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Method for temporary protection of blank surfaces against corrosion, and component with temporary corrosion protection

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Abstract:

Method for temporary protection of blank surfaces (11.1) against corrosion, and a component with a surface protected according to this method. In a first step a corrosion protection foil (12) is applied to a blank surface (11.1) to be protected. A self-sealing, semi-solid protection layer (13) in order to at least partly cover the corrosion protection foil (12) then follows. At a later point in time at least a part of the blank surface (11.1) can be exposed by pulling off the corrosion protection foil (12) inclusive of the protection layer (13) disposed thereon. The self-sealing protection layer (13) forms a closed film and the corrosion protection foil (12) and/or protection layer (13) comprise hydrophobically acting components in order to prevent moisture from penetrating to the blank surface (11.1) to be protected.

(Fig. 1)

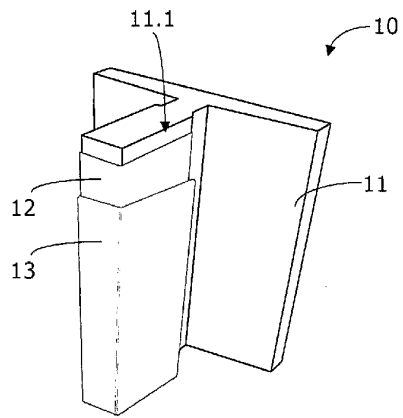


Fig. 1

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COMPLETE SPECIFICATION STANDARD PATENT

Application Number:

Lodged:

Invention Title: **Method for temporary protection of blank surfaces against corrosion, and component with temporary corrosion protection**

The following statement is a full description of this invention, including the best method of performing it known to us:

Method for temporary protection of blank surfaces against corrosion, and component with temporary corrosion protection

FIELD OF THE INVENTION

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The invention relates to temporary protection of blank surfaces against corrosion.

BACKGROUND OF THE INVENTION

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Corrosion is a known problem. There are various approaches used to prevent or reduce corrosion. For example, the flow of electrons can be interrupted so that the chemical composition of the materials concerned is changed. Similarly, material to be protected against corrosion can be separated from the electrolyte (for example, salty water). There are also, for example, methods which are based on the use of a protection layer or a protection coating, on the use of a medium which prevents formation of rust, or on the use of a surface passivation. Such protection layers are typically based on painting, organic layers, ceramic and anorganic layers, plastic coatings, platings with non-rusting metal, etc. Other layers, such as, for example, zinc, aluminium-based metal and magnesium-based metal are distinguished by the fact that they have a tendency to corrode more quickly than the surface to be protected (these layers are therefore also termed sacrificial layers). Means which prevent rust formation typically change the surface chemistry and form an intermediate layer. The surface passivation mentioned above typically involves the application or production of an oxide layer. These methods are essentially suitable for permanent protection of surfaces susceptible to corrosion.

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However, the need also exists to protect blank metal surfaces only temporarily. Thus, for example, there are semi-finished products or finished products which have a blank metallic surface which has to be protected after production and until final use. As an example there may be mentioned drive shafts, tooth flanks of gearwheels, rails and the like. In that case it is desirable for a protection means to be able to be applied quickly and simply and able to be removed again later. The approaches mentioned above are, however, only conditionally suitable when the objective is temporary protection of a blank metal surface.

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Two different methods have proved themselves in practice, although these methods have disadvantages.

A blank surface is usually protected by a corrosion protection means which is applied to or sprayed onto the surface. In machine and vehicle construction and in machine plants there is used for this purpose, for example, a product sold under the name 'Tectyl' (Registered Trade Mark). This product provides corrosion protection, but has the disadvantage that it can be removed only with difficulty. Particularly in the case of lift construction, where guide rails are used for the lift cage or the counterweight and the running surfaces of such rails must be absolutely smooth and clean, such a protection means, which is removable only with cost in order to be again free of residue, is only conditionally suitable. The use of solvents in order to expose the blank surface again has disadvantages, especially as these solvents can also be environmentally harmful and therefore expensive in handling.

The sacrificial layers mentioned above are also not suitable for a temporary protection, since they have the disadvantage that they enter into an intimate connection with the surface to be protected and cannot be removed again or can be removed only with a substantial outlay on processing. Moreover, they change the properties of the blank surface and thus cannot be used with guide rails, drive shafts and the like.

There is accordingly a need to protect blank surfaces, particularly blank metallic surfaces susceptible to corrosion, in a simple and effective manner against corrosion, wherein these surfaces shall after a period of time be exposed again free of residue.

SUMMARY OF THE INVENTION

The invention involves use of a multi-layer protection system which is applied in the following steps and removed again when required. A corrosion protection foil is applied to a blank surface to be protected. This corrosion protection foil is at least partly covered by the application of a self-sealing, semi-solid protection layer. These two layers form the multi-layer protection system. The protection system is removed again when required. At least a part of the blank surface is exposed by pulling off at least a part of the corrosion protection foil. The protection layer is also removed at the same time with the corrosion protection foil.

The self-sealing protection layer forms a closed film and the protection system involves hydrophobically acting components in order to prevent moisture from penetrating to the

blank surface to be protected.

Embodiments of the invention are particularly advantageous for temporary protection of a guide rail of the lift installation, since only the running surfaces of the guide rails are selectively exposed.

DESCRIPTION OF THE DRAWINGS

The invention is described in more detail in the following on the basis of examples and with reference to the drawings, in which:

- Fig. 1 shows a schematic, perspective view of part of a guide rail with a protection system;
- Fig. 2A shows a schematic, perspective view of part of a guide rail with a protection system, wherein mechanical damage has occurred;
- Fig. 2B shows a schematic, perspective view of the guide rail, which is shown in Fig. 2A, after the mechanical damage has healed;
- Fig. 3A shows a schematic, perspective view of part of a guide rail with a protection system, wherein the corrosion protection foil covers only the surface to be protected; and
- Fig. 3B shows a schematic, perspective view of the guide rail, which is shown in Fig. 3A, after the corrosion protection foil was removed and the surface to be protected thereby exposed.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

A method for temporary protection of smooth surfaces having a tendency to corrode is described. The approach is described in the following on the basis of a method example, wherein subsequently further methods are explained with reference to the first method example.

In order to illustrate the method reference is made to Fig. 1. There is concerned a

method for temporary protection of blank surfaces 11.1 against corrosion. The following steps are carried out in order to provide a protective system which develops the desired protective effect.

- 5 After an optional cleaning step a corrosion protection foil 12 is applied to the blank surface 11.1 to be protected. In Fig. 1 the illustration was intentionally selected so that the corrosion protection film 12 is visible. In a further step a self-sealing, semi-solid protection layer 13 is applied. This protection layer 13 is applied so that it at least partly covers the corrosion protection foil 12, as can be seen in Fig. 1. The corrosion protection
10 foil 12 forms, together with the protection layer 13, an intelligent protective system, the construction and effect of which is explained in later sections.

- 15 After application of this protective system the component, for example a guide rail 10, is protected in the region of the smooth surface 11.1 against corrosion. The component can now be stored and transported as desired.

- At a later point in time, for example after transport to a construction site and mounting on site, at least a part of the blank surface 11.1 can be exposed again by pulling off at least a part of the corrosion protection foil 12. The protection layer 13 can be removed in
20 simple manner together with the corrosion protection foil 12. In the case of appropriate selection of the corrosion protection foil 12, neither a tool nor a special machine is required for that purpose. The corrosion protection foil 12 can be pulled off without effort and without residues. A further method is described in the following with reference also to Figures 3A and 3B. The illustrated example concerns a guide rail 10, as used in, for
25 example, lift construction. The rail 10 has a T-shaped cross-section. The two mutually opposite side surfaces of the web of the rail 10 serve as guide for a lift cage or a counterweight. One of the two oppositely disposed side surfaces is denoted in Fig. 3A by 11.1. The other side surface of the web is not visible. In order to ensure faultless functioning of the lift cage it is important that the side surfaces are blank. This means
30 that these running surfaces 11.1 should not have rust, residues of rust protection agents or mechanical damage. This is essential, above all, when emergency braking actions of the lift cage occur, since in this case there is direct action of braking means on the running surfaces 11.1.

- 35 In the illustrated example of embodiment the corrosion protection foil 12 is applied only to those regions of the blank surface 11.1 which are to be later exposed. It can be seen in

5 Fig. 3A that the corrosion protection foil 12 is strip-shaped and extends over the entire surface 11.1 parallel to a longitudinal axis of the rail 10. The other surfaces of the rail 10 are not covered by the foil 12. The self-sealing protection layer 13 is now applied, wherein this protection layer 13 then covers not only the corrosion protection foil 12, but also adjacent regions of the rail 10. In the illustrated example the protection layer 13 covers all sides of the entire web of the T-shaped rail 10. The protection layer 13 reaches as far as the right-angled transition region between the web and the transverse plate of the T-girder.

10 In the case of exposure merely the strip-shaped corrosion protection foil 12 inclusive of a part of the protection layer 13 is now pulled off and a blank surface 11.1 thereby laid open, as shown in Fig. 3B. The self-sealing protection layer 13.1 remains on the adjacent regions of the web, as can be recognised by way of Fig. 3B.

15 This approach makes it possible to protect a component entirely and in the case of need to expose a predetermined region. The form of the predetermined region is defined by the shape of the corrosion protection foil 12.

20 The protection layer 13 is distinguished by the fact that it is self-sealing and forms a closed film. Moreover, the corrosion protection foil 12 and/or the protection layer 13 have hydrophobically acting components in order to prevent moisture from penetrating to the blank surface 11.1 to be protected. Moreover, the hydrophobic provision has the consequence that water is displaced.

25 In a preferred form of embodiment the corrosion protection foil 12 is distinguished by the fact that it forms a strong adhesive bonding to blank surfaces, particularly blank metallic surfaces. On the one hand that leads to good adhesion of the corrosion protection foil 12 to the blank surface and on the other hand there thereby results a blocking effect between the blank surface 11.1 and the corrosion protection foil 12. This blocking effect
30 can prevent penetration of moisture.

In a preferred form of embodiment the self-sealing (self-compensating) protection layer 13 is distinguished particularly by the fact that it forms a sealed, closed film. The protection layer 13 thereby forms a kind of closed membrane, which is preferably
35 executed to be moisture-repellent. The film preferably has a thickness between 10 microns and 500 microns in order to be able to achieve the desired protective effect.

The self-sealing protection layer 13 preferably has a thixotropic agent in order to thereby form, on application, on the one hand the sealed, closed film and on the other hand to offer protection against damage, in that the film automatically closes after a local mechanical disturbance 13.1, as indicated in Fig. 2A. A snapshot after occurrence of a local mechanical disturbance 13.1 is shown in Fig. 2A. The disturbance can be produced, for example, by contact with a tool or the like during transport of the component 10. The same component 10 is shown in Fig. 2B a short time later. Due to the self-sealing action of the protection layer 13 the location of the disturbance 13.1 has automatically closed. This location is denoted in Fig. 2B by 13.2. Closure of the disturbance 13.1 can take place, for example, in that the protection layer 13 continues to flow slowly and again closes the open location. Further details with respect to the self-sealing action and the thixotropic agent used in this connection are given in the following.

In general, there is denoted by the term "thixotropic" a reversible transition from a gel-state or gelatinous state to a solid state. This transition is reversible. Thus, in the case of a thixotropic material the viscosity reduces if, for example, shearing forces are applied.

By the term "thixotropic" there is understood in the following connection the setting of the protection layer 13 in a plastic state with the addition of thickeners, also termed thixotropic agent. In this state the otherwise very liquid protection layer 13 can be set to be so viscous that this can also be processed free of problems at vertical components 10 and does not run off. The thixotropically set protection layer 13 has the property that in rest it behaves like a gel and if it is agitated or processed like a viscous liquid. If a local disturbance occurs, as indicated in Fig. 2a, then due to the thixotropic agent the viscosity reduces in the region of the disturbance 13.1 and the protection layer 13 compensates for the disturbance, as shown in Fig. 2B.

A self-sealing protection layer (13) is particularly preferred which combines one or more of the following functions in one substance or composition:

- moisture repelling,
- abrasion resistance,
- low viscosity on application,
- rapid hardening or drying,
- resistant to touch.

One form of embodiment is based on passivation of the surface 11.1 to be protected. Inhibition of corrosion thereby results. The protection foil 12 and/or the protection layer 13 have a carrier material or carrier component and one or more pH buffer constituents (buffer agents). These buffer constituents are so selected that they keep the (metal) surface 11.1, which is to be protected, in the region of a pH value at which the surface is passive relative to corrosion. In order to protect a metal surface 11.1 the pH value is set to a range between 8 and 13 pH. The protection system of protection foil 12 and protection layer 13 is basically set by addition of the buffer constituents.

Particularly preferred are protection foils 12 and/or protection layers 13 having corrosion-inhibiting components which is suitable for the purpose of inhibiting corrosion of the surface 11.1 in the presence of moisture or in the presence of other corrosion-promoting substances.

In the case of a particularly preferred form of embodiment the corrosion-inhibiting components co-operate with the buffer constituents.

Particularly preferred are protection foils 12 and/or protection layers 13 which have water-repelling (hydrophobic) components in order to prevent water from coming into connection with the surface 11.1. Aluminium silicate and/or wax and/or oil can, for example, be used as hydrophobically acting components. Synthetic oils and/or refined microcrystalline waxes are particularly suitable.

It is also possible to add to the protection foil 12 and/or the protection layer 13 components in order to offer effective protection against corrosive materials such as air, carbon dioxide, chloric ions, etc. The protective system of protection foil 12 and protection layer 13 have one or more of these components.

The protection foil 12 has a flexible carrier material which is suitable for reception of the buffers and/or other components. Particularly suitable as foils are: polymer material, polyacryl, silicon, polyurethane, vinyl polymer or polyvinylacetate, in order to mention to a few examples.

The protection layer 13 by contrast has a special carrier component in order to give the protection layer 13 a film-like or gel-like consistency. Preferably there is concerned a wax-like carrier component and forms, after hardening, a flexible, sealed wax film. After

coating or spraying the thixotropic property of the protection layer 13 comes into use and opposes entry of moisture and/or liquid, as described.

5 The said components are preferably dispersed or absorbed in the carrier material (in the case of the protection foil 12) or carrier component (in the case of the protection layer 13).

10 Accordingly there is made available an intelligent corrosion protection system which by contrast to the state of the art on the one hand offers good protection and on the other hand is removable again without problems and without cost. The surfaces 11.1 to be protected are not only passivated if buffer constituents find use, or protected against penetration of moisture if hydrophobically acting components are used, or reduce or prevent corrosion if corrosion-inhibiting components are used, but an effective overall protection is provided which combines positive characteristics of several protective mechanisms with one another in a previously unknown mode and manner.

15 It is an advantage that the entire protection system is based on materials which are compatible with the environment. Moreover, the application and removal can be carried out in such a manner that chemicals do not have to be used. There is also no increased expenditure of energy required, since no hot air systems or grinding machines are needed.

20 A desirable property of the protective system is realised by the combination of two protection means 12, 13. In that case the protection foil 12 acts inter alia as a water-repellent (hydrophobic) and/or watertight blocking layer or blocking intermediate layer. If the protection layer 13 and the protection foil 12 should be damaged, then the components present in the protection layer and/or the protection foil 12 come into use.

25 The method is not restricted only to guide rails. The method can be used generally on surfaces of components which have to be provided with a corrosion protection only temporarily, for example:

- 30 - surfaces of guides, particularly guides of machine tools,
- surfaces of drive shafts,
- surfaces of drive pulleys,
- 35 - surfaces of measuring tables, especially precision measuring tables.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A method for temporary protection of blank surfaces (11.1) against corrosion, the method including:
- applying a corrosion protection foil to a blank surface to be protected,
 - 5 - applying of a self-sealing, semi-solid protection layer which at least partly covers the corrosion protection foil,
 - subsequently exposing at least a part of the blank surface by pulling off at least a part of the corrosion protection foil together with the protection layer disposed on this part of the corrosion protection foil,
- 10 wherein the self-sealing protection layer forms a closed film and at least one of the corrosion protection foil and the protection layer have hydrophobically acting components to prevent moisture from penetrating to the blank surface to be protected or to displace moisture which is present.
2. The method of claim 1, wherein the corrosion protection foil has an adhesive for
- 15 bonding to blank metallic surfaces, whereby a blocking effect between the blank surface and the corrosion protection foil results.
3. The method of claim 1 or 2, wherein the self-sealing protection layer after application forms a sealed, closed film preferably having a thickness between 10 microns and 500 microns.
- 20 4. The method of claim 3, wherein the self-sealing protection layer has a thixotropic means and after application of the protection layer thereby forms the sealed, closed film which protects against damage in that it automatically closes after a local mechanical disturbance.
- 25 5. The method of any one of claims 1 to 3, wherein the self-sealing protection layer combines one or more of the following functions in one substance:
- moisture repelling,
 - abrasion resistance,
 - low viscosity on application,
 - rapid hardening or drying,
 - 30 - resistant to touch.

6. The method according to any one of claims 1 to 5, wherein prior to application of the corrosion protection foil the blank surface is made dry, rust-free and grease-free.
7. The method of any one of claims 1 to 4, wherein for application of the self-sealing protection layer use is made of a coating, rolling or dip method or an airless spray method.
8. The method of any one of claims 1 to 5, wherein the corrosion protection foil has at least one of oily and wax-like constituents.
9. The method of any one of claims 1 to 8, wherein the protection layer preferably forms a wax film.
10. The method of any one of claims 1 to 9, wherein the blank surface is the surface of a steel element.
11. The method of claim 10, wherein the steel element is a guide rail for use in a lift installation, and the exposure is carried out during installation of the guide rail in the lift installation or prior to placing the lift installation in operation.
12. The method of any one of claims 1 to 11, wherein
- on application of the corrosion protection film only that region of the blank surface is temporarily covered which on exposure is to be laid open again,
 - the self-sealing protection layer covers not only the corrosion protection foil, but also adjacent regions, and
 - on exposure the self-sealing protection layer remains on the adjacent regions.
13. The method of claim 11, wherein the corrosion protection foil is constructed as a strip which temporarily covers a running surface of the guide rail in order after pulling off the corrosion protection foil to expose the running surface of the guide rail.
14. A component having a surface protected against corrosion, to which a corrosion-protection foil is applied and a self-sealing, semi-solid protection layer at least partly covers the corrosion protection foil, and wherein at least a part of the surface (11.1) can

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5 be exposed by pulling off at least a part of the corrosion protection foil inclusive of the protection layer disposed on this part of the corrosion protection foil, wherein the self-sealing protection layer forms a closed film at least one of and the corrosion protection foil and the protection layer has hydrophobically acting components to prevent moisture penetrating to the surface or to displace moisture which is present.

15. A method for temporarily protecting surfaces against corrosion, the method substantially in accordance with reference to the accompanying drawings.

10 16. A component protected against corrosion substantially in accordance with reference to the accompanying drawings.

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WATERMARK PATENT & TRADE MARK ATTORNEYS

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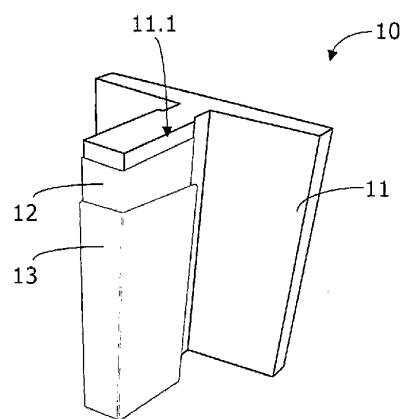


Fig. 1

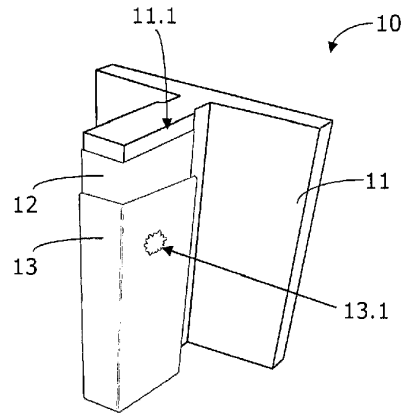


Fig. 2A

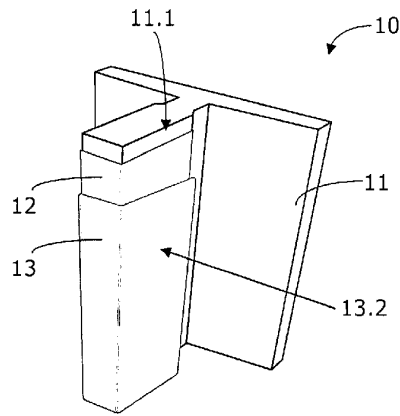


Fig. 2B

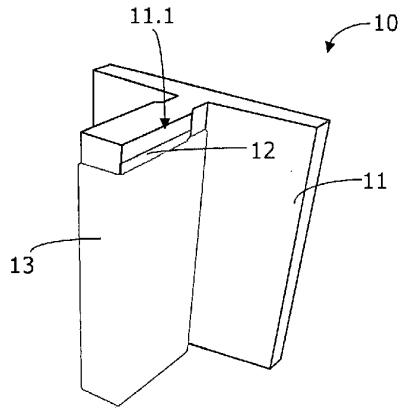


Fig. 3A

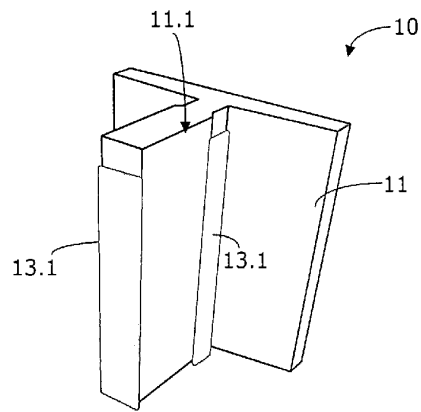


Fig. 3B