub> of AlN particles, where the d<sub>GM</sub> refers to a geometrical mean (ab) 1/2 of a length "a" and a thickness "b" of an AlN particle. The wire rod is usable typically for a high-strength prestressing steel wire and wire rope that less suffer from reduction in delayed fracture resistance with an increasing strength and have delayed fracture resistance conforming building standards.

IPC 8 full level  
**C22C 38/00** (2006.01); **C21D 8/06** (2006.01); **C21D 8/08** (2006.01); **C21D 9/02** (2006.01); **C22C 38/02** (2006.01); **C22C 38/04** (2006.01); **C22C 38/06** (2006.01); **C22C 38/08** (2006.01); **C22C 38/10** (2006.01); **C22C 38/12** (2006.01); **C22C 38/16** (2006.01); **C22C 38/18** (2006.01)

CPC (source: EP)  
**C21D 8/06** (2013.01); **C21D 8/065** (2013.01); **C21D 8/08** (2013.01); **C21D 9/02** (2013.01); **C22C 38/00** (2013.01); **C22C 38/001** (2013.01); **C22C 38/002** (2013.01); **C22C 38/02** (2013.01); **C22C 38/04** (2013.01); **C22C 38/06** (2013.01); **C22C 38/08** (2013.01); **C22C 38/10** (2013.01); **C22C 38/12** (2013.01); **C22C 38/16** (2013.01); **C22C 38/18** (2013.01); **C21D 9/52** (2013.01); **C21D 2211/004** (2013.01); **C21D 2211/009** (2013.01)

Citation (search report)  
• [X] EP 1897964 A1 20080312 - NIPPON STEEL CORP [JP]  
• [X] JP 2009280836 A 20091203 - NIPPON STEEL CORP  
• [X] EP 1900837 A1 20080319 - NIPPON STEEL CORP [JP]  
• [X] EP 2062991 A1 20090527 - NIPPON STEEL CORP [JP]  
• [X] WO 2011089782 A1 20110728 - NIPPON STEEL CORP [JP], et al  
• [X] US 2012070687 A1 20120322 - SHIMODA NOBUYUKI [JP], et al  
• [X] EP 1728883 A1 20061206 - HONDA MOTOR CO LTD [JP], et al  
• [X] WO 2011125447 A1 20111013 - KOBE STEEL LTD [JP], et al  
• [A] US 4889567 A 19891226 - FUJIWARA TADAYOSHI [JP], et al  
• See references of WO 2013146676A1

Cited by  
US10808305B2; EP3327161A4; CN107849659A; US2018216213A1; EP3327162A4; US10752974B2

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