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(54) **Process for the preparation and application of a protective coating composition, as well as objects coated with such composition**

(57) The present invention relates to a process for the preparation of a coating composition, in particular for protecting surfaces from undesired contamination and facilitating removal of the contamination from these surfaces, a combination of a wet lacquer and a powder lacquer being applied to the surface, which combination comprises a primer, as well as tetrafluorethylene poly-

mer and/or polyfluoranoxyde. This composition can be used for many applications, in particular for the protection of surfaces of suspension and support organs that are used during high-pressure spray operations, like painting or cleaning.

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Description

[0001] The present invention relates to a process for the preparation and application of a coating composition, in particular for protecting surfaces against undesired contamination and for facilitating removal of such contamination. More particularly, this invention relates to the protection of surfaces of suspension and support organs, that are used in high-pressure spray treatments, like painting or cleaning.

[0002] In most cases it is inevitable that the immediate surroundings of an object to be treated such are hit by a certain amount of paint or cleaning agent and such, it being desired that the paint or cleaning agent on the unwanted areas can be removed easily and without detrimental consequences.

[0003] In WO 92/08555 a protective coating is described, that can be applied in the spray-painting of cars and buildings etc. Spray-paint treatments require considerable preparation, where one has to make sure that parts of a car or a building that are to be left out of the treatment, are protected against overspray. This is often done with masks and tape of paper or plastic. The application of those is a labour-intensive and time-consuming chore, that has to be performed with great accuracy. The masking material that is described in this reference comprises polyvinyl alcohol, glycerin or triethylene alcohol a surface-active agent and water. It is applied to the surface that is to be protected and subsequently dried. When the thus treated surface has been into contact with paint, the paint is left to dry, after which it can be removed by peeling it off or with water.

[0004] During spray-painting or high-pressure cleaning of smaller objects special precautions have to be taken as well. In such cases the objects to be treated are either suspended or supported. Thereby it is desired that the surfaces of the suspension or support organs, as well as all other surfaces that are hit by the overspray are made such, that the overspray of paint or impurities does not adhere to these surfaces permanently, and may also be removed from them easily. It is presently the custom to have contaminated suspension and support organs cleaned with special cleaning techniques after use. However, this is expensive and time-consuming.

[0005] It is the aim of the present invention to provide a process and a coating composition for the protection from undesired contamination of surfaces that, for example, come into contact with paint and/or cleaning treatments. In particular, it is the aim of this invention to provide a coating composition that allows to remove this contamination, which composition exceeds the existing protective compositions with respect to its characteristics.

[0006] Surprisingly, it has now been found, that this aim can be achieved with a coating composition comprising a combination of a wet lacquer and a powder lacquer, both lacquers being baked together, the wet lac-

quer comprising a primer and the powder lacquer comprising a fluoropolymer, in particular a polytetrafluoroethylene, a fluorinated ethane-propane copolymer or comprising a perfluoroalkoxy or a mixture of two or more of these polymers.

[0007] Therefore the invention is characterized in that a combination of a wet lacquer and a powder lacquer is applied to the surface, which combination comprises a primer, as well as fluoropolymer, in particular a polytetrafluoroethylene, a fluorinated ethane-propane copolymer or a perfluoroalkoxy or a mixture of two or more of these polymers.

[0008] Tetrafluoroethylene polymer, better known by the name Teflon, possesses, as is known, good anti-caking characteristics. However, the characteristics of this material alone did not prove sufficient to provide a coating composition that achieves the set aim.

[0009] Fluorinated ethane-propane copolymer and perfluoroalkoxy are coating materials that also display favourable anti-caking characteristics, but of which the characteristics alone are not sufficient to allow to obtain a coating composition that reaches the set aim.

[0010] The non-obvious combination of a wet lacquer and a dry lacquer of tetrafluoroethylene polymer and/or polyfluoranoxide, that forms the basis of the invention, surprisingly lead to a coating composition, to which paint and other substances, like dirt do not adhere or non-permanently and from which they can be removed easily.

[0011] According to a further aspect of the invention the preparation of the protective coating composition comprises the following steps:

- application of a primer coat to the surface as a wet lacquer;
- application to the wet layer of a powder layer of polytetrafluoroethylene, a fluorinated ethane-propane copolymer or a perfluoroalkoxy or a mixture of two or more of these polymers; and
- baking these layers at increased temperature. It was found that during the baking, the powder lacquer melts and that this melt becomes fixed to the primer.

[0012] The weight ratio of the wet lacquer and the dry lacquer and also of the tetrafluoroethylene polymer and polyfluoranoxide amongst themselves is not critical for this invention and can be selected from a wide range. Preferably the coat thickness of the wet lacquer after baking is 7-15 μm , more preferably about 10 μm , and of the powder lacquer after baking about 12-20 μm , preferably about 15 μm . A coat thickness that is too small is at the expense of the lifespan of the coating, and has an adverse influence on the anti-caking characteristics of the coating composition.

[0013] The coating composition according to the invention may, if so desired, contain other components, like further anti-caking agents, filling agents, adhesion

agents, colouring agents, a hardener, a top coat etc.

[0014] Prior to application of the coating composition according to the invention to the surface to be treated, this surface is preferably cleaned thoroughly beforehand. This cleaning may be performed in many ways, which are known to the man skilled in the art. It is particularly important that the surfaces to be treated are degreased. The degreasing may also be performed in many ways, attention having to be given to the nature of the material and of the dirt. Preferably metal objects, aluminium excluded, are degreased thermally in an oven at a temperature of 300-400°C. Objects made of aluminium are preferably degreased chemically using well-known solvents.

[0015] A further cleaning method is blasting of the objects to be treated, for example with silicium oxide (sand) or aluminium oxide as blasting agent. A suitable blasting agent is korund aluminium oxide type 24, preferably the purest kind to avoid corrosion of the underlying layer. The blasting is preferably performed at a pressure of about 3,5 bar based on an impact with a depth of about 10 µm.

[0016] The two cleaning steps described above are preferably performed consecutively on the surfaces to be treated, the degreasing step usually being performed first. After blasting, the surfaces to be treated are treated further as quickly as possible, to avoid oxidation.

[0017] The zinc layer preferably contains two components, viz. zinc in powder form and a hardener in liquid form, which is known to the man skilled in the art. The two components are mixed, preferably with a mixer, so that a liquid product is formed. A suitable zinc:hardener mixing ratio is for example about 1:2. The thus obtained mixture is preferably sprayed on the surfaces to be treated immediately after blasting. Next, the objects are allowed to dry and harden, for example for 12 hours at room temperature. In order to accelerate the drying process the temperature can be increased or water can be misted on the objects to be treated.

[0018] After degreasing and/or blasting and possible application of a zinc layer or a similar layer of another material, the first layer is applied that forms part of the coating composition according to the invention, viz. the primer coat. Generally, many primers are suitable for use in said coating composition, resulting in a choice from a wide range. Suitable primers comprise for example diacetone, methylisobutylketone and dypyrilidone. Highly suitable primers are solvent-based primers, for example a Primer Black 423-604 BL of Dupont. The primer may comprise a suitable hardener. The primer is preferably sprayed on the surface to be treated, more preferably with a spray pressure of about 3,5 bar. The primer coat thickness is preferably 10 to 15 µm after baking at increased temperature.

[0019] Next, the dry lacquer of polytetrafluoroethylene, a fluorinated ethane-propane copolymer or a perfluoroalkoxy or a mixture of two or more of these polymers is applied, preferably also by spraying the lacquer

onto the surface. A usual technique for its application is electrostatic spraying. For the application of the powder lacquer the powders of these compounds are melted beforehand, both melts being mixed in some cases, after which the melt of one of both substances or of the mixture is sprayed on. The mixture can also be prepared by previously mixing the powders of the two components, then letting that mixture melt. If so desired, a suitable solvent is added in order to be able to spray the compound(s) better. Preferably the thickness of the applied dry lacquer is about 20 µm in molten state. Preferably the thus formed coat is allowed to rest for about 30 minutes, before the baking process is started.

[0020] The baking process constitutes an important part of the preparation process, excessive temperature swings having to be guarded against. It is important that the part, of which the surface is to be coated, is not heated too fast, in order to bring about that the part has a homogenous temperature, and a homogenous melt is obtained. The temperature of the baking process is preferably within the range of 300 to 370°C, more preferably between 315 and 340°C. The baking time is usually about 10 to 15 minutes. According to a preferred embodiment a temperature gradient is applied, according to which the temperature is raised from room temperature to about 340°C in about 1 hour, after which the temperature is held at this highest value for about 10 minutes. Next the product is air cooled. This process takes about 1 hour, during which the obtained coating composition hardens.

[0021] The thus prepared coating composition has highly favourable characteristics, especially with respect to the removal of paint overspray and of dirt of various nature. These materials can easily be removed from a surface that has been provided with the coating composition according to the invention, for example by applying a high-pressure water cleaner or alternatively with air under high pressure. The paint that is to be removed is best removed when it has dried. If so desired, the materials are removed from the protective coating by peeling them off.

[0022] The protective coating composition according to the invention can be used for many applications, but is especially suitable for metal. These applications comprise, but are not limited to, the covering of suspension and mounting systems, like those present on spray lines, that are led through ovens during the painting process, casu quo lacquering process. Such spraying lines can be automated, whereby efficient use can be made of conveyor belt systems (including screening plates and conveyor belt chains), which in such cases are preferably also protected with a coating composition according to the invention. The applications further comprise grates, for example floor grates and panels in spray cabins (for applications of primer, as well as of base lacquer and clear lacquer); filter holders; robot parts; spray turbines, ducts, ventilators of exhaust systems, water curtains and "flow coat" cabins.

[0023] The invention is now further illustrated with the following examples, that are in no way to be construed as limiting the invention.

Example 1

[0024] A suspension rack was degreased for 60 minutes by heating in an oven at 350°C. After cooling the rack was subjected to sand blasting until an impact of 10-15 µm was reached. Next a coat of a primer was applied, type Black 423-604 BL of Dupont, with a thickness of about 15 µm. Over the wet primer coat a layer of a PFA powder lacquer was applied, that had a thickness after baking of about 15 µm. After application of the powder lacquer the suspension rack was heated for about 60 minutes in an oven at 350°C to harden the coating.

[0025] The present invention is not limited to the embodiments described here, but also comprises all modifications, variants that are based on this description, whether it be in combination with the state of the art or not, and that lie within the grasp of the expert in this field. Such embodiments are also included in this invention. The claimed rights are defined by the following claims.

Claims

1. Process for the preparation of a coating composition, in particular for the protection of a surface against undesired contamination and for facilitating the removal of the contamination from this surface, **characterized in that** a combination of a wet lacquer and a powder lacquer are applied to the surface, the combination comprising a primer, as well as a polytetrafluoroethylene, a fluorinated ethane-propane copolymer or a perfluoroalkoxy, or a mixture of two or more of these polymers.
2. Process according to claim 1, **characterized in that** the process comprises the steps:
 - application of a primer coat to the surface as a wet lacquer
 - application of a powder coat of tetrafluoroethylene polymer and/or polyfluoranoxy over the wet coat; and
 - baking these coats at increased temperature
3. Process according to claim 2, **characterized in that** the baking is performed at a temperature between about 300°C and about 370°C, preferably between 315 en 340°C.
4. Process according to claim 2 or 3, **characterized in that** the temperature of the baking process is allowed to rise during 1 hour from room temperature to about 350°C and the temperature is held at 350°C for about 10 minutes, after which the surface

is allowed to cool.

5. Process according to any of the previous claims, **characterized in that** as primer use is made of a solvent-based primer, preferably a Primer Black 423- 604 BL of Dupont.
6. Process according to any of the previous claims, **characterized in that** the surface is cleaned prior to treatment with the wet lacquer.
7. Coating composition, **characterized in that** it comprises a combination of a wet lacquer and a powder lacquer, the wet lacquer being a primer and the dry lacquer consisting of a polytetrafluoroethylene, a fluorinated ethane-propane copolymer or comprising a perfluoroalkoxy or a mixture of two or more of these polymers.
8. Object provided with a surface that has been coated partially or completely with the composition of claim 7.



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EUROPEAN SEARCH REPORT

Application Number
EP 02 44 7040

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
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X	US 5 232 746 A (BLAEDEL HERMANN ET AL) 3 August 1993 (1993-08-03) * column 4, line 34 - line 63 * * claims 1,5; examples 1,2 * ---	1,2,7,8	
A	US 5 626 907 A (HAGIWARA MINORI ET AL) 6 May 1997 (1997-05-06) * column 5, line 23 - line 25 * * claims 1,2,10,11 * ---		TECHNICAL FIELDS SEARCHED (Int.Cl.7)
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Place of search THE HAGUE		Date of completion of the search 4 December 2002	Examiner Stembrouck, I
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ----- & : member of the same patent family, corresponding document	

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