

Title (en)

Auto-compensating spring for mechanical oscillatory spiral spring of clockwork movement and method of manufacturing the same

Title (de)

Selbstkompensierende Spiralfeder für mechanische Uhrwerkunruhspiralfederoszillator und Verfahren zu deren Herstellung

Title (fr)

Spiral autocompenseur pour oscillateur mécanique balancier-spiral de mouvement d'horlogerie et procédé de fabrication de ce spiral

Publication

EP 0886195 A1 19981223 (FR)

Application

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Priority

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Abstract (en)

The autocompensating hairspring is made from a paramagnetic alloy of Niobium and Zirconium containing 5%-25% of Zirconium by weight and having a thermal coefficient of Young's Modulus such that a function $(1/E) \cdot (DE/DT) + 3\alpha_s - 2\alpha_b$ tends to zero, E being Young's Modulus, T the temperature, α_s the thermal coefficient of expansion of the hairspring and α_b the thermal coefficient of expansion of the balance wheel. The alloy should include at least 500 ppm by weight of a doping agent containing oxygen and is formed from wire by pressing or drawing in oxygen followed by cold working to form a ribbon. The ribbon is spiralled and heat treated at pressure to reduce the thermal coefficient of the Young's Modulus by controlled precipitation of phases rich in Zirconium.

IPC 1-7

G04B 17/22

IPC 8 full level

C22C 27/02 (2006.01); **C22F 1/00** (2006.01); **C22F 1/18** (2006.01); **G04B 17/06** (2006.01); **G04B 17/22** (2006.01)

CPC (source: EP KR US)

C22C 27/02 (2013.01 - EP KR US); **G04B 17/066** (2013.01 - EP); **G04B 17/227** (2013.01 - EP KR US)

Citation (search report)

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Cited by

US6329066B1; EP3502786A1; CN103676600A; EP1039352A1; EP4060424A1; EP3736638A1; EP2498151A1; US8922283B2; EP4039843A1; WO2022167327A1; US6705601B2; US11334028B2; US11898225B2; EP3736639A1; EP3889691A1; WO2019120959A1; US8100579B2; EP3327151A1; WO2018083311A1; EP3663867A1; EP3252542A1; US10409223B2; US6503341B2; US11550263B2; EP3252541A1; US10338529B2; US11002872B2; US11809137B2; EP3736638B1; EP1791039A1; WO2007059876A2; US7753581B2; WO2014006229A1; US10372083B2; US11914328B2; EP3502288B1; EP3422116B1; EP3422115B1

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