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(54) **Coating surfaces.**

(57) Surfaces such as lead alloys, to which paint does not adhere well, have previously been shot blasted with an abrasive, cleaned and then coated with the pain or similar coating. It is now found that dry epoxy powder may be projected at high pressure at such surfaces and will form a conditioning layer to which paint will adhere well. The conditioning layer penetrates into the surface to form a mechanical bond. In one example, dry epoxy powder paint is projected by air at 5.5 bar pressure onto terne steel to condition it. This is followed by electrostatic coating with the same epoxy powder paint and heat treatment.

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COATING SURFACES.

This invention relates to coating surfaces with materials which have poor adhesion thereto, and particularly, but not exclusively, to coating metal surfaces.

Previous methods of coating surfaces with materials having poor adhesion thereto, for instance painting lead alloys, have comprised shot blasting the surface with an abrasive, cleaning the abrasive material from the surface and then using a wet paint to cover the surface. This process has the disadvantage that an appreciable amount of lead is removed from the surface, and that the surface must be made free of contaminating abrasive before it can be painted.

This invention is concerned with providing a method of coating surfaces which does not suffer these problems and which provides a particularly good bond to the surface.

The invention provides a method of coating a surface with a material which has poor adhesion thereto, comprising first bombarding the surface with particles of a conditioning material and then applying a coating material, the bombardment being such as to effect a mechanical bond between the conditioning material particles and the surface, the conditioning material and the coating material being selected so that they will bond together.

The said bombardment of the surface is such that the particles of conditioning material penetrate small irregularities in the surface forming a mechanical key. The particles may also form indentations in the surface and seat in the indentations. The relative characteristics of hardness of the surface and particles and the kinetic energy of the particles impinging on the surface determines the extent of penetration of the surface by the particles.

The conditioning material may be a dry epoxy resin powder and the coating material may be an epoxy resin paint applied either in a dry powder coating process or wet in a solvent.

The conditioning material and the coating material may be the same dry epoxy resin powder paint.

Some specific examples of the invention are now described with reference to the accompanying diagrammatic drawing.

A casing (11) is formed of pressed terne steel, i.e. steel coated with a lead alloy which improves the corrosion resistance of the steel. Great difficulty has previously been found in applying paint or other decorative or protective surface coating to this material. The casing is first subjected to a conventional degreasing operation, for instance in a TRICHLOR solvent bath. It is then bombarded with dry particles of a conditioning material discussed hereinafter. As shown, an air gun (12) has a reservoir (13) containing the dry powdered conditioning material. A high pressure air stream (14) propelled by air from a 5.5 bar source is passed across a nozzle (15) of 9.5 mm diameter to pick up the particles and propel them through a mixing nozzle (16) in a jet (17) to impinge on the surface of the casing. The whole surface to be coated is subjected to this bombardment.

The conditioning powder material comprises particles which when projected with sufficient energy penetrate small crevices in the surface of the casing and stay embedded therein. They also make indentations in the surface and embed themselves therein. A strong physical bond between the conditioning powder material and the surface of the casing is thus made. The conditioning process depends on selection of the pressure of the air stream, the size and hardness of the particles and the hardness of the casing. Selection between these criteria is made so that the powder is mechanically locked to the surface of the casing without destroying the surface. It is emphasized that the casing is not subjected to an electrostatic charge, the bond being the result of impact pressure of the particles.

The choice of material for the conditioning powder material is made with relation to the coating material it is desired to use, and is such that the coating material adheres well to the powder material. In one example, the conditioning material is a fusible powder paint mixture of dry polyester and epoxy resin particles of between 1.26 and 80.64 microns diameter, a material having no appreciable abrasive qualities. This is propelled by a 3.5 bar pressure air source at a terne steel casing so that the surface is evenly coated. A conditioning machine may, for instance, have ten guns of the kind shown at (12), all operating together about 10 cms from the casing to coat the exterior surfaces of the rotating casing. The conditioning is maintained for 4.5 seconds, at the end of which the casing is visibly coated with the paint. The coating adheres to the casing sufficiently so that it is not possible to remove all the embedded powder by rubbing with a finger.

Immediately, or at least within 2 hours of the conditioning treatment, and with no intermediate processing, the casing is passed into a conventional electrostatic powder coating plant, using the same powder paint mixture as was used for the conditioning treatment. In this process the casing is electrostatically charged and the dry paint mixture is propelled towards it at low pressures (e.g. 0.3 - 0.7 bar air source pressure), so that a powder layer clings to the charged conditioned surface. The casing is then heated in an oven to fuse the paint. For instance, the casing may be held at between 160^{o} - 180^{o}C for 8 to 15 minutes.

The paint coating so formed is of about 50 microns thickness, and is found to have a good bond to the terne steel, performing well in corrosion tests.

It will be appreciated that in this process, the conditioning material has negligible abrading effect on the terne steel, and forms an essential base layer of the final paint coating. Thus, there is no problem with spent conditioning material contaminated with lead, and there is no need to clean the surface after conditioning.

In another example, the conditioning material is a dry epoxy resin powder of between 2 - 50 microns diameter, propelled by air at 5.5 bar onto a lead/tin alloy surface. The coating material is a wet epoxy resin paint in a solvent which is also a solvent for the conditioning material. When the wet paint is applied, the solvent attacks the surface of the conditioning material, dissolving it and forming a liquid interface layer between the conditioning and coating materials comprising the solvent and a dissolved mixture of the conditioning material and the coating material. When the solvent evaporates, it leaves the paint layer adhering closely to the conditioning material, thus strongly bonded to the casing.

In another example, the dry powder conditioning material comprises a catalyst, e.g. a hardener and accelerator, while the coating material comprises a liquid epoxy resin which hardens on contact with the catalyst. The coating material may include a pigment so that a coloured coating is formed. The hardening may take place at room temperature or heat may be used to speed the hardening process. In a variation of this example the coating material is also a dry powder.

The base surfaces onto which the coating is made may include terne steel, galvanised steel, aluminium, copper, zinc or plastics materials. Since a mechanical bond is being made to the base surface, the main requirements concern the pressure and particle size of the conditioning material being adjusted to give satisfactory penetration of the base surface. For instance, in the examples given above using terne steel, if the air pressure is reduced to 2 bar, good conditioning is achieved, but if it is reduced to 1.3 bar the bond is rated only as fairly good. Different pressure ranges are required for other base surfaces. It is found that aluminium requires lower pressures than terne steel, but trial and error for each material is required to assess the best pressure to use.

In order to increase the penetration of the particles, they may be chilled before use, and/or the base surface may be softened by heating. Also air pressures up to 13 bar may be used.

CLAIMS:

1. A method of coating a surface with a coating material which has poor adhesion thereto in which the surface is first conditioned and then coated, characterized by the conditioning comprising bombarding the surface (11) with particles of dry conditioning material (17) so that the particles are partially or fully embedded in the surface and thus bonded to it, the conditioning material being selected to bond easily to the coating material.

2. The method as claimed in claim 1, further characterized by the said particles being projected in a jet (17) of pressurized gas from a supply pressurized at between 1.3 bar and 13 bar.

3. The method as claimed in claim 1 or claim 2, further characterized by said conditioning material comprising an epoxy resin powder.

4. The method as claimed in claim 3, further characterized by said epoxy resin powder comprising a paint suitable for use in powder coating.

5. The method as claimed in any of claims 1 to 4, further characterized by said coating material being a dry powder paint applied by an electrostatic powder coating process, and said conditioning material is the same as the coating material.

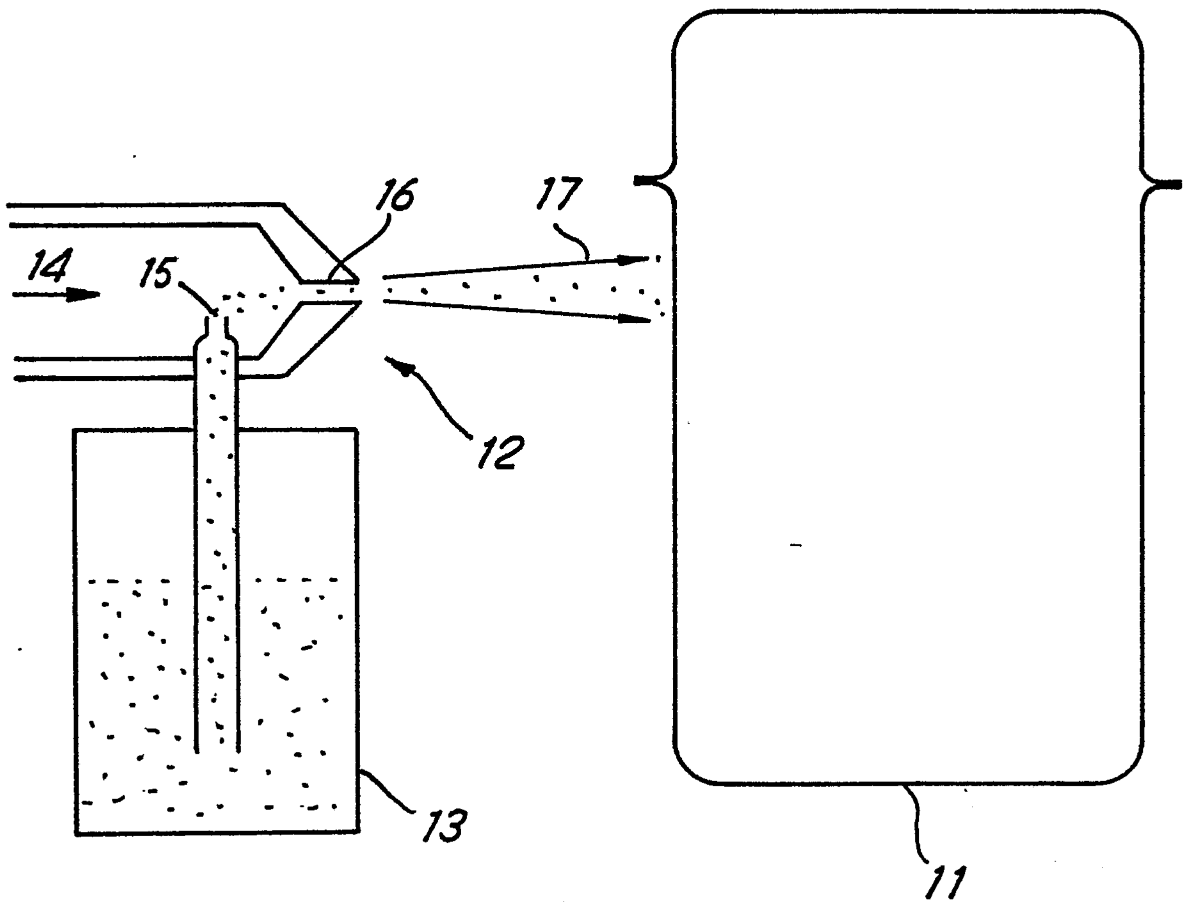
6. A method of coating a surface with a coating material as claimed in claim 1, further characterized by the conditioning comprising directing dry epoxy powder propelled by jets of air pressurized to 3.5 bar at a lead alloy surface (11) so that a layer of the powder is bonded to the surface and thereafter subjecting the surface to conventional electrostatic epoxy powder painting followed by heat treatment to fuse the layers of epoxy powder.

7. A method of coating a surface as claimed in claim 6, further characterized by the conditioning material comprising dry epoxy resin powder paint containing mainly particles of diameters between 1.26 and 80.64 microns.

8. A method as claimed in any of claims 1 to 5,further characterized by said surface being of terne steel, or galvanised steel, or aluminium, or copper, or zinc, or a plastics material.

9. A member painted with material which has poor adhesion thereto characterized by a layer of conditioning material being partially or fully embedded in its surface beneath the paint layer, the conditioning material bonding easily to the paint layer.

10. A member as claimed in claim 9, being made of terne steel, and further characterized by both the conditioning layer and the paint layer being of epoxy resin.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