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Selected Patents Related to Thermal Spraying

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Applications

Aircraft Wheel Part Having Improved Corrosion Resistance. A steel member having wear and corrosion resistance through a combination of coatings is disclosed, the steel member being a hardened and tempered steel member having a high tensile strength, at least one selected portion of the steel member coated by thermal spraying with a tungsten carbide-cobalt composition to provide wear and corrosion resistance, the tungsten carbide-cobalt composition being approximately 78 to 90% tungsten carbide and approximately 10 to 19% cobalt, and a sacrificial ceramic-metallic coating on the steel member to provide corrosion resistance for the steel member. A method of coating a steel member is also disclosed.

WO 5116287: D.K. Kaczynski, M.S. Day, and J.C. Chan. Company: Honeywell International Inc. Issued/Filed: Dec 8, 2005/May 24, 2005.

Environmentally Protected Reinforcement Dowel Pins and Method of Making. Galvanically protected reinforcement dowel pins and methods of producing the same. In one embodiment, the reinforcement dowel pins comprise a bar or tube, the longitudinal exposed surfaces of which are covered by a heavy gage of a sacrificial metal, such as zinc, zinc alloy, magnesium, magnesium alloy, aluminum, or aluminum alloy. The bar or tube comprises steel, carbon steel, or other ferrous metal. The heavy gage of sacrificial metal is applied to the ferrous metal by various processes, such as roll bonding, lock seaming, welding, die casting, flame spraying, plasma spraying, dipping, sinking, and drawing. The resulting reinforcement dowel pins resist corrosion without sacrificing structural integrity and are reasonable in materials and manufacturing costs. These dowel pins may be installed in adjacent concrete panels using conventional methods and therefore do not introduce additional costs in installation.

WO 5119070: W. Miller, C.P. Schenk, and D. Tarrant. Company: Jarden Zinc Products, Inc. Issued/Filed: Dec 15, 2005/May 9, 2005.

Health Jewelry Utilizing Silicone Elastomer and Process for Producing the Same. A process for producing a body jewelry constituted of a silicone elastomer jewelry main-frame comprising, arranged on its skin contact side, a silicone elastomer layer having titanium micropowder mixed therein, the titanium micropowder at least composed mainly of titanium micropowder obtained by carrying out combustion of a mixed gas of oxygen and hydrogen in water under high pressure and melting elemental metallic titanium by means of resultant combustion gas to thereby deposit titanium micropowder in the water, and comprising, arranged outside, ornamental protrudent streaks of silicone elastomer. In particular, there is provided a body jewelry, available in ring form, constituted of a silicone elastomer jewelry main-frame comprising, arranged on its skin contact side, a silicone elastomer layer having titanium micropowder mixed therein, and comprising, arranged outside, ornamental protrudent streaks of silicone elastomer, which silicone elastomer jewelry main-frame is obtained by first providing a silicone elastomer jewelry main-frame with a continuous depressed portion, subsequently planting a titanium-micropowder-containing silicone elastomer layer in the continuous depressed portion, separately preparing ornamental protrudent streaks of silicone elastomer, and finally mounting the formerly obtained jewelry main-frame on the ornamental protrudent streaks, followed by thermal vulcanization to thereby effect integration. Further, there is provided a process for producing the body jewelry.

WO 5122820: Y. Hirata. Company: Phild Co., Ltd. Issued/Filed: Dec 29, 2005/June 9, 2005.

Heat Exchanger Tube, Heat Exchanger, and Manufacturing Method Thereof. This invention relates to a method of manufacturing an aluminum heat exchanger tube. In forming a thermally sprayed layer on a surface of an aluminum flat tube by thermally spraying Al-Si alloy thermal spraying particles, quenching the thermally sprayed thermal spraying particles in a molten state to make them adhere to the tube core. The surface of the thermally sprayed layer is smoothed with, for example, reduction rolls to form a brazing layer. With this method, brazing defects due to fin detachment, erosion to the tube of the brazing material, and so forth can be prevented, resulting in good brazing performance.

WO 5097389: M. Kazuhiko, T. Yamanoi, and T. Hashimoto. Company: Showa Denko K.K. Issued/Filed: Oct 20, 2005/April 8, 2005.

Heat Treated Spray Formed Superalloy Articles and Method of Making the Same. Heat treated, spray formed articles are disclosed that exhibit crack growth rates and resistance to stress rupture comparable to corresponding, forged articles. The articles are first formed by depositing molten metal droplets, for example, of IN 718, on a substrate to form a rough article. The articles are hot isostatically pressed and then processed by heat treating, which includes solution, stabilization, and precipitation heat treatments. The resultant articles have fine average grain sizes compared to forged and conventionally heat treated material, as well as yield and tensile strengths comparable to forged material. Importantly, the articles also exhibit low crack growth rates and stress rupture resistance, for example, comparable to forged material, and have an isotropic microstructure. The articles can be used in place of forged articles.

EP 957183: A.C. Cabral. Company: United Technologies Corp. Issued/Filed: Dec 7, 2005/May 10, 1999.

Method of Surface Modification for Thermal Shock Resistance and Member Thereof. A method of enhancing the thermal shock resistance of surface of ceramic member whose thermal shock resistance is demanded, characterized in that the thermal shock resistance of ceramic member whose thermal shock resistance is demanded is enhanced by forming a uniformly distributed linear dislocation structure on the surface of ceramic member whose thermal shock resistance is demanded with the use of a spray material of microparticles with convexly curved surface of 5 to 200 μm average particle size, which microparticles has a Vickers hardness (HV) of ≥800 being not higher than the hardness of the ceramic member whose thermal shock resistance is demanded.

WO 5100283: H. Saka, W.-J. Moon, S. Uchimura, and T. Ito. Company: Japan Science and Technology Agency, National University Corporation, Nagoya University Shintokogio, Ltd. Issued/Filed: Oct 27, 2005/April 6, 2005.

Process for the Preparation of Low Contact Resistance Contact on a High Transition Temperature Superconductor. Disclosed is a three-layer process for making contact points to a high transition temperature superconductor (HTSC), particularly to $(Bi,Pb)_2\ Sr_2Ca_2\ Cu_3O_{19+x}$ with and without silver in the superconductor. The contact structure is a three-layer configuration with a perforated silver foil sandwiched between two metal spray gun deposited silver layers and subsequent heat treatment in air. The contact has been made on tubes and rods. The silver contacts are capable of carrying a continuous current of 200 A without adding any substantial heat load to the cryogen used to cool the HTSC. The contact resistance at 4.2 K is in the range of 1.5×10^{-8} to 8.5×10^{-8} ohm in zero applied field.

WO 5096440: S. Ekbote, G.K. Padam, N.K. Arora, M. Sharma, R. Sethi, and M.K. Banerjee. Company: Council of Scientific and Industrial Research. Issued/Filed: Oct 13, 2005/March 31, 2004.

Rotary Machine Sealing Assembly. A sealing assembly for disposition in a rotary machine is disposed between a rotary component and a stationary component of the rotary machine. The sealing assembly includes at least one sealing strip affixed by caulking to one of the rotary and stationary components. An abradable portion is disposed on another of the rotary and stationary components and is positioned radially opposite to at least one sealing strip. The abradable portion includes a thermal spray coated material, and the thermal spray coated material includes cobalt, nickel, chromium, aluminum, yttrium (CoNiCrAlY), and further includes a material selected from the group consisting of hexagonal boron nitride, a thermoset polymer, and combinations thereof.

US 6969231: F. Ghasripoor, N.A. Turnquist, B.A. Courture, and R.W. Korzun. Company: General Electric Co. Issued/Filed: Nov 29, 2005/Dec 31, 2002.

Thermal Sprayed Metallic Conformal Coatings Used As Heat Spreaders. Heat dissipation and electromagnetic interference (EMI) shielding for an electronic device having an enclosure. An interior surface of the enclosure is covered with a conformal metallic layer, which, as disposed in thermal adjacency with one or more heat-generating electronic components or other sources contained within the enclosure, may provide both thermal dissipation and EMI shielding for the device. The layer may be sprayed onto the interior surface in a molten state and solidified to form a self-adherent coating.

US 6965071: G.R. Watchko, M.T. Gagnon, P.W. Liu, M. de Sorgo, C.V. Rodriguez, W.G. Lionetta, and S.M. Oppenheim. Company: Parker-Hannifin Corp. Issued/Filed: Nov 11, 2005/Nov 1, 2002.

Thermoplastic Coating for Composite Structures. A method of thermoplastic coating composite structures includes heating a tool. A thermoplastic layer is deposited onto the heated tool by thermal spraying a thermoplastic on the heated tool. Composite material is applied onto the thermoplastic layer. The thermoplastic layer and the composite material are then cured.

US 6974606: D. DiMarzio, C. Weizenecker, S. Chu, and D. Anton. Company: Northrop Grumman Corp. Issued/Filed: Dec 13, 2005/May 23, 2003.

Wear-Resistant Quasi-crystalline Coating. A thermally sprayed coating formed with a quasi-crystal-containing alloy, the alloy consisting essentially of, by weight percent, 10 to 45 Cu, 7 to 22 Fe, 0 to 30 Cr, 0 to 30 Co, 0 to 20 Ni, 0 to 10 Mo, 0 to 7.5 W, and balance aluminum with incidental impurities. The alloy contains at least 50 wt% ψ phase. The coating has a macrohardness of at least HR15N 75.

EP 1036857: F.J. Hermanek. Company: Praxair S.T. Technology, Inc. Issued/Filed: Oct 5, 2005/March 14, 2000.

Diagnostics and Characterization

Method for Preparation of Test Bodies. The invention relates to a method for preparation of test bodies for analysis of porous, preferably thermally sprayed, surface layers, which are incorporated by casting in plastic. The method according to the invention is carried out by placing one or more test pieces of the surface layer in a mold introduced into a vacuum chamber, the pressure of which is lowered, pouring a ready-mixed, liquid casting resin into the mold containing the test pieces, again letting the air into the chamber, lifting the test pieces out of the casting resin and allowing the excess resin to drip from the test pieces. After that, they are placed in a mold cavity together with the test pieces with a pulverized resin, and applying pressure and heat to the mold cavity for a predetermined period of time, whereupon the test body is ready to be taken out and lapped.

US 6960542: S.-O. Stålberg. Company: Volvo Aero Corporation. Issued/Filed: Nov 1, 2005/Jan 27, 2003.

Feedstock

Improved Composite Powders for Thermal Spray Coatings. Composite thermal spray powders having a core to which fine particles of exothermically reacting aluminum or aluminum alloy and iron or copper fine particles are bonded. The thermal spray powders may be produced by an agglomerating technique and are useful in producing coatings having both high adhesive bond strength and good machinability.

CA 2171191: S. Rangaswamy and R.A. Miller. Company: Sulzer Plasma Technik, Inc. Issued/Filed: Nov 15, 2005/Sept 14, 1994.

Thermal Spray Powder of Dicalcium Silicate and Coating Thereof and Manufacture Thereof. A powder of dicalcium silicate is made by spray drying calcia and silica with incorporation of sodium and phosphorus or stabilized zirconia. The spray dried powder is sintered to form a thermal spray powder. Sprayed coatings have a web of interconnected, randomly oriented microcracks substantially perpendicular to the coating surface. The coatings are stable in thermal cycling and a hot corrosive environment.

EP 1063316: X. Wei, M.R. Dorfman, L.F. Correa, F. Jansen, and J. Peters. Company: Sulzer Metco (US) Inc. Issued/Filed: Nov 30, 2005/June 21, 2000.

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% Cr, about 20 to 65 wt% Mo, about 0.5 to 3 wt% C, and about 10 to 45 wt% Ni. The wear-resistant alloy powders are useful for forming coatings having the same composition.

WO 5118185: W.J.C. Jarosinski and L.B. Temples. Company: Praxair S.T. Technology, Inc. Issued/Filed: Dec 15, 2005/ May 26, 2005.

Pretreatment and Posttreatment

Method and Arrangement Implementing Heat Treatment After the Execution of Sprayform Techniques. A method and arrangement for implementing post heat treatment after spray forming is ended to achieve stress control in the manufacture of a spray formed metallic tool involves providing a spray formed metallic tool by applying a spray forming material on a mold substrate and causing substantially homogenous metallic phase transformations of the spray forming material within the spray-formed metallic tool to a substantially homogenous distribution of commingled metallic phases consisting, for example, of predetermined proportions of at least a bainite phase and a martensite phase.

US 6955209: R.L. Allor, A.D. Roche, and S. Samir. Company: Ford Motor Co. Issued/Filed: Oct 18, 2005/Nov 27, 2001.

Spraying Systems and Methods

Feedback Enhanced Plasma Spray Tool. An improved automatic feedback control scheme enhances plasma spraying of powdered material through reduction of process variability and providing better ability to engineer coating structure. The present inventors discovered that controlling centroid position of the spatial distribution along with other output parameters, such as particle temperature, particle velocity, and molten mass flux rate, vastly increases control over the sprayed coating structure, including vertical and horizontal cracks, voids, and porosity. It also allows improved control over graded layers or compositionally varying layers of material, reduces variations, including variation in coating thickness, and allows increasing deposition rate. Various measurement and system control schemes are provided.

US 6967304: M.A. Gevelber, D.E. Wroblewski, J.R. Fincke, W.D. Swank, D.C. Haggard, and R.L. Bewley. Company: Cyber Materials LLC. Issued/Filed: Nov 22, 2005/April 26, 2003.

High-Velocity Flame Spray Gun and Spray Method Using the Same. A thermal spray gun of the present invention is capable of forming a good-quality ceramic spray coating. According to the machine, a flame generated in a combustion chamber of the machine is sent into a passage formed from the combustion chamber and through a discharge port that communicates with the combustion chamber, and then the flame is discharged from the discharge port to outside of the machine. A spray material is fed to the flame passing through the passage so that the spray material can be softened or melted by the flame and can be jetted out. An auxiliary fuel is fed to the flame passing through the passage to increase a temperature of the flame.

EP 1407824: T. Itsukaichi, S. Osawa, and T. Morishita. Company: Fujimi Inc. Issued/Filed: Dec 28, 2005/Oct 10, 2003.

Method of Eliminating Unevenness in Pass-Reversal Thermal Spraying. A method of eliminating unevenness in pass-reversal thermal spraying of a substrate surface by: (a) uniformly thermally spraying the substrate surface by moving a wire fed arc spray gun along the length of the substrate surface at constant spray parameters while using a first wire feed rate and a first current level for the gun's power supply, (b) when said spray gun approaches an end zone of the pass length requiring reversal of spray gun movement, reducing the wire feed rate and current by up to about 25% until the spray gun has completed such reversal and has exited from said end zone in the opposite direction, (c) while still continuing thermal spraying, restoring the wire feed rage and current to said first levels, and (d) repeating steps (b) and (c) as the spray gun approaches other or repeated end zones of the substrate length during repeated passes.

EP 949350: D.J. Cook and J.R. Baughman. Company: Ford Global Technologies, Inc. Issued/Filed: Nov 16, 2005/ March 23, 1999.

Process for Treating a Surface of a Component, for example, Cylinder Face, Comprises Thermally Spraying the Surface Using Electric Arc Wire Spraying and Irradiating with a Laser. Process for treating a surface of a component comprises thermally spraying the surface using electric arc wire spraying and irradiating with a laser. An independent claim is also included for a device for treating a surface of a component comprising an electric arc wire spraying unit containing a laser arranged so that they operate in one operating step.

DE 10248278: M. Beck, T. Haug, F. Lampmann, and C.-D.. Reiniger. Company: DaimlerChrysler AG. Issued/Filed: Oct 20, 2005/Oct 16, 2002.

Thermal Spraying Method and Device Used for Coating Surfaces. The invention relates to a method for thermally spraying, in particular, metals in order to coat surfaces, whereby the material used for coating is fed in the form of a wire, is melted, and is sprayed. The inventive method utilizes a plasma arc.

PL 190514: D. Kley. Company: Grillo-Werke AG. Issued/Filed: Dec 30, 2005/ Oct 29, 1999.

Thermal Barrier Coatings and Bondcoats

Process for Applying a Metallic Adhesion Layer for Ceramic Thermal Barrier Coatings to Metallic Components. In a process for applying a metallic adhesion layer for thermally sprayed ceramic thermal barrier coatings to metallic components, the surface that is to be coated being cleaned in a first process step, so that the metallic surface is free of grease and oxide, a binder is applied to the metallic surface of the base material in a second process step. Metallic adhesive powder is applied uniformly to the binder in a third process step and solder powder, which has a smaller particle size than the adhesive powder, is applied uniformly to the binder in a fourth process step. After drying the binder, a heat treatment is carried out for the purpose of soldering. The adhesion layers produced in this way are rough and provide a considerable positive lock for the ceramic thermal barrier coatings that are to be sprayed thereon.

CA 2188614: R. Fried. Company: ABB Research Ltd. Issued/Filed: Oct 4, 2005/ Oct 23, 1996.

Process of Producing of Thermal Barrier Coating with Nitride Particles. The present invention relates to an overlay coating that has improved strength properties. The overlay coating comprises a deposited layer of MCrAlY material containing discrete nitride particles therein. The nitride particles are present in a volume fraction in the range of 0.1 to 15.0% and have a particle size in the range of from 0.1 to 10.0 μm. The coating may also have oxide particles dispersed therein.

EP 1391531: S. Bose, M.T. Ucasz, D.A. Bales, M.W. Wight, S.M. Burns, and E.R. Tyrus. Company: United Technologies Corp. Issued/Filed: Nov 23, 2005/Aug 5, 2003.