

Title (en)  
Method for manufacturing a multilayer coil

Title (de)  
Verfahren zur Herstellung einer mehrlagigen Spule

Title (fr)  
Procédé de fabrication d'une bobine multicouche

Publication  
**EP 2333133 A1 20110615 (DE)**

Application  
**EP 10014526 A 20101111**

Priority  
• DE 102009053987 A 20091123  
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• EP 10014526 A 20101111

Abstract (en)  
The method for the production of a multi-layered coil (100), comprises spraying carrier particles areawisely on the surface of a magnetic substrate (5) or magnetic form part by cold gas spraying for forming a carrier layer (15), where the carrier particle has weak electrically conducting or electrically insulating characteristics, and spraying conductive particles areawisely on the carrier layer by cold gas spraying for forming a conductive layer, where the conductive particles have electrically superconducting characteristics. The method for the production of a multi-layered coil (100), comprises spraying carrier particles areawisely on the surface of a magnetic substrate (5) or magnetic form part by cold gas spraying for forming a carrier layer (15), where the carrier particle has weak electrically conducting or electrically insulating characteristics, spraying conductive particles areawisely on the carrier layer by cold gas spraying for forming a conductive layer, where the conductive particles have electrically superconducting characteristics, forming the conductive layer by mechanical processing using laser in a helical web, imbedding the conductor web through spraying further carrier particles under formation of a further carrier layer, spraying the conductive particles under formation of a further conductive layer on the further carrier layer, forming the further conductive layer by mechanical processing using laser in further conductive web, and providing an electrically superconductive connection (20) for further conductive layers. The electrically conductive connection is carried out according to a tapping-hole spraying process. The recess is mechanically provided in the carrier layer limiting on the electrically conductive conductor layer to be connected so that the recess is bored by the carrier layer. The recess is filled with electrically superconductive material. The weak electrical conductive or electrically insulated characteristics are provided through copper, and/or through niobium-titanium or niobium-tantalum. The conductive particles are contained for the part of the chemical component of high temperature super conductors, and/or the substrate or the mold part has a micro-structure or micro-texture that corresponds to the micro-structure or micro texture of a high temperature super conductors. Nanoparticles are used as carrier particle and/or as conductor particles. A reactive gas such as oxygen is added during cold gas spraying of the gas beam. After the application of the carrier particles and/or the conductor particles, a heat treatment of the coated substrate or mold part is carried out. Independent claims are included for: (1) a device for the production of a multi-layered coil; and (2) a multi-layered coil.

Abstract (de)  
Bei einem Verfahren zum Herstellen einer kompakten und/oder massiven mehrlagigen Spule (100) mittels Kaltgassprühens (Dynamic Cold Spraying) werden elektrisch leitende Verbindungen (20) zwischen den im Trägermaterial eingebetteten einzelnen Leiterlagen (25), insbesondere zwischen den einzelnen Leiterbahnen (25'), geschaffen.

IPC 8 full level  
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CPC (source: EP US)  
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Citation (applicant)  
• EP 1382720 A2 20040121 - LINDE AG [DE]  
• DE 3806177 A1 19890907 - SIEMENS AG [DE]  
• WO 2006061384 A1 20060615 - SIEMENS AG [DE], et al  
• DE 102004058806 A1 20060608 - BOSCH GMBH ROBERT [DE]  
• EP 1921176 A2 20080514 - SULZER METCO US INC [US]  
• US 5646094 A 19970708 - TALLON JEFFREY LEWIS [NZ], et al  
• US 2002056473 A1 20020516 - CHANDRA MOHAN [US], et al  
• US 2004026030 A1 20040212 - HATONO HIRONORI [JP], et al  
• US 2004202797 A1 20041014 - GINDER JOHN [US], et al  
• WO 0186018 A2 20011115 - AMI DODUCO GMBH [DE], et al  
• WO 2004044672 A2 20040527 - UNIV NEW YORK STATE RES FOUND [US], et al  
• DE 102008024504 A1 20091126 - LINDE AG [DE]  
• US 2009291851 A1 20091126 - BOHN MATTHIAS [DE]  
• VON R. S. LIMA; J. KARTHIKEYAN; C. M. KAY; J. LINDEMANN; C. C. BERNDT: "Preparation and Characterization", vol. 416, 2002, ELSEVIER, article "Microstructural characteristics of cold-sprayed nanostructured WC-Co coatings", pages: 129 - 135

Citation (search report)  
• [X] DE 10224780 A1 20031218 - LINDE AG [DE]  
• [XD] WO 2006061384 A1 20060615 - SIEMENS AG [DE], et al  
• [X] WO 2006082170 A1 20060810 - SIEMENS AG [DE], et al  
• [A] JP H07142255 A 19950602 - MATSUSHITA ELECTRIC IND CO LTD  
• [A] WO 03019589 A1 20030306 - COATED CONDUCTORS CONSULTANCY [GB], et al  
• [A] JP S63207007 A 19880826 - SEMICONDUCTOR ENERGY LAB

Cited by  
CN108937606A

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