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Selected Patents Related to Thermal Spraying

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CA denotes Canadian, DE denotes German, EP denotes European, KR denotes Korean, US denotes United States patents. The information has the following format: Title, Abstract, Patent number, Inventors, Company, Issued/Filed dates.

Applications

Universal Joint. There is provided a universal joint which is a universal joint of a block type in which a bearing cup for supporting a trunnion of a joint cross is integrally formed with a key portion, and the bearing cup is joined to be fixed to a yoke by a bolt in a state of fitting the key portion to a key way of the yoke, in which by forming WC-Ni-Cr thermally sprayed coatings at both side surfaces of the key portion, corrosion resistance of the key portion is promoted, even when used over a long period of time in a drive system of a rolling mill or the like, a clearance between the key portion and the key way caused by corrosion of the key portion is prevented from being brought about, and a stable performance can be maintained over a long period of time by promoting service life of the bearing and preventing an excessively large bending load from being operated to the bolt.

US 7691000: Akihide Nagayama and Nobuo Komeyama. Company: JTEKT Corporation. Issued/Filed: 2010-04-06/2005-09-08.

Bipolar Plate With Enhanced Stability. An enhanced stability and inexpensive bipolar plate for a fuel cell is disclosed. The enhanced stability bipolar plate includes a bipolar plate substrate and a corrosion-resistant coating thermally sprayed on the bipolar plate substrate. A method for enhancing corrosion resistance of a bipolar plate is also disclosed.

US 7700212: Mahmoud H. Abd Elhamid, Gayatri Vyas, Youssef M. Mikhail, Richard H. Blunk, and Daniel J. Lisi. Company: GM Global Technology Operations, Inc. Issued/Filed: 2010-04-20/2004-10-07.

Coatings Including Pigments Comprising Substrate Particles With Ultrafine Metal Oxide Particles Deposited Thereon. Coatings including pigments comprising substrate particles with ultrafine metal oxide particles deposited on the surfaces thereof and made by a plasma process are disclosed. The substrate particles may comprise an oxide such as SiO_2, Al_2O_3, Bi_2O_3, etc. The ultrafine metal oxide particles may be partially oxidized such as Cu_2O, Ti_3O_4, etc. The pigments may be used in coating compositions in which the substrate particles substantially match the refractive index of the coating composition base, and the ultrafine metal oxide particles provide the desired reflectance characteristics for the coating.

US 7713349: Cheng-Hung Hung and Noel R. Vanier. Company: PPG Industries Ohio, Inc. Issued/Filed: 2010-05-11/2008-01-22.

Sliding Element for an Internal Combustion Engine, Comprises a Substrate and a Coating Obtained by Thermal Spraying of a Powder Comprising Chromium, Nickel, Carbon, and Nitrogen. The sliding element comprises a substrate and a coating obtained by thermal spraying of a powder comprising chromium (40-79.9 wt.%), nickel (10-30 wt.%), carbon (0.1-5 wt.%), and nitrogen (10-20 wt.%). The powder comprises chromium nitride (CrN) and chromium carbide (Cr_3C_2) embedded in a nickel/chromium (Ni/Cr) matrix. The amounts of CrN and Cr_3C_2 are 30-99.9 and 0.1-30 wt.%, respectively. The particle size of the powder is 5-65 μm. The particle size of the carbide embedded in the Ni/Cr matrix is 1-5 μm. The layer thickness of the coating is up to 100 μm. The thermal spraying comprises high-speed flame spray coating or plasma spraying.

DE 102008056720: Marcus Dr. Kennedy, Michael Zinnabold, and Marc-Manuel Matz. Company: Federal-Mogul Burscheid GmbH. Issued/Filed: 2010-05-12/2008-11-11.

Thermal Barrier Coatings and Bondcoats

Method of Applying Environmental and Bond Coatings to Turbine Flowpath Parts. A method for coating an article such as a turbine engine shroud with an environmental or bond coating, such as a MCrAlY composition, to produce a surface finish suitable for machining to predetermined dimensions and specifications. The method of applying an environmental or bond coating uses a thermal spray process such as hyper velocity oxygen fuel (''HVOF'') to produce a thick and reasonably uniform coating which can be machined to desired dimensions while still providing key quality characteristics required to protect the coated part in a high temperature, oxidative and corrosive atmosphere and permitting application of long life thermal barrier topcoats.

CA 2462318: Karl L. Borneman, Thomas J. Tomlinson, and Raymond Heidorn. Company: General Electric. Issued/Filed: 2010-05-18/2004-03-25.

Silicate-Resistant Thermal Barrier Coating With Alternating Layers. A thermal barrier coating system for use on a turbine engine component which reduces sand-related distress is provided. The coating system comprises at least one-first layer of a stabilized material selected from the group consisting of zirconia, hafnia, and titania and at least one-second layer containing at least one of oxyapatite and garnet. Where the coating system comprises multiple first layers and multiple second layers, the layers are formed or deposited in an alternating manner.

US 7722959: Kevin W. Schlichting, David A. Litton, Michael J. Maloney, Melvin Freling, John G. Smeggil, and David B. Snow. Company: United Technologies Corp. Issued/Filed: 2010-05-25/2006-09-06.

Spraying Systems and Methods

Masking System Using Temperature-Resistant Hook and Loop Fasteners. A method of masking portions of a part from a high temperature coating, such

as a plasma flame spray coating includes mask elements that extend between spaced ends. Hook and loop fasteners are associated with the two spaced ends. The hook and loop fasteners are of a material that can withstand very high temperatures such as are experienced in the high temperature coating. The hook and loop fastener elements may be metallic elements. While a single mask element may be utilized to wrap around the part, in another embodiment, a plurality of mask pieces can be assembled together to surround the part.

EP 1958702: John E. I. Markowski. Company: United Technologies Corporation. Issued/Filed: 2010-04-07/2008-02-12.

Selective Partial Coating of Sheet Materials, e.g., To Make Conductive Patterns on Textiles, Involves Applying a Mask of Intumescent Material, Coating the Entire Surface by Thermal Spraying and Then Removing the Mask. A method for the selective partial coating of sheet materials by thermal spraying of coating material(s), involves applying a masking structure of intumescent material, carrying out at least one thermal spray procedure over the whole surface and then removing the masking structure. An independent claim is included for coated sheets in the form of knitted, woven or nonwoven fabric, produced by the method described above.

DE 102008036152: Wolfgang Dr. Scheibner, Ingo Köttner, and Reiner Wesnigk. Company: Textilforschungsinstitut Thüringen-Vogtland e.V. Issued/Filed: 2010-04-15/2008-08-01.

Liquid Feed Flame Spray Modification of Nanoparticles. Nano- and micron-sized metal oxide and mixed metal oxide particles are injected into a high temperature region wherein the temperature is between about 400 °C and less than 2000 °C, and collected as particles or as coatings wherein a particulate nature is substantially maintained. The particles are altered in at least one of phase, morphology, composition, and particle size distribution, and may achieve further changes in these characteristics by coinjection of metal oxide precursor in liquid form.

US 7700152: Richard M. Laine, Julien Marchal, José Azurdia, and Roy Rennesund. Company: The Regents of the University of Michigan. Issued/Filed: 2010-04-20/2005-02-25.

Nozzle for Use With Thermal Spray Apparatus. The present invention provides an improved nozzle assembly for use with a thermal spray apparatus for applying a coating to a workpiece. The nozzle assembly including a housing supporting a nozzle defining a gas conduit having an inlet and an outlet at opposing ends of the housing. The inlet for receiving a carrier medium from a thermal spray apparatus. The housing and the nozzle cooperating to define a material feed opening such that the material feed opening intersects the gas conduit proximate the outlet end of the nozzle. The material feed opening being angularly disposed relative to the gas conduit and intersecting the gas conduit proximate the outlet end of the nozzle such that coating material injected into the gas conduit through the material feed opening is heat-softened and propelled towards a workpiece to be coated by the carrier medium flowing outwardly from the nozzle.

US 7717358: Majed Noujaim. Company: Technical Engineering, LLC. Issued/Filed: 2010-05-18/2006-02-16.

Methods for Controlling Plasma Spray Coating Porosity on an Article and Articles Manufactured Therefrom. Disclosed herein is a spray coating process for a robotic spray gun assembly comprising importing a discretized model of an object geometry to be coated; importing a numerically characterized spray pattern file; importing a robot motion file comprising a plurality of motion positions, dwell times and orientations defining a spray direction of the robotic spray gun; reading each motion position within the motion file; determining which portions of the object geometry are visible at each motion position; computing a void volume fraction at each visible portion of the object geometry based on the core compression, the incident angle of the robotic spray gun and the ricocheting of the spray for each motion position; and calculating total coating thickness on portions of the object geometry for the complete motion step.

US 7722916: Hsin-Pang Wang, Michael C. Ostrowski, Eric Moran, Stephen G. Pope, John D. Vanselow, and Edward R. Haupt. Company: General Electric Co. Issued/Filed: 2010-05-25/2006-05-30.

Pre- and Post-Treatments

Method of Applying Material on a Component and Component. In order in particular to allow interconnects to be applied to a component by a thermal spraying process in such a way that they are clearly delimited from one another, before the actual spraying process the surface of the component is treated, in particular laser treated, in such a way that a non-adhering region with a nub-like surface structure is formed.

US 7713594: Knuth Götz, Robert Süss-Wolf, Marco De Paolis, and Dieter Geist. Company: Leoni AG. Issued/Filed: 2010-05-11/2006-12-26.

Feedstock

Method and an Apparatus of Plasma Processing of Tantalum Particles. Porous microparticles of high-purity tantalum may be processed in a vacuum plasmatron using a hollow cathode and spraying apparatus in which the coolant is in the form of a metal surface. In one embodiment, the initial powder of tantalum is introduced through a coaxial hole in a hollow cathode and supplied to a vertical column of plasma by inert gas and exposed to heating to temperatures close to the melting point of tantalum. The atomizing tantalum particles are directed through a hole in the anode and collide with a rotating inclined tantalum substrate and cooled from within water, thereby flattened and solidifying the particles.

US 7691177: John Crawley, Vladimir S. Cherednichenko, and James A. Fife. Company: Niotan, Inc. Issued/Filed: 2010-04-06/2007-10-30.

Zinc-Aluminum-Zirconium Alloy for the Thermal Spray Coating. Abstract not available

KR 0951439: Kim Seong Jong, Seo Young Ju, Lee Sang Ea, and Cho Chu Hyon. Company: Alcoma Metal Co Ltd. Issued/Filed: 2010-04-07/2009-04-22.

Wear-Resistant Alloy Powders and Coatings. This invention relates to alloys and wear-resistant alloy powders useful for deposition through thermal spray devices. The alloys comprise from about 20 to 65 wt.% chromium, about 20 to 65 wt.% molybdenum, about 0.5 to 3 wt.% carbon, and about 10 to

45 wt.% nickel. The wear-resistant alloy powders are useful for forming coatings having the same composition.

CA 2567089: William J. C. Jarosinski and Lewis B. Temples. Company: Praxair Technology Inc. Issued/Filed: 2010-04-20/2005-05-26.

Yttria Thermal Spray Powder and Method for Forming a Thermal Spray Coating. A thermal spray powder contains granulated and sintered yttria particles and fine yttria particles, the average particle diameter of the fine yttria particles being no more than 1 μm. The content of the fine yttria particles in the thermal spray powder is 1,000 to 10,000 ppm by mass. It is preferred that the thermal spray powder be used in applications for forming a thermal spray coating by plasma thermal spraying at atmospheric pressure.

US 7700060: Junya Kitamura and Hiroyuki Ibe. Company: Fujimi Inc. Issued/Filed: 2010-04-20/2006-11-02.

Ceramic Material for High Temperature Service. The invention is directed to a ceramic material for use in thermal barriers for high temperature cycling applications and high temperature abradable coatings. The material is an alloy formed predominantly from ultrapure zirconia (ZrO_2) and/or hafnia (HfO_2) that has uncharacteristically high sintering resistance to achieve a high service lifetime and low thermal conductivity to achieve high operating temperatures. In the material, oxide impurities such as soda (Na_2O), silica (SiO_2), alumina (Al_2O_3), titania (TiO_2), hematite (Fe_2O_3), calcia (CaO), and magnesia (MgO) make up no more than 0.15 wt.%. The invention provides materials to produce a coating structure so that the changes in the coating microstructure over the in-service lifetime are either limited or beneficial.

US 7723249: Jacobus C. Doesburg, Liangde Xie, and Mitchell Dorfman. Company: Sulzer Metco (US), Inc. Issued/Filed: 2010-05-25/2006-09-13.

Al_2O_3-Rare Earth Oxide-ZrO_2/HfO_2 Materials, and Methods of Making and Using the Same. Al_2O_3-rare earth oxide-ZrO_2/HfO_2 ceramics (including glasses, crystalline ceramics, and glass-ceramics) and methods of making the same. Ceramics according to the present invention can be made, formed as, or converted into glass beads, articles (e.g., plates), fibers, particles, and thin coatings. The particles and fibers are useful, for example, as thermal insulation, filler, or reinforcing material in composites (e.g., ceramic, metal, or polymeric matrix composites). The thin coatings can be useful, for example, as protective coatings in applications involving wear, as well as for thermal management. Certain ceramic particles according to the present invention can be are particularly useful as abrasive particles.

US 7737063: Anatoly Z. Rosenflanz. Company: 3M Innovative Properties Company. Issued/Filed: 2010-06-15/2007-06-26.

Thermal Spraying Powder and Method of Forming a Thermal Sprayed Coating Using the Same. The present invention relates to a thermal spraying powder capable of reliably allowing the achievement of a thermal sprayed coating having superior characteristics. A thermal spraying powder according to a first embodiment of the invention includes a predetermined amount of each of molybdenum, boron, cobalt, and chromium. The total content of molybdenum, boron, cobalt, and chromium in the thermal spraying powder is no less than 95 wt.%. The primary crystal phase of the thermal spraying powder is multi-element ceramics containing at least one of cobalt and chromium along with molybdenum and boron. A thermal spraying powder according to a second embodiment of the invention includes a predetermined amount of each of molybdenum, boron, nickel, and chromium. The total content of molybdenum, boron, nickel, and chromium in this thermal spraying powder is no less than 95 wt.%. The primary crystal phase of this thermal spraying powder is multi-element ceramics containing at least one of nickel and chromium along with molybdenum and boron.

EP 1464720: Tsuyoshi Itsukaichi and Satoru Osawa. Company: Fujimi Inc. Issued/Filed: 2010-06-16/2004-03-31.