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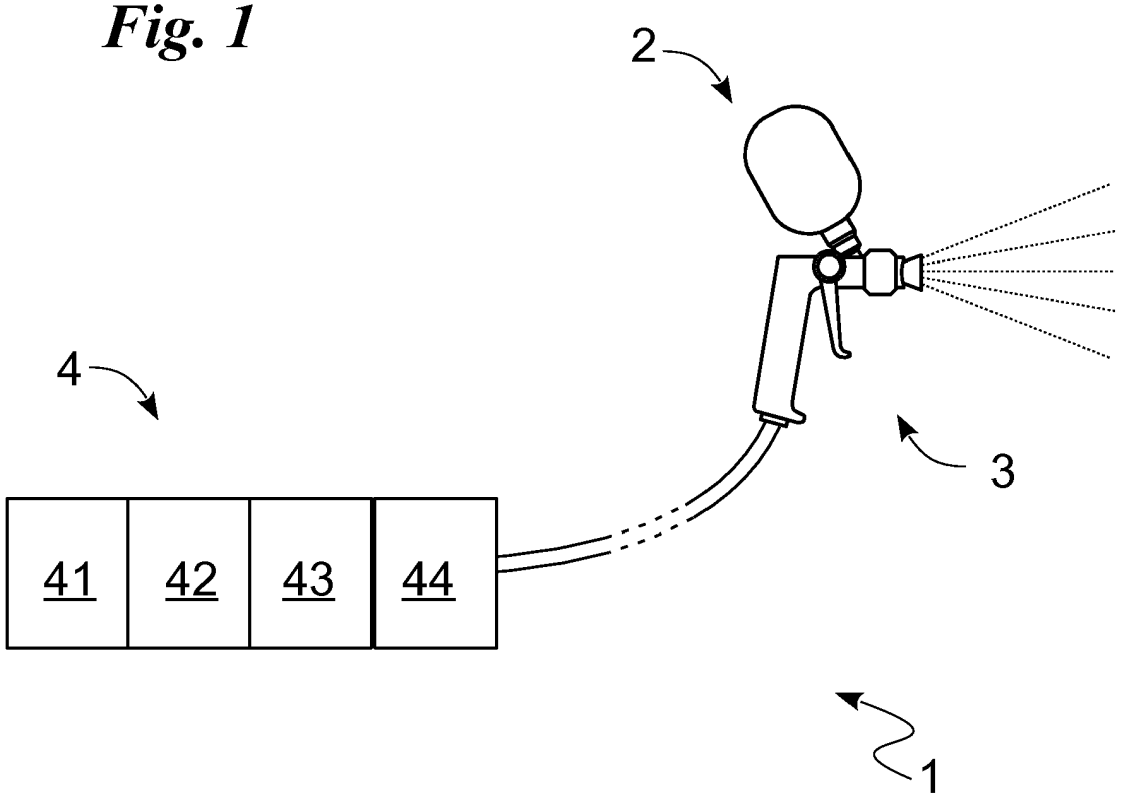
(54) A SPRAY SURFACE TREATMENT DEVICE

(57) There is provided a spray surface treatment device (1) comprising a tank (2) of paint product; a paint gun (3) adapted to spray the paint product in the tank (2); and a feeding system (4) adapted to supply the paint gun (3) with a pressurized feed gas comprising a nitrogen content comprised between 790,000 and 1,000,000 ppmv, a carbon dioxide content comprised between 5 and 100,000 ppmv, an argon (Ar) content comprised between 100 and 100,000 ppmv, an oxygen (O2) content comprised between 10 and 210,000 ppmv, so as to allow the paint gun (3) to spray a mixture of feed gas and paint product.

Fig. 1



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Description

[0001] The present invention relates to a spray surface treatment device, i.e. a device exploiting a pressurized gas jet to deliver a (powder or liquid) paint product of the type specified in the preamble of the first claim.

[0002] As is known, spray surface treatment devices, and in particular spray painting devices, usually consist of a pressurized air feeding system (such as a compressor); a tank of paint product; and a (manual or automatic) paint gun connected both to the pressurized air feeding system and to the tank designed to deliver a fluid produced at the outlet of the paint gun provided by the mixing of the product with the pressurized air.

[0003] The paint product may be of various types: watercolour, ink, oil paint, tempera paint, acrylic paint, or solvent based paint. It may be either in the form of a powder or in the form of a liquid.

[0004] The described prior art has a few major drawbacks.

[0005] A first drawback is that the surface treatment, and specifically the painting thus executed are often low quality as they exhibit defects and nonconformities that can only be seen at the end of the process and therefore require both costly and time-consuming post-processing interventions in order to correct such imperfections and/or defects.

[0006] It should be pointed out that the defects may be so critical that the entire treatment has to be carried out again.

[0007] These aspects are due to the fact that the fluid produced at the outlet of the paint gun is very susceptible to environmental conditions (temperature, humidity, the presence of electrostatic charges, etc.) and therefore requires, for each application, that the parameters of the fluid produced be selected in a precise and accurate manner.

[0008] It should be pointed out that this selection, being carried out by the operator based on his/her own experience, is almost never the optimum.

[0009] This aspect is evident in paintings where dust or other impurities may be introduced. It should be noted that, in order to reduce the susceptibility of the produced fluid to environmental conditions, the operator often selects much higher working pressures than those actually necessary, leading to an increase in the product used per unit area and therefore to increased costs of the surface treatment.

[0010] In addition, the surface treatment devices are forced to work in much harsher conditions and therefore tend to break more frequently.

[0011] In this context, the technical task underlying the present invention is to devise a spray surface treatment device, which is capable of substantially obviating at least some of the above-mentioned drawbacks.

[0012] Within the scope of said technical task, a major object of the invention is to obtain a spray surface treatment device, which allows a surface treatment substantially defect-free, and therefore of high quality and low cost, to be provided in a simple, fast and reproducible manner.

[0013] Another major object of the invention is to provide a spray surface treatment device, which is not affected by environmental parameters such as, for example, temperature and humidity.

[0014] The technical task and the specified objects are achieved by means of a spray surface treatment device as claimed in appended claim 1. Exemplary preferred embodiments are described in the dependent claims.

[0015] Preferred embodiments are set forth in the dependent claims.

[0016] The features and advantages of the invention will be clarified in the following detailed description of preferred embodiments of the invention, with reference to the accompanying drawings, in which:

Fig. 1 shows a spray surface treatment device according to the invention; and

Fig. 2 schematizes the operation of the spray surface treatment device. Herein, the measures, values, shapes and geometric references (such as perpendicularity and parallelism), when used with words like "about" or other similar terms such as "approximately" or "substantially", are to be understood as except for measurement errors or inaccuracies due to production and/or manufacturing errors and, above all, except for a slight divergence from the value, measure, shape or geometric reference with which it is associated. For example, these terms, if associated with a value, preferably indicate a divergence of not more than 10% from said value.

[0017] Furthermore, when used, terms such as "first", "second", "higher", "lower", "main" and "secondary" do not necessarily identify an order, a priority relationship or a relative position, but can simply be used to distinguish more clearly the different components from each other.

[0018] Unless otherwise indicated, the measurements and data provided in this document are to be considered using International Standard Atmosphere ICAO (ISO 2533). Unless otherwise specified, as is apparent from the following discussion, terms such as "treatment", "data processing", "determination", "calculation", or the like, are understood to refer to the action and/or processes of a computer or similar electronic computing device which manipulates and/or transforms data represented as physical, such as electronic sizes of registers of a computer system and/or memories, into other data similarly represented as physical quantities in computer systems, registers or other storage, transmission or information display devices. With reference to the Figures, the spray surface treatment device according to the invention is indicated as a whole by the numeral **1.**

[0019] The spray surface treatment device 1 is suitable for painting or performing other surface treatments by

discharging, and specifically depositing a paint product. In particular, it is suitable for coating\painting by discharging a flow obtained by mixing a pressurized gas with at least one paint product. Preferably, the spray surface treatment device 1 can be used to paint or perform surface treatments of metal elements (such as, for example, in car body shops) or polymeric or natural elements (such as wood).

[0020] The spray surface treatment device 1 may comprise at least one tank **2** of paint product.

[0021] The spray surface treatment device 1 may comprise at least one paint gun **3** adapted to use a feed gas to pulverize (or atomise) the paint product contained in the tank 2 and then spray a mixture of feed gas and paint product on the surface to be treated. The paint gun 3 is in fluidic through connection with the tank 2.

[0022] The paint gun 3 may be of a known type. For example, it may be a single-action airbrush; a dual-action airbrush; a turbine airbrush; a gun airbrush.

[0023] The tank 2 may be integral with the paint gun 3, which can therefore be identified as a well-known airbrush or gun airbrush.

[0024] The spray surface treatment device 1 may comprise a feeding system 4 adapted to supply the paint gun 3 with a pressurized feed gas so as to allow the paint gun to spray a mixture of feed gas (coming from the feeding system 4) and paint product (coming from the tank 2).

[0025] This mixture virtually determines the spray pattern.

[0026] The feeding system 4 is in fluidic through connection with the paint gun 3.

[0027] The feed gas provided by the feeding system 4 has an ozone (O_3) content substantially comprised between 0.1 and 100,000 ppmv (parts per million by volume), and in particular between 0.1 and 50,000 ppmv and more particularly between 0.1 and 10,000 ppmv.

[0028] This feed gas has a methane (CH_4) content substantially comprised between 1 and 5,000 ppmv, and in particular between 1 and 100 ppmv.

[0029] The feed gas has a carbon monoxide (CO) content substantially comprised between 0.1 and 5,000 ppmv, and in particular between 0.1 and 100 ppmv.

[0030] The feed gas has a nitrogen (N_2) content substantially comprised between 820,000 and 999,883.80 ppmv, and in particular between 880,000 and 980,000 ppmv.

[0031] The feed gas has an argon (Ar) content substantially comprised between 100 and 100,000 ppmv by volume, in particular between 5,000 and 10,000 ppmv and more particularly between 5,000 and 7,500 ppmv.

[0032] The feed gas has a carbon dioxide (CO_2) content substantially comprised between 5 and 100,000 ppmv by volume, in particular between 10 and 20,000 ppmv and more particularly between 10 and 10,000 ppmv. It is preferably substantially comprised between 500 and 10,000 ppmv and more particularly between 1000 and 10,000 ppmv.

[0033] The feed gas has an oxygen (O_2) content substantially comprised between 10 and 210,000 ppmv, in particular between 10,000 and 100,000 ppmv and more particularly between 20,000 and 50,000 ppmv.

[0034] The feed gas is suitably air depleted of oxygen (O_2) and consequently having an advantageously greater content of one or more of ozone, methane, carbon monoxide, carbon dioxide, nitrogen and argon, appropriately present at the concentrations described above.

[0035] Preferably, the feed gas is air depleted of oxygen comprising ozone, methane, carbon monoxide, carbon dioxide, nitrogen and argon, appropriately present at the concentrations described above.

[0036] The term "air" refers to the gas present in the troposphere and in particular in the vicinity of the earth's crust.

[0037] The feed gas can be ionized. It can therefore selectively exhibit a negative or positive charge. Alternatively, the feed gas is pulsed-charged and therefore characterised by a charge variation frequency suitably between two limit values. These limit values can be positive, negative and/or null.

[0038] Optionally, the feed gas can be thermoregulated so as to have a different temperature from room temperature. In particular, it can be heated to a heating temperature higher than room temperature or cooled down to a cooling temperature lower than room temperature.

[0039] The heating temperature may be at least 20°C, more precisely substantially comprised between 30°C and 100°C, and even more precisely between 30°C and 60°C.

[0040] The cooling temperature may be substantially comprised between -10 °C and 40 °C, and more precisely between 5 °C and 20 °C.

[0041] The feeding system 4 can be a storage tank for the feed gas. Alternatively, the feeding system 4 may comprise several gas tanks each containing at least one of the above-mentioned components of the feed gas and optionally of the air, and an apparatus for mixing the components according to the contents described above.

[0042] Preferably, the feeding system 4 is adapted to generate the feed gas by exploiting suitably pressurized air.

[0043] The feeding system 4 may comprise at least one filter **41** adapted to remove dusts and other impurities from the suitably pressurized air entering the system 4.

[0044] The filter 41 is adapted to achieve a purity level of at least class 1 (said class is defined according to ISO 8573-1:2010).

[0045] The filter 41 is the first element encountered by the air entering the feeding system 4.

[0046] The filter 41 may be of a known type.

[0047] The feeding system 4 can be adapted to generate said feed gas by removing at least part of the oxygen from the air, suitably from pressurized air. It may thus comprise at least one separator **42** adapted to obtain a feed gas with reduced oxygen content and specifically featuring a different content of at least one component from the gas, i.e. the air, entering the separator 42. Said

at least one component can be one or more of ozone, methane, carbon monoxide, carbon dioxide, nitrogen and argon.

[0048] The separator 42 can be downstream of the filter 41 (in accordance with the progress of the gas/air) so as to receive the gas coming out of the same filter 41. The separator 42 can be adapted to obtain the feed gas by extracting at least part of the oxygen, and suitably of the water vapour, from the air.

[0049] Preferably, the separator 42 extracts at least part of the oxygen, the water vapour, the helium and the hydrogen from the air.

[0050] The separator 42 may have a suitably polymeric membrane (more suitably a hollow fibre membrane) adapted to use one or more membranes at least partially impermeable to the elements to be discarded, at least partially, from the air (oxygen, water vapour, helium and hydrogen) and permeable to one or more of ozone, methane, carbon monoxide, carbon dioxide, nitrogen and argon.

[0051] Conveniently, the separator 42 may comprise one or more membranes at least partially permeable to ozone, methane, carbon monoxide, carbon dioxide, nitrogen and/or argon.

[0052] Alternatively, the separator 42 can be of the PSA type (Pressure Swing Adsorption) i.e. a separator exploiting, as the working principle, the PSA, in other words the affinity of the elements to be discarded from the air with an adsorbent material. This type of separator 42 may comprise activated charcoal molecular sieves. Preferably the separator 42 has a suitably polymeric membrane, and more suitably a hollow fibre membrane.

[0053] It should be noted that the feeding system 4 can be, and in detail is, devoid of a temperature regulation apparatus, and precisely of heating upstream of the separator 42 and preferably of the filter 41, and therefore of the air entering the separator 42 and preferably the filter 41. Accordingly, the air entering the separator 42 and preferably the filter 41 has the same temperature as the outside temperature. Preferably, the spray surface treatment device 1 is devoid of a temperature regulation apparatus, and precisely of heating upstream of the feeding system 4 and therefore able to heat the air entering the feeding system 4.

[0054] The feeding system 4 may comprise an ionizer **43** for the feed gas.

[0055] The ionizer 43 can be downstream of the separator 42 (in accordance with the progress of the gas/air) so as to receive the gas coming out of the same separator 42.

[0056] The ionizer 43 is adapted to at least partially ionize the oxygen in said feed gas, at least partially transforming it into ozone. It can be adapted to produce ozone in the feed gas, preferably by electron ionization of said gas. In particular, the ionizer 43 is suitable to provide the feed gas with a high-voltage electric charge suitable to generate ozone in addition to that already present in the feed gas.

[0057] The desired ozone content can thus be obtained through ionization and/or said extraction of at least part of the oxygen.

[0058] In particular, the ionizer 43 may be adapted to generate a magnetic field of such intensity (greater than the dielectric strength of the feed gas) that the ions in the feed gas are excited and, by colliding with any residual oxygen in the feed gas, ionize it, thereby causing additional ozone formation.

[0059] The ionizer 43 is adapted to modify the electric charge of said feed gas, and for example to charge it electrically or make it statically/electrically neutral. It comprises at least one electrode and at least one generator adapted to apply a voltage (a negative and/or positive charge) to said at least one electrode, and therefore to electrically (negatively and/or positively) charge the feed gas.

[0060] Said charge may be constant or pulsed.

[0061] Preferably, the at least one generator is adapted to apply a voltage substantially comprised between 0.1 kV and 100 kV to said at least one electrode.

[0062] In particular, the ionizer 43 comprises two generators, one of which is adapted to generate a negative voltage, leading to a negatively charged feed gas, and the other is adapted to generate a positive voltage, leading to a positively charged feed gas. The ionizer 43 conveniently emits a variable-frequency pulsed voltage (constant voltage), thus favouring a greater number of collisions between the molecules in terms of numbers and therefore the formation of ozone, anions (negative oxygen ions that have gained electrons) and cations (positive oxygen ions that have given up electrons).

[0063] The feeding system 4 may comprise a regulator **44** for adjusting the temperature of the feed gas and hence of the feed gas and paint product mixture coming out of the paint gun 3.

[0064] It should be noted that the temperature regulator 44 acts on the feed gas and not on the paint product. The paint product is heated in the paint gun 3 by contact with said feed gas. It is thus heated immediately before being deposited, therefore preventing dangerous chemical and rheological reactions.

[0065] The regulator 44 is adapted to heat the feed gas to the heating temperature. Alternatively or additionally, the regulator 44 is adapted to cool down the feed gas to the cooling temperature.

[0066] The regulator 44 is downstream of the separator 42 so as to heat the air coming out of the same separator 42. Preferably, it is downstream of the ionizer 43.

[0067] The regulator 44 may be of a known type.

[0068] It should be noted that the regulator 44 is adapted to heat the feed gas to the heating temperature.

[0069] The regulator 44 is therefore the only control element, and in particular the only element heating the feed gas of the feeding system 4, and specifically of the spray surface treatment device 1.

[0070] Alternatively, the feeding system 4 may be devoid of the temperature regulator 44. Lastly, the spray

surface treatment device 1 can comprise a control unit adapted to control the operation of the spray surface treatment device 1; and, preferably, interface means (such as a keypad or knob) adapted to allow an operator to control, even remotely, the operation of the spray surface treatment device 1.

[0071] The control unit is adapted to adjust the delivery of the paint product and in particular of the feed gas and paint product mixture. In particular, the control unit is adapted to define a continuous delivery or a pulsed-charge delivery at a frequency preferably selectable by the operator via said interface means.

[0072] The control unit is adapted to control the regulator 44 and therefore the temperature of the feed gas.

[0073] The invention comprises a new spray surface treatment method **10** which can be implemented by the spray surface treatment device 1 previously described in structural terms.

[0074] The spray surface treatment method 10 is characterised in that it paints or performs other surface treatments by delivering a mixture of a paint product and a pressurized feed gas comprising at least one or more of ozone, methane, carbon monoxide, carbon dioxide, nitrogen and argon, appropriately present at the concentrations described above.

[0075] Preferably, the feed gas is air depleted of oxygen comprising ozone, methane, carbon monoxide, carbon dioxide, nitrogen and argon, appropriately present at the concentrations described above.

[0076] The characteristics (composition, temperature, etc.) of the feed gas are described above and hence not set out here for practical purposes.

[0077] The spray surface treatment method 10 may comprise a deposition step **11** wherein the feed gas and the paint product are mixed together and then delivered to the surface to be painted.

[0078] In particular, the feed gas is conveyed towards the paint product and strikes said paint product causing the atomization\pulverization thereof and thus allowing the mixing thereof with the feed gas and the consequent formation of the mixture (the spray pattern).

[0079] In particular, the deposition step 11 may provide the delivery of said mixture at a constant and/or pulsed charge.

[0080] This step 11 can be performed by the paint gun 3.

[0081] Prior to the deposition step, the spray surface treatment method 10 may comprise a provision step **12** of providing the feed gas through the removal of at least part of the oxygen from suitably pressurized air.

[0082] The extraction of the oxygen from the air can be performed by the separator 42, for example through PSA, or preferably a suitably polymeric membrane, and more suitably a hollow fibre membrane, or alternately.

[0083] Oxygen extraction is performed by processing unheated air since the feeding system 4 is devoid of a temperature regulation apparatus upstream of the separator 42.

[0084] Suitably, the spray surface treatment method 10 may comprise a filtration step **13,** prior to the provision step 12, wherein dusts and other impurities are removed from the air.

[0085] Preferably, the filtration step 13 allows air of class 1 to be obtained in accordance with ISO 8573-1:2010.

[0086] The filtration step 13 can be performed by the filter 41.

[0087] The spray surface treatment method 10 may comprise an ionization step **14,** subsequent to the provision step 12 and prior to the deposition step 11, wherein the feed gas is ionized.

[0088] In this ionization step 14, the feed gas can be either negatively or positively electrically charged.

[0089] The ionization step 14 can be performed by the ionizer 43.

[0090] The spray surface treatment method 10 may comprise a thermoregulation step **15** for regulating the temperature of the feed gas prior to the deposition step.

[0091] In the thermoregulation step 15, the gas can be adjusted to the cooling and/or heating temperature.

[0092] The thermoregulation step 15 is preferably subsequent to the provision step, and precisely to the ionization step.

[0093] The thermoregulation step 15 can be performed by the regulator 44.

[0094] The device 1 and consequently the spray surface treatment method 10 according to the invention achieve important advantages.

[0095] A first important advantage is that the separator 42 processes air which is substantially at room temperature and thus not heated.

[0096] In fact, while all the known devices heat the air before performing oxygen removal, obtaining an increase in the capacity of the separator 42, the inventor has realized that the increase in the temperature of the air entering and then being processed in the separator 42 causes a rapid and significant deterioration of the processing capacity of the separator itself. Consequently, the deterioration of the capacity of the separator 42 quickly undoes the enhancement given by the higher temperature of the air being processed and immediately after leads to a fast impossibility of correctly using the air coming out of the separator 42.

[0097] By virtue of this, the surface treatment device 1, in contrast with the known devices which require frequent replacement/reconditioning of the separator, features a more durable separator 42 and therefore requires less frequent maintenance and, above all, is provided with greater constructional simplicity and reliability and lower consumption.

[0098] It should be noted that this advantage, due to the absence of means for heating the air upstream of the separator 42, is particularly evident in the separator 42 if of the membrane type.

[0099] An important advantage is the innovative use of a feed gas characterised by the above-described

ozone contents, which allows a slight abrasion of the surface to be painted, which is therefore cleaned of any residues, thus enabling optimal deposition and adhesion of the paint product.

[0100] An important advantage is given by the content of carbon monoxide in the feed gas, which prevents oxidation of the surface to be dyed.

[0101] A further advantage is given by the fact that the particular feed gas, by virtue of its own characteristics, minimizes the surface tension of a liquid or powder paint product, allowing greater fractionation of the paint product and therefore its reduction into very small and homogeneous drops/particles.

[0102] This aspect allows the deposition of small sized drops and therefore the generation of a produced film with reduced thickness and thus lower cost.

[0103] One advantage is the particular concentration of oxygen, which, in addition to allowing the creation of ozone, is optimal in order to optimize the drying of some paint products. In fact, some of them are added with fillers (e.g. gliding, drying and antioxidant additives), which dry by absorbing oxygen and become thicker until they form a solid film and thus a thick and surface-hardened film.

[0104] Another advantage is given by the particular content of carbon dioxide, which, in addition to cleaning the surfaces to be treated, has a great capacity of penetration and diffusion in the surfaces, thus allowing greater adhesion of the paint product during spraying, greater homogeneity of the film and absence of later swelling. These aspects result in a reduced need for solvent use during spraying, thus reducing the volatile organic components which are harmful to the environment. Other advantages are the particular content of argon, which ensures protection against oxidation and early wear of the electrodes intended for the ionization of the carrier fluid, and the particular content of methane, which effectively dissolves organic solvents and acts as a temperature stabilizer.

[0105] A major advantage is also the possibility of thermoregulating the feed gas, thereby avoiding variations in the temperature of the mixture coming out of the paint gun and ensuring greater uniformity, and hence quality, of the paint or other surface treatment.

[0106] A further major advantage is given by the particular content of nitrogen, which, for example, stabilizes the flow, making the mixture produced by the surface treatment device 1 less subject to turbulence.

[0107] One advantage is given by the arrangement of the ionizer 43 upstream of the temperature regulator 44. In fact, as the ionization is sensitive to temperature variations and the oscillations of the ambient temperature are lower than those that can be set by the operator (from -10°C to +100°C), the ionizer 43 can work in conditions of reduced energy expenditure.

[0108] An important advantage is that the temperature regulator 44 acts on the feed gas and not on the paint product. Accordingly, the paint product is heated in the paint gun 3 shortly before being deposited, thereby preventing chemical and rheological reactions that would occur in the case of prior heating.

[0109] Another advantage is that the ionizer 43 acts as a filter. In fact, the anion, as it has a larger surface, allows better cleaning of the feed gas from suspended dust. In fact, it binds to said dust that can then be carried and deposited on the surface of the ionizing treatment chamber, which, since it is grounded like the whole device, represents my positive pole at the electrostatic level.

[0110] Lastly, it should be noted that the mixture produced by the surface treatment device 1 is anhydrous (or in any case with a low content of water vapour), thus avoiding all the problems that are typical of the known devices due to the presence of water vapour.

[0111] The invention is susceptible of variations falling within the scope of the inventive concept as defined by the claims. In this context, all details are replaceable by equivalent elements, and the materials, shapes and dimensions may be any type of materials, shapes and dimensions.

Claims

1. A spray surface treatment device (1) adapted to deposit a pulverized paint product and comprising:

- a tank (2) of said paint product;
- a feeding system (4) adapted to supply said surface treatment device (1) with a feed gas;
- a paint gun (3) adapted to use said feed gas to pulverize said paint product contained in said tank (2) and then spray a mixture of said feed gas and said paint product;

and **characterised in that**

- said feeding system (4) is adapted to supply said paint gun (3) with said pressurized feed gas comprising a nitrogen content substantially comprised between 790,000 and 1,000,000 ppmv, a carbon dioxide content substantially comprised between 5 and 100,000 ppmv, an argon (Ar) content substantially comprised between 100 and 100,000 ppmv, an oxygen (O2) content substantially comprised between 10 and 210,000 ppmv.

2. The spray surface treatment device (1) according to claim 1, wherein said nitrogen content is substantially comprised between 880,000 and 980,000 ppmv; wherein said carbon dioxide content is substantially comprised between 1000 and 10,000 ppmv; wherein said argon (Ar) content is substantially comprised between 5,000 and 7,500 ppmv; and wherein said oxygen (O2) content is substantially comprised between 10,000 and 100,000 ppmv.

3. The spray surface treatment device (1) according to at least one of the preceding claims, wherein the ozone content in said feed gas is substantially comprised between 0.1 and 50,000 ppmv.

4. The spray surface treatment device (1) according to at least one of the preceding claims, wherein said feed gas comprises a methane content substantially comprised between 1 and 100 ppmv.

5. The spray surface treatment device (1) according to at least one of the preceding claims, wherein said feed gas comprises a carbon monoxide content substantially comprised between 0.1 and 100 ppmv.

6. The spray surface treatment device (1) according to at least one of the preceding claims, wherein said feeding system (4) comprises an ionizer (43) adapted to at least partially ionize the oxygen in said feed gas, at least partially transforming it into ozone.

7. The spray surface treatment device (1) according to at least one of claims 5-6, wherein said ionizer (43) is adapted to modify the electric charge of said feed gas.

8. The spray surface treatment device (1) according to at least one of the preceding claims, wherein said feeding system (4) comprises a regulator (44) for adjusting the temperature of said feed gas and hence of said mixture of said feed gas and said paint product coming out of said paint gun (3).

9. A spraying surface treatment method (10) **characterised in that** the painting process is performed through delivering a mixture of a paint product and a pressurized feed gas comprising a nitrogen content substantially comprised between 790,000 and 1,000,000 ppmv, a carbon dioxide content substantially comprised between 5 and 100,000 ppmv, an argon (Ar) content substantially comprised between 100 and 100,000 ppmv, an oxygen (O2) content substantially comprised between 10 and 210,000 ppmv.

10. The spraying surface treatment method (10) according to the preceding claim, wherein said pressurized feed gas comprises an ozone content substantially comprised between 0.1 and 50,000 ppmv, a methane content substantially comprised between 1 and 100 ppmv, a carbon monoxide content substantially comprised between 0.1 and 100 ppmv.

11. A spray surface treatment device (1) adapted to deposit a pulverized paint product and comprising:

- a tank (2) of said paint product;
- a feeding system (4) adapted to supply said surface treatment device (1) with a feed gas;
- a paint gun (3) adapted to use said feed gas to pulverize said paint product contained in said tank (2) and then spray a mixture of said feed gas and said paint product;

and characterised in that

- said feeding system (4) comprises at least one separator (42) adapted to obtain said feed gas with reduced oxygen content by removing oxygen from the air and is devoid of a temperature regulation apparatus upstream of said separator (42) so as to allow said separator (42) to process the air at the same temperature as the outside temperature.

12. The spray surface treatment device (1) according to claim 11, wherein said feeding system (4) is devoid of a heating apparatus upstream of the separator (42).

13. The spray surface treatment device (1) according to at least one of claims 11-12, wherein said feeding system (4) comprises a filter (41) adapted to remove dusts and other impurities from said air entering said separator (42); and wherein said feeding system (4) is devoid of a temperature regulation apparatus upstream of said filter (41).

14. The spray surface treatment device (1) according to at least one of claims 11-13, wherein said feeding system (4) comprises a regulator (44) for adjusting the temperature of said feed gas downstream of said separator (42) and an ionizer (43) for said feed gas arranged downstream of said separator (42) and upstream of said regulator (44).

15. A spray surface treatment method (10) for spraying a mixture of a paint product and a feed gas, **characterised in that** it comprises a provision step (12) of providing said feed gas through the removal of at least part of the oxygen from suitably pressurized, non-heated air.

Fig. 1

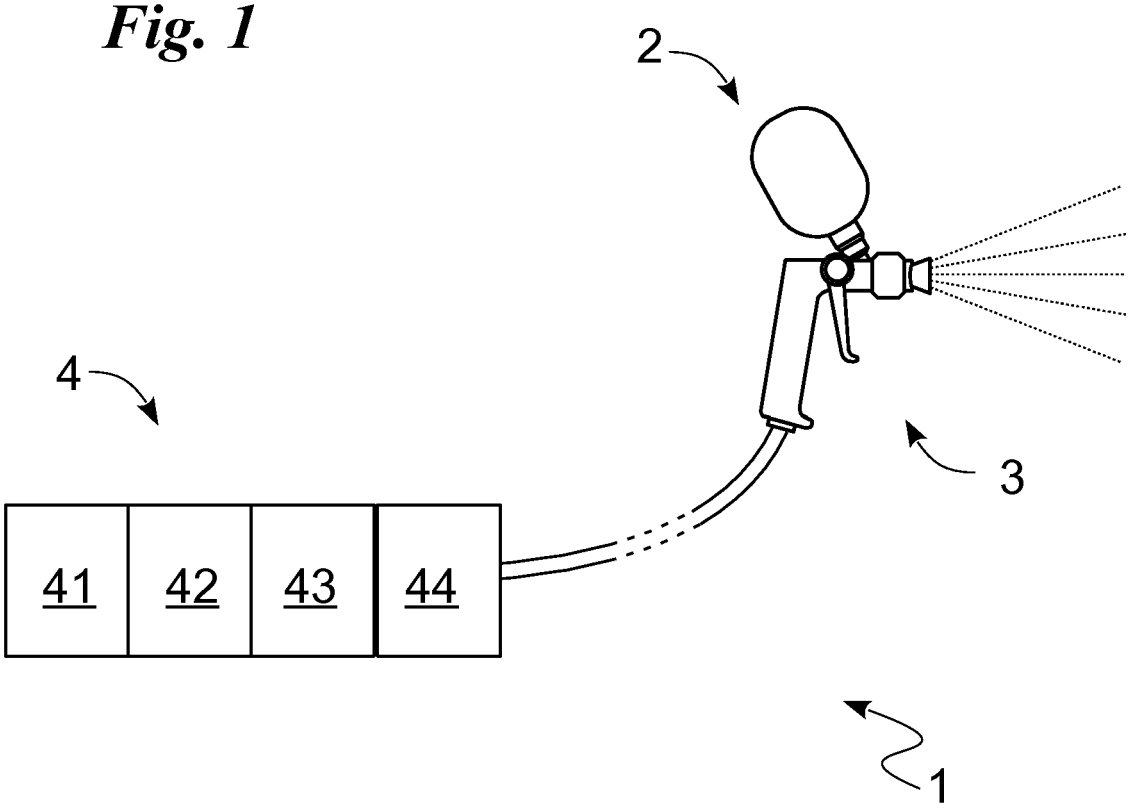
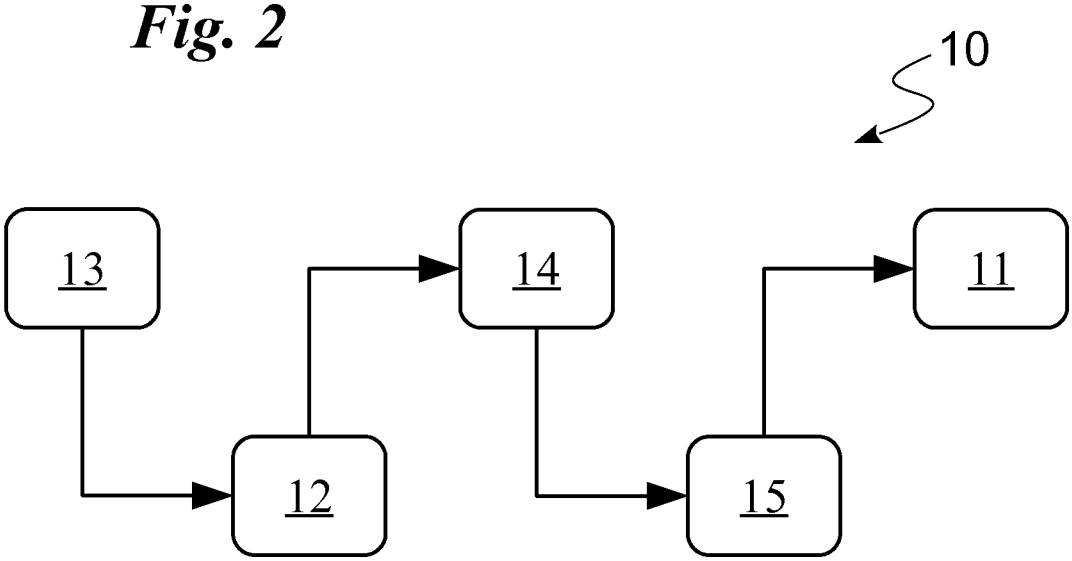


Fig. 2



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EUROPEAN SEARCH REPORT

Application Number
EP 19 15 1921

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	GB 964 339 A (GREIFF SVENSKA MASKIN AB) 22 July 1964 (1964-07-22) * page 2, line 51 - line 125; figures 1-3 * -----	1-10	INV. B05B7/02 B05B7/14 B05B5/03 B05B5/16
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	29 May 2019	Lohse-Busch, Heike

CATEGORY OF CITED DOCUMENTS

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Application Number
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