AQUEOUS SOLUTION FOR TREATMENT OF AN ELECTRICALLY NON CONDUCTIVE SURFACE TO ALLOW ELECTROSTATIC COATING THEREOF WITH POWDER PAINT

This invention relates to an aqueous solution for conferring conductivity to non conductive surfaces. The solution comprises a first salt, a second salt and a water-soluble alcohol. The first salt is an ammonium salt and the second salt is sodium chloride, unrefined marine salt or sodium hyposulfite.
Aqueous solution for treatment of an electrically non conductive surface to allow electrostatic coating thereof with powder paint

This invention relates to an aqueous solution for treatment of non conductive surfaces, particularly surfaces of wood, plastic or MDF (medium density fiberboard) products, to allow subsequent electrostatic coating thereof with powder paint.

In short, powder painting involves the generation of a jet of ionized powder paint, which is directed against a surface connected to an electrode and maintained at such a potential as to be able to attract ionized powders.

Electrostatic painting provides many advantages as compared with other technologies.

Particularly, a single coat of powder paint provides a thicker coating having a high chemical resistance and high durability to atmospheric agents.

For products of non conductive materials - such as wood, wood laminates, plywood, plastics and MDF - the surface to be coated must be suitably treated to increase its electrical conductivity to such an extent as to allow electrostatic paint spraying.

In prior art, electrical conductivity of the surface to be treated may be increased by coating such surface with particular aqueous solutions (known as "primers"), usually graphite based aqueous solutions.

However these aqueous solutions used to confer electrical conductivity to wood and plastic surfaces have high costs.

Also, graphite does not adhere firmly to the treated surfaces, and the paint deposited thereafter
tends to peel off the product surface.

Moreover, prior art primers require powder painting to occur within a few tens of minutes from primer coating, otherwise electrical conductivity would be lost.

The object of this invention is to obviate at least some of prior art drawbacks and particularly the drawbacks set out hereinbefore.

This object is fulfilled by a solution for adding conductivity to non conductive surfaces according to the principle of claim 1, by a method according to claim 13 and by an MDF product according to claim 14.

Further advantages may be achieved by the additional features of the dependent claims.

An exemplary embodiment will be described hereinafter of an aqueous solution with which a non conductive surface of a product has to be first coated to increase the electrical conductivity of the surface to such an extent as to allow electrostatic coating thereof with powder paint.

For this purpose, an aqueous solution is prepared, comprising a first salt, a second salt and a water-soluble alcohol.

The first salt may be an ammonium salt, e.g. a quaternary ammonium salt.

In one possible embodiment, the quaternary ammonium salt may be 80% quaternary ammonium ethyl sulfate salt in 20% n-butanol, as it is currently sold by F.IN.CO. S.r.l. (Italy, 20122 Milan - Viale Bianca Maria, 13) with the trade name "CATAFOR CA 80".

The second salt may be sodium chloride (NaCl) or sodium hyposulfite (Na₂S₂O₃ • 5 H₂O).

It was found that sodium chloride does not
necessarily have to be in the pure state, and that unrefined marine salt may be used instead.

The water soluble alcohol may be ethyl alcohol.

Ethyl alcohol is preferred not only for its low cost and its availability, but also because it involves low health risks for people who use such solution in the treatment of products to be prepared for electrostatic painting.

Particularly, ethyl alcohol produced by fermentation may be used to prepare the solution.

The product surface to be treated is wetted with this solution.

The aqueous solution may be applied by electrostatic or non-electrostatic spraying or by dipping the product in an isolated and electrostatically charged tank, to allow it to be evenly coated.

The wetted product is allowed to dry, for instance by ventilation with air at room temperature.

The alcohol in the solution accelerates evaporation (and drying) of the aqueous solution.

Once the product surface has been dried, a deposit remains that contains a mixture of ammonium salt crystals and sodium chloride (or sodium hyposulfite) crystals.

Electrostatic coating with the powder paint may occur immediately after drying.

However, the treated product maintains its electrical conductivity substantially unaltered even for one year after treatment.

Once the treated products are dried, they may either be conveyed to the painting station or stored for later painting.
Powder painting is carried out conventionally, using electrostatic sprayers for inert materials having energy control and internal charge generation. The paint may be applied in one or more coats without repeating the preparation steps.

While this shall not be intended as a scientific explanation, the increase in electrical conductivity is deemed to be caused not only by the presence of the ammonium salt deposit, but also by the tendency of the ammonium salt to absorb moisture from ambient air.

The inventors believe that sodium chloride (or sodium hyposulfite) provides better anchorage of the ammonium salt to the product surface, particularly when such product surface is made of plastic.

In wood or wood-based products, sodium chloride (or sodium hyposulfite) further prevents ammonium salt crystals from being absorbed by wood fibers.

Furthermore, the alcohol in the aqueous solution is deemed to be able to form micropores in wood fibers, in which the aqueous solution salts may be deposited.

Particularly interesting results in the preparation of the aqueous solution are obtained from the use of ethyl alcohol obtained by alcoholic fermentation, i.e. food grade ethyl alcohol.

In this respect, the inventors believe that sugar residues (typically fructose) contained in the alcohol produced by alcoholic fermentation act as an adhesive, allowing a more effective adhesion of the aqueous solution salts to the treated surface.

The above aqueous solution is particularly suitable for treatment of surfaces of products made of MDF (Medium Density Fiberboard), a composite material forming the base of a number of widely used products,
such as office furniture, panels for doors or shelves.

The volume percentage (at room temperature) of the ammonium salt may be of 0.03% to 2%, preferably the volume percentage of the ammonium salt is of 0.2% to 2%.

The percentage of the ammonium salt depends on the nature of the material to be treated.

The volume percentage of the ammonium salt may be lower when wood products are to be essentially treated, and higher when treating MDF or plastic products.

The volume percentage of ethyl alcohol may be of 0.06% to 1%.

More preferably, the volume percentage of ethyl alcohol may be of 0.06 % to 0.1 %.

Ethyl alcohol (C₂H₅OH) may be also mixed with methyl alcohol (CH₃OH) or a mixture of both; the overall volume percentage of the mixture or of ethyl alcohol shall be within the above ranges.

In a possible alternative embodiment, fructose (or another monosaccharide) may be separately added.

It shall be noted that the amount of fructose may be very small, an amount of 0.02% thereof being sufficient.

The weight percentage of sodium chloride or sodium hyposulfite may be of 1% to 3%.

The solution might also contain a higher percentage of sodium chloride, but the weight percentage of 3% shall be preferably not exceeded to prevent crystallization on the means (e.g. spraying guns) used to coat the products with the aqueous solution.

The aqueous solution so obtained preferably has a pH of 6 to 8.8.
The composition for a solution to be applied to a MDF product is hereinafter described as an example.

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distilled water</td>
<td>1,000 Liters</td>
</tr>
<tr>
<td>Sodium chloride (or unrefined marine salt)</td>
<td>10 Kg</td>
</tr>
<tr>
<td>Quaternary ammonium salt</td>
<td>0.2% by volume (at room temperature)</td>
</tr>
<tr>
<td>Ethyl alcohol (obtained by alcoholic fermentation)</td>
<td>0.06% by volume (at room temperature)</td>
</tr>
</tbody>
</table>

The application of the aqueous solution on MDF products may be possibly preceded by thermal treatment of the product.

In this case, the MDF product is introduced in a hot-air oven at a temperature of 130°C to 160°C for about 4 minutes, afterwards the product is allowed to cool to room temperature.

This step allows degassing of the product, and particularly removal of the air contained within the surface of the MDF product, to stabilize and prepare the product for subsequent treatment with the above aqueous solution.
CLAIMS

1. An aqueous solution for conferring conductivity to non conductive surfaces, said solution comprising a first salt, a second salt and a water-soluble alcohol, said first salt being an ammonium salt and said second salt being sodium chloride or unrefined marine salt or sodium hyposulfite.

2. An aqueous solution as claimed in claim 1, wherein said water-soluble alcohol is ethyl alcohol.

3. An aqueous solution as claimed in claim 2, wherein said ethyl alcohol is obtained by alcoholic fermentation.

4. An aqueous solution as claimed in claim 1 or 2, further containing a monosaccharide.

5. An aqueous solution as claimed in claim 4 wherein said monosaccharide is fructose.

6. An aqueous solution as claimed in any one of claims 1 to 5, wherein said ammonium salt is a quaternary ammonium salt.

7. An aqueous solution as claimed in any preceding claim, wherein the weight percentage of sodium chloride or said unrefined marine salt or said sodium hyposulfite is of at least 1%.

8. An aqueous solution as claimed in claim 7, wherein the weight percentage of sodium chloride or said unrefined marine salt or said sodium hyposulfite does not exceed 3%.

9. A solution as claimed in any one of claims 1 to 8, wherein the volume percentage of said ammonium salt at room temperature is of 0.03% to 2%.

10. An aqueous solution as claimed in any one of claims 1 to 8, wherein the volume percentage of said
ammonium salt at room temperature is of 0.2 % to 2%.

11. An aqueous solution as claimed in any one of claims 1 to 10, wherein the volume percentage of said ethyl alcohol at room temperature is of 0.06 % to 1 %.

12. An aqueous solution as claimed in any one of claims 1 to 10, wherein the volume percentage of said ethyl alcohol at room temperature is of 0.06 % to 0.1 %.

13. A method for electrostatic application of powder paint to the surface of a wood-based and/or plastic product, particularly made of MDF, comprising the steps of:
   - wetting said surface of said product with an aqueous solution as claimed in any preceding claim;
   - allowing the surface of said product to dry.

14. A MDF product whose surface has been treated with an aqueous solution as claimed in any one of claims 1 to 12.