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# Selected Patents Related to Thermal Spraying

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### Applications

***Active Carbon Fibre Cloth/Sprayed Aluminium Composite Polar Plate Double-Electric Layer Capacitor and Producing Method Thereof.*** The present invention discloses a kind of active carbon fibre fabric/spray-coated aluminium combined plate double layer electric capacitor and its preparation method. Said method includes the following steps: (1) preparing active carbon fibre fabric; (2) using arc spraying process to spray the molten high-purity aluminium wire on the surface of active carbon fibre fabric, the mass of the composite aluminum is 15-30% of that of combined plate; (3) successively laminating collecting body, polar plate, diaphragm, polar plate and collecting body, and adopting the winding or continuously reverse-folding mode to prepare inner core of capacitor, and (4) mounting upper end cover, adopting laser, argon arc welding or flanging, compression and sealing, making dewatering treatment, adding organic electrolyte and sealing injection hole. Said capacitor is formed from plate, collecting body, diaphragm, organic electrolyte, shell body, pole column, pole ear and end cover.

CN100424796: Wang Dazhi, Wang Xiaofeng, and Ruan Dianbo. Company: Beijing Jixingshiji Science. Issued: October 8, 2008.

***Bicycle Disc Brake Pad.*** A bicycle disc brake pad is used in a disc brake device and is configured to reduce restrictions on backplate material in a disc brake pad for a bicycle in which a friction member is bonded to a backplate by a diffusion bonding method. The bicycle disc brake pad has a backplate, a spray coating layer and a friction member. The surface of the backplate has a spray coat surface. The spray coating layer is a copper or copper alloy layer formed on the spray coat surface. The friction member is bonded to the spray coating layer by a diffusion bonding method. Preferably, the spray coat surface of the backplate is formed with a rough surface on at least part of the spray coat surface.

CN100445591: Hara Masaaki, Iwai Toru, Fujitani Takashi, and Fukuta Tsukasa. Company: Shimano Inc. Issued: December 24, 2008.

***Catalyst for the Selective Oxidation of Carbon Monoxide and Its Preparation.*** The invention pertains to the preparation and use of catalytic materials and catalyst members for the selective oxidation of carbon monoxide in a gas stream that contains hydrogen. One such catalyst member may be produced by depositing by electric arc spraying a metal feedstock onto a metal substrate to provide a metal anchor layer on the substrate, and depositing a catalytic material comprising platinum and iron dispersed on a refractory inorganic oxide support material onto the metal substrate. The catalytic material may optionally be produced by wetting the support material, especially a particulate support material, with a platinum group metal solution and iron solution and drying and calcining the wetted support material in air at a temperature in the range of from 200 to 300 °C, preferably using a solution containing bivalent platinum ion species. The catalyst member may be used by flowing the gas stream therethrough at a temperature at about 90 °C with a $O_2$:CO ratio of about 1:1 and a space velocity of about 20,000/h or, alternatively, at a temperature of about 150 °C with a $O_2$:CO ratio of about 1.5:1 and a space velocity of about 80,000/h.

JP4181774: Korotkikh Olga, Farrauto Robert J., and McFarland Andrew. Company: Engelhard Corp. Issued: November 19, 2008.

***Composite Surface on a Steel Substrate.*** A composite surface having a thickness from 10 to 5000 microns comprising a spinel of the formula $Mn_xCr_{3-x}O_4$ wherein x is from 0.5 to 2 and oxides of Mn, Si selected from the group consisting of MnO, $MnSiO_3$, $Mn_2SiO_4$ and mixtures thereof which are not prone to coking and are suitable for hydrocarbyl reactions such as furnace tubes for cracking.

EP1636401: Benum Leslie Wilfred, Oballa Michael C., Petrone Sabino Steven, and Antony. Company: Nova Chemicals Corp. Issued: November 12, 2008.

***Corrosion Resistant Component of Semiconductor Processing Equipment and Method of Manufacture Thereof.*** A corrosion resistant component of a plasma chamber includes a liquid crystalline polymer. In a preferred embodiment, the liquid crystalline polymer (LCP) is provided on an aluminum component having an anodized or non-anodized surface. The liquid crystalline polymer can also be provided on an alumina component. The liquid crystalline polymer can be deposited by a method such as plasma spraying. The liquid crystalline polymer may also be provided as a preformed sheet or other shape adapted to cover the exposed surfaces of the reaction chamber. Additionally, the reactor components may be made entirely from liquid crystalline polymer by machining the component from a solid block of liquid crystalline polymer or molding the component from the polymer. The liquid crystalline polymer may contain reinforcing fillers such as glass or mineral fillers.

CN100434196: Robert J. O'Donnell, Chang Christopher C., and Daugherty John E. Company: Lam Research Corp. Issued: November 19, 2008.

***Donor Roll Coatings.*** A toner donor roll for use in a development apparatus of a electrophotographic apparatus is disclosed. The donor roll includes a conductive core and a ceramic outer coating over the conductive core. The ceramic coating is formed by thermal spraying a single homogeneous powder consisting of particles each of which contains a specific ratio of pure alumina and pure titania held together with an organic binder.

JP4185349: Longhenry Joy L. and Schlafer Michelle L. Company: Xerox Corp. Issued: November 26, 2008.

***Electromagnetic Shield Material and Mechanism for Floor.*** Problem to be solved: To provide an electromagnetic shield material capable of sticking to a floor panel having ferromagnetism in addition to electric conductivity by the magnetic force of a band magnet preventing electromagnetic waves in the joint from leakaging and preventing electromagnetic waves in the joint by sticking the electromagnetic shield material by turning the elective conductive layer side to the floor panel side in the joint with an adjacent floor panel. Solution: A floor panel having both electric conductivity and ferromagnetism is arranged in both longitudinal and breadthwise directions to form a floor. An electromagnetic shield material in which an electric conductive layer is formed in one side face of a flexible band magnet on the upper side of the same forms an electromagnetic shield mechanism of the floor having a constitution in which the electric conductive layer is stuck for the lower side. The band magnet having flexibility is constituted by forming by mixing magnetic powder in a joint material having flexibility of a rubber, synthetic resin like nylon, etc. as so-called bond magnet, as magnets, ferrite magnet, neogium magnet, samarium cobalt magnet, alnico magnet, etc. are used. The electric conductive layer is constituted of a foil or plate made of a metal such as silver, copper, gold, aluminum, or the like or a metal film made on the band magnet by spattering or thermal spraying of these metals.

JP4172787: Miyazaki Hiroshi, Yoshino Ryoji, and Endo Tetsuo. Company: Taisei Corp. Issued: October 29, 2008.

***Electrostatic Chuck for Substrate Stage, Electrode Used for the Chuck, and Treating System Having the Chuck and Electrode.*** An electrostatic chuck is provided for a substrate stage that can be used in plasma treatment of various substrates such as a large-sized glass substrate for a flat panel display (FPD), a semiconductor wafer or the like. The electrostatic chuck is divided into a plurality of electrodes formed into nearly bar-like shapes. In accordance with an exemplary embodiment, each of the divided bar-like electrodes includes an inner electrode and a single layer thermally sprayed film formed on the surface of the inner electrode, with the bar-like electrodes disposed in parallel so as to form a plane electrode.

CN100433286: Kobayashi Toshiki and Iwabuchi Katsuhiko. Company: Future Vision Inc. Issued: November 12, 2008.

***Electrostatic Chuck Support.*** The object of the present invention is to provide an electrostatic chuck which has high plasma resistance and high capability of cooling a material to be clamped. As for the basic structure of the electrostatic chuck, an insulating film is formed on a surface of a metal plate by flame spraying, and a dielectric substrate is bonded onto the insulating film by an insulating adhesive layer. The top surface of the dielectric substrate is a surface for mounting a material to be clamped W such as a semiconductor wafer. Electrodes are formed on the lower surface of the dielectric substrate.

US7468880: Itakura Ikuo and Himuro Syouichiro. Company: Toto Ltd. Issued: December 23, 2008.

***Erosion Resistant Coatings and Methods Thereof.*** Erosion resistant coating processes and material improvements for line-of-sight applications. The erosion resistant coating composition includes nanostructured grains of tungsten carbide (WC) and/or submicron sized grains of WC embedded into a cobalt chromium (CoCr) binder matrix. A high velocity air fuel thermal spray process (HVAF) is used to create thick coatings in excess of about 500 microns with high percentages of primary carbide for longer life better erosion resistant coatings. These materials and processes are especially suited for hydroelectric turbine components.

US7431566: Gray Dennis M., Anand Krishnamurthy, Nelson Warren, Aunemo Hans, Demers Alain, and Rommetveit Olav. Company: General Electric. Issued: October 7, 2008.

***Feed Water Pump.*** Problem to be solved: To provide a feed water pump having shaft sealing part(s) wherein exfoliation of a covering layer of the shaft sealing part resulting from corrosion, wear, erosion, etc., is suppressed. Solution: The feed water pump has shaft sealing part(s) where an allow powder containing Ni, Cr, Fe and W as essential component or a mixture powder prepared by adding WC and/or $Cr_2C_3$ to the mentioned alloy powder is applied by a high-speed flame fusion spray to form coatings on a rotary shaft in its shaft sealing part and at least either of a throttle bushing and a casing adjoining to the rotary shaft.

JP4184695: Yoshioka Hiroaki, Saito Masahiro, Sakamoto Sadao, and Okihara Tatsuya. Company: Tokyo Shibaura Electric Co. Issued: November 19, 2008.

***Film-Covered Member Resistant to High-Temperature Oxidation and Its Production Method.*** Problem to be solved: To provide a film-covered member which can sufficiently exhibit an excellent high-temperature oxidation resistance of a thermally sprayed MCrAlX alloy film by forming a compact layer rich in adhesiveness, excellent in protective properties, and comprising $Al_2O_3$ alone on the surface of a thermally sprayed film of a high-temperature-oxidation-resistant alloy comprising an MCrAlX alloy; and its production method. Solution: The film-covered member is produced by forming a high-temperature-oxidation-resistant alloy film comprising MCrAlX containing 3-24 mass% Al on the surface of a substrate made of a heat-resistant alloy and forming a $Cr_2O_3$ film alone or together with a Cr film on the above alloy film via an $Al_2O_3$ layer. In the MCrAlX, M is at least one element selected from among Co, Cr, Ni, and Fe; and X is at least one element selected from among Y, Hf, Ta, Cs, Ce, La, Th, W, Si, Pt, Mn, and B.

JP4167465: Harada Yoshio, Minazu Tatsuo, and Teratani Takema. Company: Tocalo Co Ltd. Issued: October 15, 2008.

***Group III Nitride Based Semiconductor Element and Method for Manufacture Thereof.*** A separator layer of Ti is formed on an auxiliary substrate of sapphire or the like. An undercoat layer of TiN is formed on the separator layer. The undercoat layer is provided so that a Group III nitride compound semiconductor layer can be grown with good crystallinity on the undercoat layer. TiN is sprayed on the undercoat layer to form a thermal spray depositing layer. Then, the separator layer is chemically etched to reveal the undercoat layer. Then, a Group III nitride compound semiconductor layer is grown on a surface of the undercoat layer.

EP1394865: Senda Masanobu, Shibata Naoki, Ito Jun, and Chiyo Toshiaki. Company: Toyoda Gosei Kk. Issued: October 15, 2008.

***Heat Exchanger and Method for Manufacturing the Same.*** A method for manufacturing an aluminum heat exchanger includes the steps of: obtaining a heat exchanger tube by forming a Zn thermally sprayed layer on a surface of an aluminum flat tube core so as to adjust Zn adhesion amount to 1 to 10 g/$m^2$; obtaining a heat exchanger core by alternatively arranging the heat exchanger tube and an aluminum fin and brazing the heat exchanger tube and the fin with end portions of the heat exchanger tube connected to aluminum headers in fluid communication; and forming a chemical conversion treatment coat (corrosion resistance coat) on a surface of the heat exchanger core by subjecting the surface of the heat exchanger core to chemical conversion treatment using at least one chemical conversion treatment agent selected from the group consisting of phosphoric acid chromate, chromic acid chromate, phosphoric acid zirconium series, phosphoric acid titanium series, fluoridation zirconium series, and fluoridation titanium series. The obtained heat exchanger has a long last good corrosion resistance and can prevent occurrence of fin detachment and pit corrosion.

US7438121: Minami Kazuhiko, Tanaka Daishi, and Nakagawa Shintaro. Company: Showa Denko Kk. Issued: October 21, 2008.

***Injection Molding Machine.*** Problem to be solved: To provide an injection molding machine which can remove residual rubber in a small number of times of injection without cleaning and decomposition so that the temperature of rubber in an injection pot is increased, productivity is improved, and costs are reduced. Solution: In the injection molding machine in which the injection pot with an injection nozzle fitted to the tip and an inlet for supplying a molding material into the pot are formed in a metal case, and a plunger is installed slidably in the pot, the tip of the plunger is shaped to be fitted into the tip part of the pot, etc. A temperature sensor is set at the tip of the plunger of the molding machine. Ceramic flame spray coat layers are formed at least in the tip part of the pot and on the inner surface of the nozzle.

JP4191395: Nishizawa Toshimichi. Issued: December 3, 2008.

***Magnesium Repair and Build Up.*** The present invention provides methods and materials for use in applying a coating on a surface of a magnesium component. The method includes the steps of: accelerating a coating powder to a velocity of between about 500 to about 1200 m/s, wherein the coating powder comprises a material selected from the group consisting of aluminum, aluminum alloys, titanium, titanium alloys, and composites; directing the coating powder through a convergent-divergent nozzle onto the surface of the magnesium component; and forming a coating on the surface of the magnesium component so as to substantially cover the surface of the magnesium component. The coating thickness may be between approximately 0.1 to approximately 1.0 mm.

US7455881: Raybould Derek, Floyd Margaret, Duffy Timothy R., Chung Vincent, and Madhava Murali N. Company: Honeywell Int Inc. Issued: November 25, 2008.

***Metal Oxide and Noble Metal Catalyst Coatings.*** A substrate having a catalytic surface having a coating of metal oxide and noble metal particles in the nominal diameter size distribution range of less than 3 microns, preferably less than 1 micron is produced by thermal spraying a mixture of large size particles (greater than 10 microns in nominal size distribution range) of hydroxides, carbonates or nitrates of the metals: cerium, aluminium, tin, manganese, copper, cobalt, nickel, praseodymium or terbium particles; and hydroxides, carbonates or nitrates of the nobles metals: ruthenium, rhodium, palladium, silver, iridium, platinum and gold onto the substrate. The coating adheres to the surface and provides desirable catalyst properties.

CA2454780: He Ting. Company: Honda Motor Co. Issued: November 18, 2008.

***Metallic Foam Trap for Poisons: Aircraft Ozone.*** The present invention is directed to an improved apparatus and method of minimizing catalyst poisoning by inorganic deposits from lube oil additives and particulate matter, especially in aircraft. More specifically, the present invention is directed to an air purification system comprising an upstream metallic foam trap and downstream converter, wherein the trap physically blocks inorganic deposits and particulate matter from poisoning the downstream catalysts. The present invention is also directed to a metallic foam trap containing a coat comprising a first metallic thermal arc sprayed layer and optionally a second refractory metal oxide.

US7462339: Galligan Michael P. and Lechelt Rudolph H. Company: BASF Catalysts LLC. Issued: December 9, 2008.

***Method for Applying Thick Thermal Spray Coating, Thick Thermal Sprayed Coating, and Fan or Blower with the Coating.*** Problem to be solved: To provide a method for obtaining a stable thick thermal spray coating having adequate adhesiveness even on a machine part which has been conventionally considered to be difficult, thick thermal sprayed coating, and fan or blower with the coating. Solution: The method for obtaining a thick thermal spray coating consisting of a cermet material by a high-speed flame spray coating, which has strength of sprayed coating of $\sigma_a$ [MPa] and residual stress in the coating of $\sigma_1$ [MPa] comprises, adjusting the residual stress $\sigma_0$ [MPa] of the surface to be sprayed, beforehand, so as to be $\sigma_0 - \sigma_1 < +\sigma_a$, and thermally spraying the cermet material.

JP4184593: Ishimori Yuichi, Azuma Yoshiaki, Sato Shinji, and Takazawa Yutaka. Company: Nippon Steel Corp. Issued: November 19, 2008.

***Method for Coating a Surface of a Track Component, in Addition to a Track Component.*** A method for coating a surface of a track component with a coating containing aluminum by means of an arc spraying process. In order to form a coating that exhibits a high resistance to sliding and abrasive wear, aluminum and silicon are applied to the surface in a ratio of 3:2 <= Al:Si <=4:1 by an arc spraying process.

CA2486411: Kunitz Walter, Heilscher Joachim, and Schmedders Stefan. Company: Butzbacher Weichenbau Gmbh. Issued: October 14, 2008.

***Method for Preventing Corrosion of Cast Iron Pipe.*** Problem to be solved: To provide a method for preventing corrosion of a cast iron pipe by using a coating material which can be coated on the surface of white rust produced in

outdoor temporary placing and on white rust produced in steam curing. Solution: This method for preventing corrosion of cast iron pipe comprises the steps of (1) thermally spraying zinc, zinc-aluminum pseudoalloy, or zinc-aluminum alloy to form a thermal spray coating layer onto the outer surface of a cast iron pipe, (2) coating an aqueous two-component epoxy emulsion coating material having a solid content of not less than 5% by weight and comprising a first component of an epoxy resin having an epoxy equivalent of 475 to 1800 and a second component of an amine curing agent having an active hydrogen equivalent (on a solid basis) of 160 to 600 onto the outer surface of the cast iron pipe to form an epoxy resin film, and (3) coating an acrylic emulsion coating material having a solid content of not less than 15% by weight on the epoxy resin film to form an acrylic resin film.

JP4160970: Saito Masahiko, Deguchi Takaaki, Kajiwara Yoshihisa, Michiura Yoshisada, Yamada Yoshio, and Tame Shinichiro. Company: Dainippon Toryo Kk, Kurimoto L. Issued: October 8, 2008.

***Method for Producing Abrasive Tips for Gas Turbine Blades.*** A process is provided for producing an abrasive coating on a substrate surface by applying a bond coat by low pressure plasma spraying and anchoring to the bond coat abrasive particles by electroplating and embedding the particles into an oxidation resistant matrix by entrapment plating.

CN100439567: Nenov Krassimir P., Fenton Richard, Fuggini Joseph, and Howard Peter. Company: Chromalloy Gas Turbine Corp. Issued: December 3, 2008.

***Method for the Production of an Electrically Conductive Resistive Layer and Heating and/or Cooling Device.*** An electrically conductive resistive layer is produced by thermally spraying an electrically conductive material onto the surface of a non-conductive substrate. Initially, the material layer arising therefrom has no desired shape. The material layer is then removed in certain areas so that an electrically conductive resistive layer having said desired shape is produced.

EP1459332: Watlow Electric Manufacturing. Company: Watlow Electric Manufacturing. Issued: November 12, 2008.

***Method of Forming Wear-Resistant Spray Deposit, and Thermal Spraying Machine.*** Problem to be solved: To provide a method capable of enhancing the boundary adhesiveness of a spray deposit of a wear-resistant material to be deposited by the high-speed flame thermal spraying, increasing the inter-particle bonding force, and preventing occurrence of cracks. Solution: In the method of forming the spray deposit by depositing a wear-resistant material in a multi-layered manner by relatively and reciprocally moving a high-speed flame thermal spraying gun nozzle facing at least one sliding surface of a sliding member, the thermal spraying is performed by increasing the supply of the wear-resistant material powder continuously or step by step. A thermal spray powder supplying apparatus has a function of automatically increasing the supply of the wear-resistant material powder on the basis of the thermal spraying elapsed time signal while forming the spray deposit.

JP4174496: Sekiya Takuma, Hosotsubo Yukio, Kamura Shuichi, and Takiguchi Katsumi. Company: Riken Kk. Issued: October 29, 2008.

***Molding Die and Its Manufacturing Method.*** Problem to be solved: To enable a smooth cavity surface to be easily and securely formed and an occurrence of an abrasion powder due to a stamper to be restrained while the cavity surface corresponding to a molded body surface to be easily formed on an insulation layer composed of a ceramic material. Solution: A nest forming the surface of the cavity is constituted of a nest body composed of stainless steel, the insulation layer and a seal layer. The upper surface of the nest body is provided with a recess area of quadrilateral shape having a diameter longer than the length and width of an optical guiding board. The recess area is filled with the insulation material by a plasma powder spray thermal spraying using a zirconia ceramic powder containing a partial stabilizer $Y_2O_3$, then the surface is ground. The insulation layer is formed by providing the surface with a hydrofluoric acid etching treatment for its roughening. The seal layer with a thickness of about 130 μm prepared by Ni-P electroless plating is provided on the insulation layer and the nest body around the insulation layer.

JP4181017: Kato Yoshitake, Miyamoto Tomoyuki, Hatsumi Masayuki, Hirai Yusuke, and Iwashita Kazuki. Company: Maxell Hi Tec Ltd. Issued: November 12, 2008.

***Photocatalytically Functional Body.*** Problem to be solved: To obtain a general-purpose photocatalytically functional body having a wide use end capable of retaining its sterilizing power and deodorizing power over a long time. Solution: When the photocatalytically functional body is formed by low temperature thermal spraying, conditions are set so as to obtain a photocatalytic film consisting of 10-40 wt.% anatase type crystals of titania and 60-90 wt.% rutile type crystals of titania. In the case of a coating film or printing ink, 50-80 wt.% rutile type fine grains of titania, 20-50 wt.% anatase type fine grains of titania, fine metal particles and fine ceramic particles as an adsorbent are mixed in a binder and stuck on a substrate to form the objective body.

JP4189074: Sakurada Tsukasa. Company: Shinshu Ceramics Kk. Issued: December 3, 2008.

***Piston Ring and Its Manufacturing Method.*** Problem to be solved: To provide a piston ring and its manufacturing method having excellent wear resistance and scuff resistance and low hostility to a mating material. Solution: A thermal-spray coating film consisted by a composite structure wherein equiaxed carbon particles having an average particle diameter of 2 μm or less are distributed in a metal matrix is provided at least on an outer peripheral side slideway.

JP4176064: Sakai Yasushi, Hosotsubo Yukio, and Obara Akira. Company: Riken Kk. Issued: November 5, 2008.

***Roll and Method for the Production Thereof.*** An improved roll is characterized in that it is subdivided into three zones at leas in the axial direction, namely two peripheral zones and a middle zone located therebetween. The peripheral zones have a metallic protective layer that is welded onto the roll base body and is provided in the form of a protective metal sheet. A flame-sprayed surface is used in the middle zone.

EP1917378: Kittsteiner Hans-Juergen. Company: Brueckner Maschinenbau. Issued: November 12, 2008.

***Rolling Bearing Protected Against Electrocorrosion.*** 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 and, 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.

CN100427784: Inukai Kosuke, Ito Hideji, Kataoka Yukihiro, and Sato Kiyoshi. Company: NTN Toyo Bearing Co Ltd. Issued: October 22, 2008.

***Seawater Corrosion Prevention Method.*** Problem to be solved: To provide a seawater corrosion prevention method by which the corrosion caused by seawater in a structural member composed of ferrous metal can be sufficiently prevented, and which is harmless for the environment as well. Solution: In the seawater corrosion prevention method, the ceramics powder of $3Al_2O_3$-$2SiO_2$ is thermally sprayed on the surface of a ferrous metallic member under the condition where an amorphous phase appears. Then, a network of an amorphous phase is formed in a through-hole in a sprayed coating, and iron ions are precipitated as iron oxide in the network. Since the iron oxide clogs the through-hole in the coating, and, in the case the structural member is contacted with seawater, the seawater is not directly contacted with the structural member, the corrosion caused by seawater in the structural member composed of ferrous metal can be prevented.

JP4172653: Uematsu Susumu. Company: National Maritime Research Inst. Issued: October 29, 2008.

***Silicon Carbide Member and Its Production Method.*** Problem to be solved: To provide a silicon carbide member which is excellent in resistances to spalling, creep and corrosion, has an excellent characteristic as a tool even when thinned, and is excellent in adhesiveness and on which a flame spray layer that is not peeled even in quick heating or cooling is formed, and also to provide a method for production thereof. Solution: This silicon carbide member is produced by forming a flame spray layer on a silicon carbide substrate. As the surface layer of the substrate, a porous layer having a relative density of 50-80% is formed, and the substrate part except the porous layer is a dense layer having a relative density of 85% or higher. The flame spray layer is provided on the porous layer.

JP4186099: Kitahama Hiroaki, Kudo Shigeru, and Ono Takashi. Company: Tokai Konetsu Kogyo. Issued: November 26, 2008.

***Silicon Carbide Sintered Member Having Non-Reactive Thermally Sprayed Film and Method of Manufacturing the Same.*** Problem to be solved: To provide a silicon carbide sintered member having a thermally sprayed film excellent in thermal shock resistance and peel resistance which is formed by thermally spraying a film material such as zirconia having low reactivity to a material to be fired to impart to a dense normal pressure sintered silicon carbide with sufficient adhesive strength by a plasma thermally spraying method and the method of manufacturing the same. Solution: The film is firmly applied on the base material by setting the average surface roughness Ra to 0.35-25 μm and controlling the peak count PPI per 1 inch to >=150 in the base material to be thermally sprayed to provide sharp projecting and recessed parts on the base material and thermally spraying the nonreactive material on the base material.

JP4161050: Ishigaki Takamasa. Company: Nat. Inst. for Materials Science. Issued: October 8, 2008.

***Sprayed Copper-Aluminum Composite Material and Method for Producing the Same.*** There is provided a composite material, which exhibits the properties of copper alloy and aluminum alloy, and which has improved wear-resistance and seizure-resistance. By flame-spraying is prepared a copper-aluminum composite material, which consists of copper or first copper-alloy (for example Cu-Pb alloy) including at least unmelted phase and aluminum or first aluminum-alloy (for example Al-Si alloy) including at least melted phase.

CN100422379: Tomikawa Takashi and Yamada Toyokazu. Company: Taiho Kogyo Co Ltd. Issued: October 1, 2008.

***Thermal Oxidation Protective Surface for Steel Pistons.*** A piston and method for making a piston for a fuel-injected diesel engine adapted to withstand the damaging effects of fuel injection plume-induced oxidation in the regions of the piston bowl and rim. The surfaces of the piston crown targeted by the fuel injection plume are first coated with a corrosion-resistant and oxidation-resistant composition applied as a slurry or by a thermal spraying technique, such as HVOF or plasma spraying. Thereafter, a high energy industrial laser beam irradiates the as-sprayed coating to increase its density, while simultaneously reforming its microstructure so as to fuse, alloy, and materially bond the coating material with the underlying steel substrate, thereby resulting in a durable protective surface for the steel piston crown.

US7458358: Lineton Warran and Azevedo Miguel. Company: Federal Mogul Corp. Issued: December 2, 2008.

***Thermal Spray Grit Roller.*** A thermal spray grit roller includes a roller shaft having an outer periphery and a roller body connected to the outer periphery of the roller shaft. A grit layer comprising a multiple individual grit particles is deposited on the circumferential outer surface of the roller body by a thermal spray process. A method for manufacturing the thermal spray grit roller includes collecting raw materials for use in the method, including at least one roller subassembly, having a roller body connected to a roller shaft, and the application material. The outer surface of each roller body is degreased. Then, any portion of the roller body outer surface that will not be covered by the grit layer is masked. Finally, the grit layer is formed on the roller body outer surface with a thermal spray process.

CN100445189: Leung Chi K. Company: Nam Wah Development Ltd. Issued: December 24, 2008.

***Thermally Conductive Coat and Method for Forming the Same.*** Problem to be solved: To provide a coat the matrix component of which is a resin, the carbon nanomaterial of which is oriented parallel to the surface of a member at the site of mechanical part production, and which is excellent in thermal conductivity in the direction parallel to the surface of the member. Solution: The carbon nanomaterial selected from carbon nanotubes and carbon nanofibers is mixed with a resin being the matrix component, and the thermally conductive coat is molded from the resulting mixture. The mixed powder is thermally sprayed in the direction vertical to the surface of a member to form an anisotropically thermally conductive coat in which the longitudinal parts of the carbon nanomaterial are oriented in the direction parallel to the surface of the member.

JP4167048: Okada Yasuaki and Yamada Shigeki. Company: Aisan Ind. Issued: October 15, 2008.

***Wear-Resistant Sliding Member.*** A wear-resistant sliding member which comprises a base metal and a sprayed coating formed by thermally spraying a mixed powder comprising, by mass, 30 to 70% of a molybdenum powder, 10 to 40% of a nickel-chrome alloy powder, 5 to 40% of a ceramics powder, and 2 to 15% of a solid lubricant onto a sliding surface of the base metal. The wear-resistant sliding member is excellent in wear-resistance and resistance to scuffing, and thus can be utilized in a large-sized marine diesel engine, which is used under severe conditions.

EP1375695: Takamura Hiroyuki. Company: Man B & W Diesel. Issued: November 12, 2008.

## Diagnostics and Characterization

***Arrangement for Monitoring Thermal Spray Processes.*** The invention relates to an arrangement for measuring characteristic properties of a plasma beam in a thermal spray process, said arrangement comprising means for introducing spray materials into the plasma, a one-dimensional or two-dimensional array consisting of first optical waveguides for receiving the light radiation emitted by the plasma, and other optical waveguides for distributing the light radiation emitted by the plasma. According to the invention, means (W) are provided for splitting the light guided in the first optical waveguides into the other optical waveguides, one optical waveguide being connected to the opening diaphragm of a particle flow arrangement, and the other optical waveguide being connected to the opening diaphragm of a spectrometer. Means are also provided for determining the current state of the spray process.

EP1867219: Hertter Manuel, Hoeschele Joerg, Schneiderbanger Stefan, and Steinwandel Juergen. Company: MTU Aero Engines Gmbh. Issued: October 1, 2008.

***Film Thickness Measuring Method for Spray Deposit.*** Problem to be solved: To measure the thickness of an iron-based metal deposit thermally sprayed on an iron-based base nondestructively without being affected by the spray deposit and the quality of a base material. Solution: An ultrasonic wave is made incident from the top surface of the spray deposit to the thermal spray base material and the reflection time (t1) up to the return of the incident wave to the top surface after reflection by the border surface between the spray deposit and base material is measured. Then the thickness T1 of the spray deposit is calculated from a found sound velocity (v1) in the thermal spray film and the reflection time (t1). Further, a test piece having the same deposit is produced when the spray deposit is formed, the film thickness (T0) of the test piece is previously measured, and this and test piece are used for measurement to calculate the sound velocity (v1) in the spray deposit from the reflection time (t0).

JP4161435: Nanba Kazuo. Company: Ishikawajima Harima Heavy Ind. Issued: October 8, 2008.

***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 mould introduced into a vacuum chamber, the pressure of which is lowered, pouring a ready-mixed, liquid casting resin into the mould containing the test pieces, again letting the air in into the chamber, lifting the test pieces out of the casting resin and allowing excess of casting resin to drip from the test pieces, and after that they are placed in a mould cavity of a hot moulding press, filling said mould cavity together with the test pieces with a pulverized resin, and applying pressure and heat to the mould cavity for a predetermined period of time, whereupon the test body is ready to be taken out and lapped.

CA2328099: Stalberg Sven-Olof. Company: Volvo Aero Corp. Issued: December 23, 2008.

## Feedstock

***Abrasion-Resistant Material Composite Wire for Arc Thermal Spraying.*** An abrasion-resistant material composite wire for arc material spraying which has an outer skin made from at least one material selected from the group consisting of a nickel base alloy, a cobalt base alloy and an iron base alloy and, covered thereby, a powder prepared from at least one material selected from the group consisting of a metal, a ceramic and a combination thereof, characterized in that the composite wire further comprises a powder prepared from at least one material selected from the group consisting of boron or a boron compound, silicon or a silicon compound, and phosphorus or a phosphorus compound, so as to have self-melting property.

CN100430514: Nakahama Shuhei, Nagasaka Hiroshi, and Sugiyama Kenichi. Company: Ebara Corp. Issued: November 5, 2008.

***Coating Powder Based on Chemically Modified Titanium Suboxides.*** A coating powder based on chemically modified titanium suboxides, for use in various coating techniques. Coatings produced from this powder are characterized by high electroconductivity, good solid lubricating properties and resistance to wear. For these reasons, there are numerous possibilities of use of components which were coated by suitable processes with this powder, especially as functional layers for fuel cells in electrochemical installations, in the new car industry, in mechanical engineering and in other economic activities. The coating powder based on

titanium suboxides having a defined defect structure is characterized in that it is modified by at least one metallic alloying element and described by general formula: $Ti_{n-2}Me_2O_{2n-1}$.

US7445763: Berger Lutz-Michael, Thiele Sven, and Nebelung Manfred. Company: Fraunhofer Ges. Forschung. Issued: November 4, 2008.

***Powder Cored Wire for CrB-Containing Amorphous Coating Prepared by Electric Arc Spraying.*** An electrical arc spraying method for preparing amorphous-coating dust core wire containing CrB belongs to hot spraying domain in material processing project and is mainly used in various industrial domains including anticorrosive domain and wearable domain. The amorphous alloy is association of high strength, hardness, tenacity, abradability and noncorrosibility, but there is no patent report about the electrical arc spraying method for preparing iron-base amorphous-coating dust core wire both at home and abroad. The invention is about an electrical arc spraying method for preparing amorphous-coating dust core wire containing CrB and is characterized in that the mass percentage content range of the said dust core components is as follows: 60-80% boron-chromium, 5-20% Cr3C2, 5-10% WC and the residue is iron dust. The covering prepared with the invented dust core contains a good deal of amorphous carborundum, the coating formation is even and has high rigidity with HV0.1 of more than 1190, and has good abradability and the relative abradability is 15.8 times than the Q235 steel.

CN100427634: He Dingyong Jiang. Company: Univ. Beijing Technology. Issued: October 22, 2008.

***Powder Cored Wire for NiB-Containing Amorphous Coating Prepared by Electric Arc Spraying.*** An electrical arc spraying method for preparing amorphous-coating dust core wire containing NiB belongs to hot spraying domain in material processing project and is mainly used in various industrial domains including anticorrosive domain and wearable domain. The amorphous alloy is association of high strength, hardness, tenacity, abradability and noncorrosibility, but there is no patent report about the electrical arc spraying method for preparing iron-base amorphous-coating dust core wire both at home and abroad. The invention is about an electrical arc spraying method for preparing amorphous-coating dust core wire containing NiB and is characterized in that the mass percentage content range of the said dust core components is as follows: 60-75% nickel-boron, 5-20% TiC, 3-10% TiB2 and the residue is nickel powder. The covering prepared with the invented dust core contains a good deal of amorphous carborundum, the coating has high rigidity with HV0.1 of more than 1000, and has good abradability and the relative abradability is 13.7 times than the Q235 steel.

CN100427635: He Dingyong Jiang. Company: Univ. Beijing Technology. Issued: October 22, 2008.

***Spray Powder, Bearing Element of a Bearing Device Coated With the Sprayed Powder.*** Spraying powder contains (in wt.%) 5-30 zinc, 1-10 tin, 0.1-3 silicon, 0.1-0.7 aluminum, 0.01-2 iron, 0.01-4 manganese, 0.01-3 cobalt and a balance of copper. - 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.

US7449249: Barbezat Gerard. Company: Sulzer Metco AG. Issued: November 11, 2008.

***Thermal Spray Compositions for Abradable Seals.*** A thermal spray composition and method of deposition for abradable seals for use in gas turbine engines, turbochargers and steam turbines. The thermal spray composition includes a solid lubricant and a ceramic preferably comprising 5 to 60 wt.% total of the composition in a ratio of 1:7 to 20:1 of solid lubricant to ceramic, the balance a matrix-forming metal alloy selected from Ni, Co, Cu, Fe and Al and combinations and alloys thereof. The solid lubricant is at least one of hexagonal boron nitride, graphite, calcium fluoride, lithium fluoride, magnesium fluoride, barium fluoride, tungsten disulfide and molybdenum disulfide particles. The ceramic includes at least one of albite, illite, quartz and alumina-silica.

EP1509631: Fiala Petr, Chilkowich Anthony Peter, and Hajmrle Karel. Company: Sulzer Metco Canada Inc, Westaim Corp. Issued: December 31, 2008.

***Wearable Iron-Based TiC-Ceramic-Containing Powder Cored Wire for Electric Arc Spraying.*** An iron-base wear electrical arc spraying dust core wire containing TiC ceramics belongs to surface project domain. The TiC ceramics have high fusing point and highest air rigidity, which is the most anti-abrasive material used at normal temperature, but there is no person to use TiC ceramics as hard phase to prepare arc spraying dust core wire. The invention is about an iron-base wear electrical arc spraying dust core wire containing TiC ceramics and is characterized in that the mass percentage content range of the said dust core components is as follows: 10-40% boron-iron, 2-10% metallic nickel, 20-35% titanium carbide ceramics, 5-10% chrome metal, 2-4% metallic titanium and the residue is metallic iron. The covering prepared with the invented dust core has high superficial Rockwell hardness and microhardness, and the antifriction particle abrasiveness is far better than Q235 low-carbon steel.

CN100427636: He Dingyong Jiang. Company: Univ. Beijing Technology. Issued: October 22, 2008.

## Pre- and Post-Treatment

***Method of Treating Metal Components.*** A method of forming an engine airfoil part. The attributes of a final workpiece product are selected. An appropriate substrate composition is determined depending on the selected attributes. A workpiece substrate is formed to near-finished dimensions. An appropriate coating material composition is determined depending on the selected attributes. The workpiece substrate is prepared for a high-density coating process. The high-density coating process, such as HVOF thermal spray, is performed to coat the workpiece substrate with the coating material. The coating material is built-up to a thickness effective to obtain desired finished dimensions after performing a hot isostatic pressing treatment. The appropriate hot isostatic pressing treatment parameters are determined. The hot isostatic pressing treatment is performed on the coated workpiece substrate to obtain a metal product having the desired finished dimensions and diffusion bonding between the coating material and the workpiece substrate.

JP4174074: Arnold James E. Company: Recast Airfoil Group. Issued: October 29, 2008.

## Thermal Barrier Coatings and Bondcoats

***Heat-Insulating Layer Made of Complex Perovskite.*** A heat-insulating material has a melting point above 2500 °C, a thermal expansion coefficient in excess of $8 \times 10^{-6}$ $K^{-1}$, and a sintering temperature greater than 1400 °C. It has a perovskite structure of the general formula A1 + r(B′1/3 + xB″2/3 + y)O3 + z where A = at least one element of the group (Ba, Sr, Ca, Be), B′ = at least one element of the group (Mg, Ca, Sr, Ba, Be), B″ = at least one element of the group (Ta, Nb), r, x, and z < >0, and −0.1 < r, x, y, z < 0.1; or of the general formula A1 + r(B′1/2 + xB″1/2 + y)O3 + z where A and B″ are as above and B′ = at least one element of the group (Al, La, Nd, Gd, Er, Lu, Dy, Tb), and −1.0 < r, x, y, z < 0.1.

US7468213: Vassen Robert, Schwartz-Lueckge Sigrid, Jungen Wolfgang, and Stoever Detlev. Company: Forschungszentrum Juelich Gmbh. Issued: December 23, 2008.

***High Temperature Corrosion Resistant Alloy, Thermal Barrier Coating Material With Metal Bonding Layer, and Gas Turbine Using High Temperature Corrosion Resistant Alloy.*** A high temperature corrosion resistant alloy composition comprising, in addition to Ni, 0.1 to 12% by weight of Co, 10 to 30% by weight of Cr, 4 to 15% by weight of Al, 0.1 to 5% by weight of Y, and 0.5 to 10% by weight of Re. The high temperature corrosion resistant alloy composition has an excellent oxidation resistance and ductility and is suitable for use in a bonding layer of a thermal barrier coating material.

JP4166977, EP1319730: Hidetaka Oguma, Ikuo Okada, Taiji Torigoe, and Kouji Takahashi. Company: Mitsubishi Heavy Ind Ltd. Issued: October 15, 2008, October 22, 2008.

***Improved Plasma Sprayed Thermal Bond Coat System.*** A method for forming a thermal barrier coating system on an article subjected to a hostile thermal environment, such as the hot gas path components of a gas turbine engine. The coating system is generally comprised of a ceramic layer and an environmentally resistant beta phase nickel aluminum intermetallic (beta-NiAl) bond coat that adheres the ceramic layer to the component surface. A thin aluminum oxide scale forms on the surface of the beta-NiAl during heat treatment. An additional layer of diffusion aluminide may be formed underlying the ceramic layer. The beta-NiAl may contain alloying elements in addition to nickel and aluminum in order to increase the environmental resistance of the beta-NiAl. These elements include hafnium, chromium and zirconium and increase the oxidation resistance of the beta-NiAl. The beta-NiAl is supplied as a powder having a size in the range of 20-50 microns. The beta-NiAl powder is applied using air plasma spray techniques to produce a surface having a roughness of 400 microinches or rougher. The ceramic top coat, a stabilized zirconia, typically ytrria-stabilized zirconia, can be applied using inexpensive thermal spray techniques to greater thicknesses than achievable otherwise because of the rough surface finish of the underlying beta-NiAl bond coat. Alternatively, the beta-NiAl coat can be used as an environmental coating without application of an overlying ceramic topcoat.

JP4191427: Rigney Joseph David, Weimer Michael James, Nagaraj Bangalore Aswatha, and Lau Yuk-Chiu. Company: General Electric (US). Issued: December 3, 2008.

***Liquid Phase Plasma Spraying Process of Preparing Nanometer Zirconia Thermal-Barrier Coating.*** The present invention is liquid phase plasma spraying process of preparing nanometer zirconia thermal barrier coating. Into water solution of zirconium salt, oxide as stabilizer and polymer as active dispersant are first added and alkali precipitant is then added to obtain zirconium hydroxide sol, and the sol after being aged and purified is sprayed as plasma spray material to prepare nanometer zirconia coating. The present invention features that hydroxide precursor sol is used to replace micron level powder of coagulated nanometer particles and as plasma spray material, which is atomized, evaporated fast in the plasma flame, dried, calcined, solidified and deposited to form nanometer zirconia coating directly. The present invention has simple operation, short technological process and low preparation cost, and is suitable for industrial production.

CN100427637: Cheng Xudong Wang. Company: Univ. Wuhan Science & Eng. Issued: October 22, 2008.

***Method for Depositing Heat-Shielding Ceramic Film, and Heat-Resistant Component Having the Film.*** Problem to be solved: To provide a means by which a heat-shielding ceramic film having a columnar structure caused by the cracks in the thickness direction is efficiently and surely deposited on a surface of a heat-resistant component used under severe conditions at low cost, and the interlayer delamination caused by the heat shock is sufficiently prevented. Solution: A ceramic material is subjected to the plasma thermal spraying under the laser irradiation in depositing the ceramic film on the surface of a work.

JP4166416: Shingu Noriya, Dogahara Mitsuru, Yoshida Naohiko, Yoshitake-Shigeru, Torigoe Taiji, Ohara Minoru, Omori Akira, Shirasawa Hidenori, Shu Nobu, and Itami Jiro. Company: Advanced Materials Proc Inst, Kansai Electric Power Co, Mitsubishi Heavy Ind Ltd. Issued: Issued: October 15, 2008.

***Method for Providing Thermal Barrier Having Bending Flexibility.*** Problem to be solved: To economically provide a thermal barrier with a thermal-spraying technique, which has bending flexibility together with enhanced peeling strength and is used for protecting a turbine engine component or the like from heat and corrosion by coating. Solution: The thermal barrier includes a substrate, an underlayer covering it, and a ceramic layer deposited thereon, wherein the ceramic layer is deposited with the thermal-spraying technique of using a torch. The method includes adjusting the torch so that (a) the ceramic layer can be deposited by one pass, and (b) the ceramic layer can acquire a thickness of at least 80 μm.

JP4172585: Bengtsson Per and Dudon Laurent P. Company: Snecma Moteurs. Issued: October 29, 2008.

***Protective Coatings for Turbine Combustion Components.*** A turbine combustion system, comprises at least one turbine combustion component that is provided with a protective coating on

the outer surface otherwise known as the non-flame surface of at least one turbine combustion component. The at least one turbine combustion component comprises an inner surface that defines a hot flame path area and an outer surface. The coating on the outer surface of the combustion components provides protection for the components from at least one of oxidation, nitridation, and hot corrosion.

JP4160168: Zhao Ji-Cheng and Lau Yuk Chiu. Company: General Electric (US). Issued: October 1, 2008.

## Spraying Systems and Methods

***A Method for Feeding Liquid to a Flame Spraying Apparatus.*** A method and a liquid feeding device for feeding liquid in a flame spraying apparatus that is arranged for treating an optical fiber structure, as well as a flame spraying apparatus in which liquid feeding is arranged according to the invention. Liquid is supplied to an unpressurized space in a pressure generating part substantially in a constant flow. In the pressure generating part the pressure of liquid is generated by means of gravity influencing the liquid, and the pressurized liquid is arranged to be supplied to the flame spraying at a substantially constant pressure and at a constant flow rate.

CN100434191: Saerkilahti Simo and Tammela Simo. Company: Liekki Oy. Issued: November 19, 2008.

***Apparatus for Thermal Spray Coating.*** A system for thermal spray coating of a particulate material onto a substrate includes a spray gun apparatus having dual vortex chambers for the mixing of fuel gas and oxygen. The apparatus provides a jet flame resulting from a compression wave formed by compressed air. Dual venturis control the flow of fluidized coating material particles to provide smooth and controlled delivery of coating material to the spray gun.

CN100434190: Gardega Thomas. Company: Xiom Corp. Issued: November 19, 2008.

***Arc Spraying Torch Head.*** The invention provides an arc spraying torch head including: a pair of spray material guides attached to a head body so as to face forward and guiding a flexible wire-like spray material inserted therein; a main air nozzle attached to the head body, and jetting main air toward a melting area of the spray material; the head body being provided with an auxiliary air nozzle which jets auxiliary air toward the melting area; the direction of jetted auxiliary air by the auxiliary air nozzle is tilted with respect to the direction of jetted main air by the main air nozzle, the auxiliary air being jetted toward the melting area; and a spray direction of the spray material being inclined with respect to the direction of the jetted main air.

US7432469: Nakahama Shuhei, Ishido Toru, Takahashi Masaru, and Uotani Reiyasu. Company: Ebara Corp. Issued: October 7, 2008.

***Arc Thermal Spray Gun Extension With Conical Spray.*** In a two-wire arc spray extension two metal wires are guided into contact, and a gas cap is affixed to a gun body. The feeding wires receive an arc current to effect an arc and thereby molten metal at the wire tips. The gas cap has a plurality of orifices therein that receive pressurized gas to generate gas jets. The orifices are disposed with substantially equal spacing arcuately such that the jets are directed with a radially inward component toward the tips to effect atomization of the molten metal into a spray stream. The orifices have axes that are offset forwardly and tangentially from radial so as to create a vortex flow such that the spray stream is effected in the form of a conical fan. Insertion of the spray stream centrally into a hole can effect a coating circumferentially on an inside surface of the hole.

CA2292240: Benary Raphael. Company: Sulzer Metco US Inc. Issued: October 28, 2008.

***Cold Air Dynamical Spray-Painting Method and Apparatus of Delivering Powder Through Down Stream.*** A cold-pneumatic spray coating method and apparatus by feeding powder at downstream is disclosed. Said method includes such steps as heating the working gas, delivering it to upstream of the flow channel in Laval nozzle, using the carrying gas to deliver the metallic powder to be sprayed to the downstream divergent segment via powder delivering tube, accelerating it by working gas, and spraying it. The cross-section the flow channel in divergent segment is elliptical or the combination of ellipse and rectangle. Its advantage is no pollution and blocking of nozzle throat.

CN100446870: Song Hongwei Zhang. Company: Baoshan Steels Co Ltd. Issued: December 31, 2008.

***Flame Spraying Process and Apparatus.*** A process, apparatus and material composition for forming a coherent refractory mass on a surface wherein one or more non-combustible materials are mixed with one or more metallic combustible powders and an oxidizer, igniting the mixture in a combustion chamber so that the combustible metallic particles react in an exothermic manner with the oxidizer and release sufficient heat to form a coherent mass of material under the action of the heat of combustion, and projecting this mass against the surface so that the mass adheres durably to the surface.

US7449068: Lichtblau George Jay. Company: GJL Patents LLC. Issued: November 11, 2008.

***Internal Burner.*** The electric arc device is used for spraying the inside surface of a cylindrical pipe. It has two pipes carrying process gases. If two gases are used, they mix in a nozzle section which has a large opening at right-angles to the gas pipes. Two gas pipes containing wire electrodes for the arc are situated in the opening for the escaping process gases the ends may taper at an angle of 30 degrees. The tips of the electrodes are inclined toward each other and a cap with a small nozzle opening may be placed over the large opening.

EP1238711: Nowotni Detlef, Wanke Christian, Haug Tilman, and Izquierdo Patrick. Company: Daimler Chrysler AG. Issued: November 12, 2008.

***Plasma Spraying Device.*** Problem to be solved: To provide a plasma spraying device capable of improving the utilizing efficiency (yield) of raw material powder and forming a film of high performance by suppressing the generation of non-melted particles. Solution: This device is provided with a raw material charging nozzle 1 charging the raw material for thermal spraying along an axis elongating in the direction to be thermal-sprayed and a plasma forming means arranged around the axis, the plasma forming means is provided with two or more pairs of plasma torches

each consisting of a cathode torch provided with a cathode and an anode torch provided with an anode, and these cathode torches and anode torches are arranged in such a manner that they surround the axis, and they are positioned mutually on the upstream side and downstream side in the raw material charging direction so as to form a plasma flow along the axis between these cathodes and anodes.

JP4164610: Sodeoka Masaru, Suzuki Masahito, Inoue Takahiro, and Fumiya Akira. Company: Aero Plasma Kk. Issued: October 15, 2008.

***Plasma Injection Method.*** The plasma spraying method is a coating method in which a material to be coated is sprayed onto a surface of a metallic substrate in the form of a powder beam. The coating material is injected at a low process pressure, which is lower than 10,000 Pa, into a plasma defocusing the powder beam and is there partly or fully melted. In this connection, a plasma with sufficiently high specific enthalpy is produced so that a substantial portion, amounting to at least 5% by weight, of the coating material changes into the vapour phase and an anisotropically structured coating is produced on the substrate. An anisotropic structured layer of the coating material is deposited on the substrate. In this coating, elongate particles, which form an anisotropic micro-structure, are aligned standing largely perpendicular to the substrate surface and low-material transitional zones bound the particles from one another.

EP1495151: Barbezat Gerard, Refke Arno, and Loch Michael. Company: Sulzer Metco AG. Issued: November 26, 2008.

***Powder Injection System for Detonation-Operated Projection Gun.*** The powder injection system is comprised of a dosing chamber which is directly supplied by a conventional powder supplier and communicates with the barrel of the detonation gun through a direct conduit. Thus, the pressure wave which progresses through the barrel enters through the communication conduits and, when reaching the dosing chamber, is subjected to a sudden expansion which stops the powder supply from the continuous supplier and produces the complete fluidification of the powder contained in the dosing chamber. The fluidized powder will then be entrained by suction up to the barrel where it resides until the pressure wave generated in a new detonation cycle entrains said powder to deposit it to the surface of the part to be coated.

CA2325021: de Juan Landaburu Julian, Fagoaga Altuna Ignacio, and Barykin Georgiy. Company: Aerostar Coatings S L. Issued: November 4, 2008.

***System and Process for Gas Recovery System.*** This invention is directed to a three-stage process for recovering and purifying a helium gas, and a system for using the three-stage process. The steps comprises (a) introducing a gas from a cold spray forming chamber to a particulate removing apparatus to form a particulate-free helium gas, and recycling a first portion of the particulate-free helium gas back to the chamber; (b) passing a second portion of the particulate-free helium gas to a first compressor prior to passing a helium gas purification membrane to form a purified helium gas and an exhaust gas, and passing the purified helium gas to mix with the first portion of particulate-free helium gas to the chamber; and (c) passing a third portion of the particulate-free helium gas to a liquid separator apparatus to remove water and a receiver to dampen any pulsation to form a liquid-free helium gas, and recycling the liquid-free helium gas to said cold spray forming chamber.

JP4162488: Jaynes Scot Eric. Company: Praxair Technology Inc. Issued: October 8, 2008.

***Thermal Spray Coating Process for Rotor Blade Tips.*** A process for controllably applying thermal spray coating onto substrates is described. The process includes positioning rotor blades in a fixture rotatable about an axis, forming a spray of particles of softened coating medium in an apparatus for propelling the coating medium towards the blade tips and coating the blade tips by passing the blades through the spray of particles of coating medium. Various process details, including process parameters, are developed.

JP4162785: Zajchowski Paul H., Diaz Alfonso, Freling Melvin, and Lally John F. Company: United Technologies Corp. Issued: October 8, 2008.