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(54) **Titre : PROCEDE DE FABRICATION DE COMPOSANTES EN ACIER COMPORTANT UN REVETEMENT AYANT UN COEFFICIENT DE FRICTION ELEVE LORSQUE LES COMPOSANTES SONT JOINTES ENSEMBLE**

(54) **Title: METHOD FOR MANUFACTURING STEEL COMPONENTS COMPRISING A COATING THAT HAS A HIGH COEFFICIENT OF FRICTION WHEN THEY ARE JOINED TOGETHER**

(57) **Abrégé/Abstract:**
Disclosed is a method for manufacturing steel components comprising a coating that has a high coefficient of friction when steel components are joined together, said method including the steps of: a) galvanizing the surface of the steel components; and b) coating the galvanized surface of the steel components with aluminum by means of a thermal spraying process.

ABSTRACT

A method for manufacturing steel components comprising a coating that has a high coefficient of friction when steel components are joined together, said method including the steps of: a) galvanizing the surface of the steel components; and b) coating the galvanized surface of the steel components with aluminium by means of a thermal spraying process.

Method for manufacturing steel components comprising a coating that has a high coefficient of friction when they are joined together

The invention relates to methods for manufacturing steel components comprising a coating that has a high coefficient of friction when they are joined together.

Steel components that are used in steel construction are usually provided with a thin layer of zinc having a layer thickness of approximately 50-200 μm for corrosion protection against atmospheric attack by city and country air by means of the method of hot-galvanizing. Despite the fact that hot-galvanized steel surfaces exhibit a good corrosion protection, when two galvanized steel components whose surfaces contact each other, are connected, unwanted sliding effects appear that adversely affect e.g. the stability of the structure, for example a lattice tower, on account of the low coefficient of friction of the galvanized surfaces.

To create non-slip connections between galvanized steel parts, abrasion-resistant coatings are usually applied onto the (hot-) galvanized steel components that increase the coefficient of friction between the elements without sliding effects occurring in the zinc cover and/or the coating. To this purpose, the zinc covers of the steel components are usually slightly sand blasted (*sweeping*) and/or provided with a zinc silicate coat of an alkali silicate zinc-dust coating for increasing the coefficient of friction.

However, this procedure is very labour and cost-intensive in particular due to the fact that the areas to be *swept* have to be determined, the other areas have to be masked and the zinc layer that protect against corrosion having to be removed. This also results in the further disadvantage that the steel components become susceptible for corrosion in that the zinc coating is removed specifically in the area of the load-transmitting connection points.

It is therefore the object of the invention to create a coating that is easy to manufacture, for steel components that is not only corrosion-resistant but also exhibits a favourable coefficient of friction for connecting steel components to each other.

This object is achieved by the method having the features of Claim 1. The sub-claims that are dependent thereon specify advantageous designs of the invention.

The basic idea of the invention is to apply a zinc layer to the steel components, using a method that is known per se, that are to be connected to each other and there to apply - without further measures such as e.g. sweeping - an aluminium layer by thermal spraying. The corrosion-resistant multilayer coating of the steel components resulting therefrom has proven to be particularly resistant. Applying the aluminium by means of thermal spraying, where the aluminium preferably exhibits temperatures of more than 600°C, presumably leads to a melting of the previously applied (untreated) zinc coating that exhibits a lower melting point of approximately 420°C.

Experiments using aluminium wires as spraying material have demonstrated that on one hand the connection of inventively treated steel components to each other usually exhibits a coefficient of friction $\mu > 0.8$ and in some cases even $\mu = 0.96$. On the other hand it could also be demonstrated that extreme loads can be placed on the connection between aluminium layer and zinc layer and that it is highly resistant, it being possible to observe that it is rather the entire coating that detaches from the steel component than the aluminium coating from the zinc surface.

Galvanizing the surface of the steel components preferably takes place by means of hot-galvanizing, it basically being also possible to use other methods such as e.g. electrogalvanizing and zinc spraying. The zinc layer resulting by coating the surface of the steel components with the zinc preferably exhibits a layer thickness between 50 and 250 µm, particularly preferably between 60 and 200 µm.

Coating the galvanized steel-component surface takes place by thermal spraying using aluminium at a temperature of at least 600°C, particularly preferably at 640°C. The aluminium layer resulting by coating the untreated galvanized surface of the steel components preferably exhibits a layer thickness between 60 and 250 µm.

Here it is in particular also advantageous that aluminium offers an effective corrosion protection against the atmosphere close to the sea and that the steel components having the attributes mentioned above can for example also be used for offshore installations. In this context it is not ignored that the coating of galvanized steel components using aluminium has already been known, for example from DE 1 621 321, GB 400 752 and JP 56136971 A, or also as an alternative for zinc coating or as a zinc-aluminium alloy - however, the known procedures do not result in a steel component having the high coefficient of friction that has been mentioned that are achieved according to the invention when coating an untreated galvanized steel-component surface with aluminium by thermal spraying, but solely serve for corrosion resistance of the steel components.

The steel components treated according to the invention are preferably corner legs of lattice towers, in particular lattice towers suitable for wind energy installations, since they are exposed to high dynamic loads and the present invention holds reliable, (weather) resistant steel components in readiness for this. Other steel components can for example be steel beams, fences, railings, stairs and connecting elements such as screws and back plates etc.

PATENT CLAIMS

1. A method for manufacturing steel components comprising a coating that has a high coefficient of friction when they are joined together, said method including the steps of:
   a. galvanizing the surface of the steel components, and
   b. coating the galvanized surface of the steel components with aluminium by means of a thermal spraying process.

2. The method according to Claim 1, characterized in that galvanizing the surface of the steel components takes place by means of hot-galvanizing.

3. The method according to one of the preceding claims, characterized in that coating the surface of the steel components with zinc takes place up to a layer thickness between 50 and 250 µm.

4. The method according to one of the preceding claims, characterized in that coating the surface of the steel components with zinc takes place up to a layer thickness between 60 und 200 µm.

5. The method according to one of the preceding claims, characterized in that coating the galvanized surface of the steel components with aluminium takes place up to a layer thickness between 60 und 250 µm.

6. The method according to one of the preceding claims, characterized in that the aluminium exhibits a temperature of at least 600°C during thermal spraying.

7. A steel component comprising a coating that has a high coefficient of friction consisting of a zinc coating applied to the steel-component surface and an aluminium coating applied there above by means of thermal spraying, characterized in that the zinc layer has a thickness between 60 und 200 µm and the aluminium layer has a thickness between 60 und 250 µm.