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(71) Applicant
Galvanisch Bedrijf Emmelot B.V., Ijssellaan 40, Gouda, The Netherlands
(72) Inventor
Adrianus Jozef Emmelot
(74) Agents
Batchellor, Kirk & Eyles, 2, Pear Tree Court, Farringdon Road, London EC1R 0DS

(54) **Coating Cast Iron with Liquid Metal**

(57) A method of applying a protective layer to corrosion-sensitive cast-iron objects comprises depositing a first layer of tin or tin-lead alloy on the object and then a second thicker protective lead alloy layer. The second layer is applied at a higher temperature and using a lead alloy composition which is thick-liquid. The object and thick-liquid alloy are caused to relatively rotate to fuse the second layer to the object.

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SPECIFICATION

Method of Applying a Protective Layer to Corrosion-Sensitive Cast-iron Objects.

The invention relates to a method of applying a protective layer to corrosion-sensitive cast-iron objects by depositing, subsequent to decarbonisation, a layer of tin or of a tin-lead alloy, after which a second, thicker, protective layer of a lead alloy is applied at a higher temperature.

Such a method is known from Dutch Patent Application 7311787, in which the second layer is applied by fusion or welding. It has appeared from our research that this process of applying the second layer can be improved by carrying out an easier treatment, whilst the product is improved because a pore-free protective layer can be made.

The method according to the invention is characterised in that for the second layer the temperature and the composition of the lead alloy are chosen so that the alloy is thick-liquid and that the layer is fused to the object by rotating the object and the thick-liquid alloy relatively to one another. Cast-iron objects, particularly the exhaust gas housings of pressure filling groups and the like and also exhaust gas slides, housings, and covers coming into contact with sea water and used for cooling, and intermediate pieces of cylinders and cylinder blocks of Diesel engines and the like are heavily exposed to corrosion. The pressure filling groups of combustion engines frequently used in a ship's Diesel engines and the like comprise turbine part driven by the exhaust gases of the engine, whilst the turbine drives a compressor for supplying combustion air to the engine. In such heavy engines, fuels of high sulphur content are frequently used. When the engine runs normally at full load, the temperature of the exhaust gases will usually have such high values that the sulphur contained in the exhaust gases causes little inconvenience. However, when not running at full load, for example, during manoeuvring and the like, sulphur compounds may be produced, which strongly attack the insides of the housings of the turbine parts of the pressure filling groups. This may result in the need to replace these cast-iron housing of relatively complicated shape, which are thus expensive, within a comparatively short time. it is, therefore, desirable to coat these housings on the inside with a corrosion-reistant protective layer. It has been found that coating the cast-iron parts with a lead layer provides a very effective protection so that the lifetime of the housing can be markedly prolonged. this requires, however, a satisfactory adhesion between the lead layer and the basic material as well as satisfactorily closed surface of the lead layer. To this end, the cast-iron object, or at least the surface to be coated, is first decarbonised or iron-purified. This preliminary decarbonisation or iron-purification can be carried out as disclosed in Dutch Patent Application 7802509. This provides a satisfactory adhesion between the cast iron and the first (lead) tin layer having a maximum thickness of about 50 μm.

Subsequently a second, thicker, protective layer is applied, which consists of a lead alloy. To this end a bath composition is prepared on the basis of, for example, a binary alloy of 2 to 5% by weight of Sb in lead having a melting range between 250°C and 300°C, and 10 to 20% by weight of Sn in lead having a melting range between 180°C and 280°C or 3 to 5% by weight of Cd in lead having a melting range between 250°C and 300°C. As an alternative, ternary and quaternary alloys with lead as a main constituent may be employed, for example, a lead alloy containing 10 to 20% by weight of Sn, 3 to 5% by weight of Cd and 2 to 5% by weight of Sb. The bath is kept at such a temperature that the alloy is thick-liquid, which means in practice a temperature lying between 180°C and 300°C. It is furtherfore preferred to add a flux agent to the bath composition, for which purpose, for example, zinc chloride may be used.

The cast-iron object to be coated, which is provided with the first tin-containing layer, is rotated in a bath or the bath fluid is rotated around the object to be coated in a furnace suitable for this purpose so that the bath fluid can be kept at the required temperature and remains thick-liquid. After the cast-iron object is coated with a second layer of a thickness of about 50 to 200μm, the object is removed from the bath and cooled. Experiments have shown that a pore-free protective layer is thus obtained, which is more corrosion-resistant and can be more readily applied than the second layer applied in accordance with Dutch Patent Application 7311787.

Claims

1. A method of applying a protective layer to corrosion-sensitive cast-iron objects by depositing, subsequent to decarbonisation, a layer of tin or of a tin-lead alloy, after which a second, thicker protective lead alloy layer is applied at a higher temperature, wherein, for the second layer, the temperature and the composition of the lead alloy are chosen so that the composition is thick-liquid and the layer is fused to the object by reiatively rotating the object and the thick-liquid alloy.

2. A method as claimed in claim 1, wherein the bath composition of the lead alloy to be applied to the second layer contains a lead alloy with 2 to 5% by weight of antimony.

3. A method as claimed in claim 1 or 2, wherein the lead alloy to be applied as the second layer contains lead and 10 to 20% by weight of tin.

4. A method as claimed in claim 1, 2 or 3, wherein the lead alloy to be applied to the second layer contains lead and 3 to 5% of cadmium.

5. A method as claimed, in any one of claims 1 to 4, wherein the temperature of the bath composition lies between 180°C and 300°C.

6. A method as claimed in any one of claims 1

to 5, wherein the thickness of the layer first applied is at the most 50μ, and the thickness of the second layer is 50 to 200μ.

7. A method according to claim 1, substantially as described herein.

8. Cast-iron objects having a protective layer applied by the method of any one of the preceding claims.

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