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Selected Patents Related to Thermal Spraying

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AT denotes Australian patent, EP denotes European patent, US denotes United States patent, WO denotes World Intellectual Property Organization application. The information has the following format: Title, Abstract, Patent number, Inventors, Company, Date of issue.

Applications

Catalytic Coating Production Method. The invention relates to methods for producing catalytic coatings by thermally spraying a powder material and can be used in different branches of chemistry, in power engineering, and in automobile production. The aim of the invention is to obtain a catalytic double-sided coating on a metal strip, which, apart from high catalytic properties in nitrogen oxides reduction and hydrocarbon oxidation reactions, exhibits high mechanical and operating properties, namely a high adhesion to a metal substrate and a high resistance to contamination in the atmosphere of sulfur dioxide gases and water vapor. For this purpose, the inventive method for thermally spraying a powder material to a metal strip consists of using a special composite powder that comprises an aluminum metal core, an intermediate aluminum hydroxide layer, and a cobalt hydrotalcite coating on a particle surface, which is applied to the intermediate layer. The qualitative and quantitative compositions of the composite powder are also disclosed. The inventive catalytic coating is sprayed according to a method consisting of thermally spraying to a metal strip, mechanically processing said strip, and forming an article.

WO2008063038: A.P. Khinsky, K. Klemkaite, N. Laurinaitis, A. Corma, and E. Polomares. Company: UAB Norta. Issued: May 29, 2009.

Centrifugally Rolling Granulating Device and Method of Treating Powder and Granular Material Using the Device. A fire-resistant heat-insulating material excellent in resistance to heat, resistance to slag, resistance to molten iron, resistance to wear, and resistance to mechanical impulse is provided. A highly endurable heat-insulating material characterized by being provided on the surface of a layer of inorganic heat insulating fibers through the medium of a coating film of surface-hardening material with a flame sprayed film of a fire-resistant ceramic substance.

EP1216749: N. Myo, A. Iwasaki, H. Okada, K. Yamanaka, K. Nagaoka, and M. Shiratori. Company: Freunt Ind Co. Ltd. Issued: April 9, 2008.

Method of Joining Tantalum Clad Steel Structures. The present invention relates to a process for joining tantalum clad steel structures. The process broadly comprises: (a) providing a first tantalum clad section, which comprises a tantalum layer over a steel layer, with a bonding layer optionally in between, with a portion of the steel layer in an edge region not being covered by the tantalum layer or the bonding layer, (b) providing a second tantalum clad section, which comprises a tantalum layer over a steel layer, with a bonding layer optionally in between, with a portion of the steel layer in an edge region not being covered by the tantalum layer or the bonding layer, (c) locating the steel edge regions adjacent each other, (d) welding the steel edge regions together, and (e) cold spraying a tantalum powder onto the welded edge regions and over the tantalum layers adjacent the edge regions thereby joining the tantalum clad steel sections. The invention also relates to tantalum welds or joints formed by cold spraying tantalum powder.

WO2008076748: S. Miller, L.N. Shekhter, and S. Zimmerman. Company: H.C. Starck Inc. Issued: June 26, 2008.

Method of Painting Metal Coat on Surface of Cooker and Cooker Painted by the Method. A method of painting metal coat on the surface of a cooker and a cooker having the metal coat. The method includes coating the metal material by the thermal spraying on the surface prepared to be processed. In the thermal spraying, the speed of the metal particles that are melted and sprayed on the surface prepared to be processed is not less than 100 m/s. The metal coat formed by the present method has high binding force, low voidage, and less thickness.

WO2008049273: R. Chin Yuen Keung. Company: Foshan Sanshui Liqiang Machinery Ltd. Issued: May 2, 2008.

Method for the Production of a Cooking Utensil for an Induction Hob. According to the invention, a cooking utensil made from aluminum or an aluminum alloy, whether forged or cast, suitable for use on an induction hob, can be produced by provision of a ferromagnetic material or a ferromagnetic sheet on the base surface thereof, whereby a ferromagnetic layer of adequate thickness is at least partly directly applied to the underside of the base of the cooking utensil using a cold gas spraying method, or a solder or metal layer acting as a solder is applied using the cold gas spraying method and a ferromagnetic plate soldered thereto, whereby said plate can also be in the form of plate sections.

EP1599116: D. Grasme. Company: Newspray Gmbh. Issued: April 23, 2008.

Process for Producing a Rotary Anode and the Anode Produced by Such Process. The present invention relates to an improved process for manufacturing a rotary anode for an x-ray tube, the rotary anode comprising a molybdenum support member on which a target layer consisting essentially of tungsten or a tungsten-rhenium alloy is provided by plasma spraying, the improvement comprising: (a) preheating the support member to a temperature of from 1150 to 1600 °C, (b) placing the support member in a gaseous atmosphere containing hydrogen and having a pressure of from 0.5 to 0.9 bars and wherein the molar ratio of hydrogen to tungsten dioxide is from 5:1 to 50:1, and (c) plasma spraying the target layer onto the support layer in said gaseous atmosphere. The invention also relates to the anode produced by the process.

WO2008060775: L.F. Haywiser and L.N. Shekhter. Company: H. C. Starck Inc. Issued: May 22, 2008.

Rapid Solidification Processing System for Producing Molds, Dies, and Related Tooling. A system for the spray forming manufacturing of near-net-shape molds, dies, and related toolings, wherein liquid material such as molten metal, metallic alloys, or polymers are atomized into fine droplets by a high-temperature, high-velocity gas and deposited onto a pattern. Quenching of the in-flight atomized droplets by a quench gas in a chamber provides a heat sink, thereby allowing undercooled and partially solidified droplets to be formed in-flight. Composites can be formed by combining the atomized droplets with solid particles such as powders, whiskers, or fibers.

EP1289699, AT391569: K.M. McHugh. Company: Bechtel BWXT Idaho Llc. Issued: April 9, 2008; April 15, 2008.

Repairs and/or Changes in Contour of a Form Surface of a Form Tool. The invention relates to the use of form tools for producing molded parts, especially, e.g., in the serial production on an industrial scale of CFK components by means of nickel 36 large-format form tools. According to the invention, thermal spraying, e.g., by means of a thermal spray gun is used for repairs and/or changes in contour of a form surface of a used form tool.

WO2008067962: S. Buerkner, D.P. Jonke, M. Englhart, and M. Meyer. Company: Eads Deutschland Gmbh. Issued: June 12, 2008.

Rolling Bearing Protected Against Electrocorrosion. The invention relates to a method to provide an electrocorrosion preventive rolling bearing assembly, wherein a final machining of an electrically insulating layer and a thickness control of the insulating layer can easily and accurately be accomplished. The electrocorrosion preventive rolling bearing assembly is of a type in which an inner race or an outer race is formed with an insulating layer so as to cover a peripheral surface thereof, which engages a housing or a shaft, and opposite annular end faces thereof. The insulating layer is a thermally sprayed layer of a metallic oxide. Of the inner and outer races, a raceway member having the insulating layer is provided at its end face with a tool reference plane for a process of finishing the electrically insulating layer or for the thickness control of the insulating layer. This tool reference plane may be either an indented radial surface of a step formed in the end face or a bare portion of the end face that is left uncovered by the insulating layer.

EP1408249: K. Inukai, H. Ito, Y. Kataoka, and K. Sato. Company: NTN Toyo Bearing Co. Ltd. Issued: April 9, 2008.

Diagnostics and Characterization

Method for Determining the Polyester Fraction of a Multicomponent Powder During a Thermal Spraying Process, and a Method for Coating or Touching Up an Object by Means of a Thermal Spraying Process and Thermal Spraying Device. The invention relates to a method for determining the polyester fraction in a multicomponent powder during a thermal spraying process. According to the invention, the multicomponent powder is heated and fed to an object with the aid of a carrier, forming a coating on the object, and at least one measured value for the intensity of the light emitted by the combination of the carrier and multicomponent material on the way to the object is detected at least in the range of a characteristic emission wavelength of polyester. A variable is then derived from all the measured values, and the fraction of polyester to be determined is calculated on the basis of a previously defined relationship between the variable and the polyester fraction.

WO2008058503: A. Jakimov, M. Hertter, and A. Kaehny. Company: MTU Aero Engines Gmbh. Issued: May 22, 2008.

Thermal Spraying Device, Method for Monitoring a Thermal Spraying Process, and Method for Coating and/or Touching Up Turbine Parts or Engine Parts. A spectrometer is used during a thermal spraying process to measure the intensity of emitted light at specific wavelengths or specific wavelength intervals. The characteristics of the coating, for example, the tensile adhesive strength (TAS) or the hardness of the coating, can be determined on the basis of a previously derived relationship. Process conditions can also be regulated during the monitoring of the process.

WO2008058504: A. Jakimov, M. Hertter, and A. Kaehny. Company: MTU Aero Engines Gmbh. Issued: May 22, 2008.

Feedstock

Process for the Preparation of Spheroidal Hard Material Powder. Production of spheroidized hard metal powder comprises producing a finely ground hard metal powder base mixture, granulate, or suspension such that the constituents undergo a chemical reaction with one another, the gas and/or the dispersant and/or alloy formation occurs under high-frequency plasma conditions, and introducing this with a carrier gas stream into the operating gas stream of a thermal, inductively coupled high-frequency plasma.

EP1086927: W. Flurschuetz Dipl-Ing, R. Horn Dipl-Ing, A. Klein Dipl-Ing, and S. Zakharian. Company: Durum Verschleisschutz Gmbh, Hard Alloy Invest Co. Ltd., Hartmetall Beteiligungs Gmbh. Issued: April 16, 2008.

Spray Powder and Bearing Element of a Bearing Device, Coated With the Spray Powder. Spraying powder contains (in wt.%) 0.1-1.5 C, 0.1-8 Mn, 0.1-2 S, 0.1-12 Cu, and the balance iron. Independent claims are also included for the following: (1) surface layer formed by thermal spraying of the above powder and (2) spraying method for forming a surface layer.

EP1637621, US7390577: G. Barbezat. Company: Sulzer Metco AG. Issued: 20080507, June 24, 2008.

Superfine/Nanostructured Cored Wires for Thermal Spray Applications and Methods of Making. Cored wires having a core comprising agglomerates of superfine particles and/or nanoparticles for thermal spray or overlay weld applications and methods of making the same are provided. Methods of coating a substrate by thermal spraying such as electric arc spraying with such cored wires are also provided. In an embodiment, a cored wire comprises a metallic sheath at least partially surrounding a core comprising agglomerates of superfine particles, nanoparticles, or a combination comprising at least one of the foregoing particles.

WO2008049080: X. Ma, M. Wang, and T.D. Xiao. Company: Inframat Corp. Issued: April 24, 2008.

Thermal Spray Rare Earth Oxide Particles, Sprayed Components, and Corrosion-Resistant Components. Rare earth oxide particles having an average particle diameter of 3-20 μm, a dispersion index of up to 0.4, and an aspect ratio of up to 2 are suitable for thermal spraying. Despite their high melting point, the rare earth oxide particles of high purity can form an adherent coating by thermal spraying.

EP1243666: Y. Takai, T. Maeda, and T. Tsukatani. Company: Shin-Etsu Chemical Co. Issued: May 7, 2008.

Wire Feedstock and Process for Producing the Same. A wire for use as a feedstock in metal spraying and in welding contains two components formed from different metals, with the components being in face-to-face contact along a convoluted interface that extends throughout the interior of the wire. This leaves the distribution of the two metals generally uniform throughout the cross section of the wire. To produce the wire, two flat strips of the different metals are provided, with the strips of the second component overlying the strips of the first component to form a laminate. Then, the laminate is deformed into a U-shaped configuration with the second strip being confined within the first strip. Next, the ends of the U-shaped laminate are turned inward. The resulting configuration, which has a convoluted interface, is drawn through a die to reduce its cross-sectional size and to densify it.

WO2008076967: D.J. Urevich. Company: Arcmelt Company Lc. Issued: June 26, 2008.

Pretreatment and Posttreatment

Innovative Technique for Improving the Dielectric and Anticorrosion Characteristics of Coatings Obtained with Thermal Spray, APS, HVOF, and Analogous Technologies, in Particular Insulating Coats such as Al_2O_3. An innovative technique for improving the dielectric and anticorrosion characteristics of coatings obtained with thermal spray, APS, HVOF, and analogous technologies, in particular insulating coats such as Al_2O_3. The deposits obtained with APS, HVOF, and analogous technologies generally have a varying inherent porosity, but is particularly significant for insulating coatings such as Al_2O_3, which suffer badly, in the breakdown tests, from the corona effect, a characteristic of noncompact materials. Said porosity furthermore permits the occurrence of phenomena of corrosion of the substrate due both to oxidization and to interaction with corrosive gases and liquids penetrating through the open pores. The use of a sealing agent consisting of a suspension of glass particles with appropriate granulometry and coefficient of expansion in specific liquids, for example, screen-printed and remelted, seals the open pores of the coats obtained with APS, HVOF, or similar, thus preventing all phenomena of corrosion and drastically reducing the corona effect.

WO2008044128: G. Cirri and M. Prudenziati. Company: Inglass S P a. Issued: April 17, 2008.

Spraying Systems and Methods

Apparatus and Method for Coating the Outer Surface of a Workpiece. A method and apparatus for coating the outer surface of a workpiece comprises disposing a workpiece in a fixed position along an axis and rotating a thermal spray gun around the axis on a support with a thermal spray thereof directed toward the axis. The powder, fuel, and oxygen are rotatably coupled to the gun, and the thermal spray gun and the support move along the axis while rotating.

EP1202819: D. Hawley, M. Nestler, and K. Varley. Company: Sulzer Metco US Inc. Issued: April 23, 2008.

Method for Coating a Workpiece. A method for coating a workpiece, whereby a coating material and an aggregate material are applied to the workpiece by thermal spraying. In addition to the coating material, an aggregate material in which or to which a fluorescent marker material is firmly fixed is applied to the workpiece. The spraying process is monitored online by detecting and evaluating at least the particles of the fluorescent marker material present in the spray jet.

EP1825016: M. Hertter, A. Jakimov, and W. Wachter. Company: MTU Aero Engines Gmbh. Issued: May 7, 2008.

Method for Feeding Particles of a Coating Material into a Thermal Spraying Process. The invention relates to a method in which particles are fed to a thermal spraying process to form a layer on a part. In the thermal spraying process, the particles are entrained by a carrier gas flow and are deposited on a part that is to be coated. According to the invention, the particles are dispersed in a liquid or solid additive before being introduced into a supply pipe that extends into the thermal spraying device, and the additive is transferred into a gaseous state in the carrier gas flow after being discharged from the supply pipe. Hence, a liquid additive evaporates while a solid additive sublimates such that the particles are individualized in the carrier gas flow. Dispersing the particles in the additive advantageously makes it easier to accurately meter the particles and prevents the particles from agglomerating, thus allowing improved layers to be deposited because the carrier gas flow is more homogeneous. Transferring the additive into a gaseous state prevents the additive from being deposited in the layer.

WO2008037761: J.D. Jensen, U. Krueger, V. Luethen, R. Reiche, O. Stier, J. Klingemann, and D. Koertvelyessy. Company: Siemens AG. Issued: April 3, 2008.

Process and Apparatus for Thermal Spraying. The invention relates to a process for coating a substrate by means of a thermal spraying process, in which the deposited layer and also the substrate are cooled after the spray transit. According to the invention, defined cooling of the deposited layer and also the substrate takes place in such a way that the average temperature level in the layer/substrate composite is at least 200 K above ambient temperature. It is advantageous for a time of less than 100 ms, in particular less than 10 ms and in particular in the range from 0.1 to 5 ms, to elapse between the spray transit and the defined cooling of this deposited layer. The increased temperature level associated with the defined cooling after application makes it possible, by means of this process, to produce, firstly, thin, gastight layers having a thickness of <100 μm and also, secondly, thicker layers ($>100 \times$ m) having a high segmentation crack density.

WO2008074301: R. Vassen, K.-H. Rauwald, and D. Stoever. Company: Forschungszentrum Juelich Gmbh. Issued: June 26, 2008.

Thermal Spray Device. A detachable coupling unit connects the supply line adapter section and the base section. The detachable coupling includes an eccentric closure device, bayonet connector, or screw. The burner is a plasma burner. The gun is for flame spraying, arc spraying, or flame shock spraying (i.e., high-velocity oxygen fuel, or HVOF, optionally explosive- or detonation-flame spraying).

EP1690601, AT390208: M. Mueller. Company: Sulzer Metco AG. Issued: March 26, 2008; April 15, 2008.

Thermal Barrier Coatings and Bondcoats

Blade Tip Coatings Using High-Purity Powders. This invention relates to blades for a gas turbine engine, the blades having an inner end adapted for mounting on a hub and a blade tip located opposite the inner end, and wherein at least a portion of the blade tip is coated with a thermally sprayed coating of a high-purity yttria or ytterbia-stabilized zirconia powder. The thermally sprayed coating has a density greater than 88% of the theoretical density with a plurality of vertical macrocracks substantially homogeneously dispersed throughout the coating, in which a cross-sectional area of the coating normal to the blade tip exposes a plurality of vertical macrocracks extending at least half the coating thickness in length up to the full thickness of the coating and having from about 5 to about 200 vertical macrocracks per linear inch measured in a line parallel to the surface of the blade tip and in a plane perpendicular to the blade tip. The high-purity yttria- or ytterbia-stabilized zirconia powder comprises from about 0 to about 0.15 wt.% impurity oxides, from about 0 to about 2 wt.% hafnium oxide (hafnia), from about 6 to about 25 wt.% yttrium oxide (yttria) or from about 10 to about 36 wt.% ytterbium oxide (ytterbia), and the balance zirconium oxide (zirconia). This invention also relates to a process for producing a coating on at least a portion of a tip of a blade for a gas turbine engine.

WO2008054536: T.A. Taylor, A. Feuerstein, A. Bolcavage, D.L. Appleby, and N. Hitchman. Company: Praxair Technology Inc. Issued: May 8, 2008.

Method for Making Heat Barrier Coatings, Coatings, and Structure Obtained Thereby As Well As Components Coated Therewith. A method for making a thermal barrier coating, such as for gas turbine components and mainly heat shields, combustion chambers, or turbine wall covering panels The thermal barrier coating results from successive deposition of various numbers of layers that join together to form the coating, which is obtained by any thermal spray process, including the steps of laying at least three coating layers, each of the layers being deposited at a different angle (t, ss, a) of the spray torch, said angles (t, ss, a) being defined relative to the surface to be sprayed and covering a range from 30 to 150° with respect to the tangent to the surface of the component to be coated. Protection also extends to the component so coated and the covering structure.

WO2008040678: N. Antolotti, A. Scrivani, and G. Rizzi. Company: Turbocoating S P a. Issued: April 10, 2008.

Roughened Bond Coating. The high-speed physical vapor deposition or cold spray method for coating a substrate with a bonding agent layer comprises generating a particle stream of a coating material, depositing the particle stream on the substrate, heating the particle stream at 550 to 650 °C, and adding powder particles with a larger particle size of 45 to 85 μm to the particle stream. The particles accelerate on the speed of sound and then are added to the particle stream. A turbine blade is coated as substrate with the bonding agent layer. An independent claim is included for a device for coating a substrate with a bonding agent layer.

WO2008058776: K. Halberstadt and W. Stamm. Company: Siemens AG. Issued: May 22, 2008.

Thermal Barrier Coating System of a Turbine Component. A method for forming a thermal barrier coating system on a turbine engine component includes forming a bondcoat on the turbine engine component and depositing a thermal barrier coating so as to overlie the bondcoat. The bondcoat is formed by thermally cospraying first and second distinct alloy powders on the turbine engine component forming an oxidation-resistant region, and thermally spraying a third alloy powder on the oxidation-resistant region to form a bonding region. The oxidation-resistant region is more resistant to oxidation than the bonding region.

EP1088909: A.M. Thompson and W.C. Hasz. Company: General Electric Co. Issued: April 30, 2008.