Title (en)

Method for producing functional elements for clockworks and functional element produced according to said method

Title (de)

Verfahren zum Herstellen von Funktionselementen für Uhrwerke sowie nach diesem Verfahren hergestellte Spiralfeder

Title (fr)

Procédé de fabrication d'éléments fonctionnels pour des mouvements d'horlogerie et élément fonctionnel fabriqué selon ce procédé

Publication

EP 2741149 A1 20140611 (DE)

Application

EP 14157676 A 20081014

Priority

- DE 102007050330 A 20071018
- DE 102007062993 A 20071221
- DE 102008008362 A 20080208
- DE 102008009747 A 20080218
- DE 102008021816 A 20080430
- DE 102008021817 A 20080430
- DE 102008026646 A 20080604
- DE 102008029429 A 20080623
- EP 08839033 A 20081014

Abstract (en)

The spiral spring (1) (or other functional component) is made from a raw material selected from: semiconductor, glass, ceramic, silicon carbide, silicon nitride, zirconium oxide and/or diamond. Silicon is used in crystalline- or single-crystal form. It is a silicon wafer. The material is polycrystalline silicon. It is silicon obtained by epitaxial deposition. The spiral spring is polycrystalline silicon deposited by epitaxy on a substrate provided with a barrier layer. The substrate is silicon with a barrier layer of silicon oxide. When glass is used, it is a silicate glass, e.g. borosilicate glass or aluminoborosilicate glass. The material is flat or plate-like and is wound (2) up into a spiral. The material is single-crystal or polycrystalline diamond. It is crystalline-, single crystal- or polycrystalline silicon carbide or silicon nitride. The material is an aluminum ceramic, e.g. an aluminum oxide-, aluminum nitride- or aluminum carbide ceramic. It is a silicon ceramic, e.g. silicon nitride ceramic. The material is germanium. The functional component is made from the material by cutting out and/or etching. It is cut from the material by laser. It is optionally treated with a water jet at the same time. A diamond coating is added by chemical vapor deposition. A surface coating of silicon oxide, silicon dioxide, silicon nitride, silicon carbide and/or diamond-like carbon is provided. The functional component is made in a single piece with other functional components, e.g. with a roller (3) or fastening section (4) for attachment to a plate, circuit board or adjuster on the board. The functional component undergoes further treatment in an etching solution. This is e.g. an alkaline solution and/or a hydrofluoric acid/nitric acid mixture. The functional component is a spiral spring, balance wheel, escapement wheel or escape lever. The maximum diameter of the spiral spring is 4-10 mm and its height is preferably 0.07-0.16 mm. Using diamond or ceramic, the heights are about 0.07 mm and 0.12 mm respectively. The winding clearance of the spiral spring is at least 0.05-0.3 mm. The spiral spring winding has a rectangular cross section of about 0.025 mm x 0.07 mm. Further details of the component are described, in accordance with the foregoing principles. An independent claim IS INCLUDED FOR the component so produced.

Abstract (de)

Die Erfindung bezieht sich auf ein Verfahren zum Herstellen von Federn, insbesondere Spiralfedern für Schwingsysteme von Uhrwerken, insbesondere von Uhrwerken für Armbanduhren mit einem eine Vielzahl von Windungen aufweisenden Federkörper.

IPC 8 full level

G04B 17/06 (2006.01); **F16F 1/04** (2006.01)

CPC (source: EP)

G04B 17/066 (2013.01)

Citation (applicant)

- EP 1422436 B1 20051026 - SUISSE ELECTRONIQUE MICROTECH [CH]
- DE 10127733 A1 20030206 - SILICIUM ENERGIESYSTEME E K DR [DE]

Citation (search report)

- [YA] EP 1445670 A1 20040811 - ETA SA MFT HORLOGERE SUISSE [CH]
- [XYI] DE 10127733 A1 20030206 - SILICIUM ENERGIESYSTEME E K DR [DE]
- [A] WO 2004092049 A1 20041028 - GFD GES FUER DIAMANTPRODUKTE M [DE], et al
- [A] EP 0732635 A1 19960918 - SUISSE ELECTRONIQUE MICROTECH [CH]

Cited by

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Designated contracting state (EPC)

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

Designated extension state (EPC)

AL BA MK RS

DOCDB simple family (publication)

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DOCDB simple family (application)

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