A method of coating a sheet of steel

The present invention relates to a method of coating a sheet of steel and to a coating for a sheet of steel and relates particularly, but not exclusively, to a method of coating a surface of a weight bearing sheet of steel for use on an aircraft carrier.

Ships, such as aircraft carriers, are commonly made from steel including the uppermost deck surface that acts as the aircrafts' takeoff and landing runway. These deck surfaces are commonly protected by applying a layer of organic paint. However, such paint is unable to withstand the gas-wash produced during the takeoff and landing of aircraft that use jet engines to facilitate a vertical takeoff or landing or short takeoff and vertical landing (STOVL). This gas-wash can result in a change of surface temperature from ambient to 2000°C causing a patch of the paintwork to be burnt away on each such manoeuvre. Such damage then makes a deck surface vulnerable to corrosion.

A surface coating is required that is able to deal with the rapid change in temperature including starting from ambient temperatures in a range of -50° C to +50° C. The coating must provide a nonslip or anti-skid surface allowing it to be safely walked on, it must be sufficiently robust to withstand the force applied to it during takeoff and landing and be easily repairable in the event of damage.

Preferred embodiments of the present invention seek to overcome the above described disadvantages of the prior art.

Summary

In one aspect, the present invention provides a method of coating a sheet of steel comprising the steps:- preparing a surface of a sheet of steel that is to be coated; applying a

first metal deposition coating to said sheet of steel, said first coating comprising aluminium; applying a second metal deposition coating to said first coating, said second coating comprising aluminium and a least one first doping material; and applying a barrier coating to said second metal deposition coating and characterised in that said second metal deposition coating is applied in a plurality of stages including a first stage and a second stage and wherein a particle accelerator used in the coating applications operates so as to accelerate the particles more in the first stage than the second stage so that a surface produced in said first stage has a surface roughness less than a surface roughness produced in said second stage. In another aspect, the present invention provides a coating for a sheet of steel, the coating comprising:- a first metal deposition coating comprising aluminium and applied to a prepared surface of a sheet of steel; a second metal deposition coating comprising aluminium and at least one first doping material and applied to said first metal deposition coating; a barrier coating applied to said second metal deposition coating, wherein said second metal deposition coating is applied in a plurality of stages including a first stage and a second stage and wherein a surface produced in said first stage has a surface roughness less than a surface roughness produced in said second stage. In yet another aspect, the present invention provides a sheet material comprising:- a sheet of steel material; and a coating as described herein applied to said sheet of steel material. In yet another aspect, the present invention provides an article comprising at least one sheet material as described herein.

Description

According to an aspect of the present invention there is provided a method of coating a sheet of steel comprising the steps:-

Claims

1. A method of coating a sheet of steel comprising the steps:-

preparing a surface of a sheet of steel that is to be coated;

applying a first metal deposition coating to said sheet of steel, said first coating comprising aluminium;

applying a second metal deposition coating to said first coating, said second coating comprising aluminium and a least one first doping material; and

applying a barrier coating to said second metal deposition coating and characterised in that said second metal deposition coating is applied in a plurality of stages including a first stage and a second stage and wherein a particle accelerator used in the coating applications operates so as to accelerate the particles more in the first stage than the second stage so that a surface produced in said first stage has a surface roughness less than a surface roughness produced in said second stage.

2. A method according to claim 1, wherein said surface of said sheet of steel is prepared by grit blasting.

3. A method according to claim 2, wherein said grit blasting uses a grit comprising brown fused alumina.

4. A method according to any preceding claim, wherein said first coating further comprises at least one second doping material.

5. A method according to claim 4, wherein said second doping material comprises at least one of zinc, molybdenum, Gallium, tin and indium.

6. A method according to any preceding claim, wherein said first metal deposition coating is applied to a thickness of between 75 and 200 µm.

7. A method according to any preceding claim, wherein said first doping material comprises at least one of titanium, chromium, manganese, boron, aluminium oxide, titanium oxide, chromium oxide, manganese oxide, boron oxide, boron nitride, boron carbide and tungsten carbide.

8. A method according to any preceding claim, wherein said second metal deposition coating is applied to a thickness of between 150 and 300 µm.

9. A method according to any preceding claim, wherein said barrier coating comprises an inorganic heat resistant coating material.

10. A method according to any preceding claim, wherein said barrier coating comprises a potassium silicate coating material.

11. A method according to any preceding claim, wherein said barrier coating is applied to a thickness of between 5 and 25 µm.

12. A method according to any preceding claim, wherein at least one of said first and second metal deposition coatings are applied using at least one of the metal deposition techniques of arc spray, wire spray, twin wire arc spray, air plasma and cold spray.

13. A coating for a sheet of steel, the coating comprising:-

a first metal deposition coating comprising aluminium and applied to a prepared surface of a sheet of steel;

a second metal deposition coating comprising aluminium and at least one first doping material and applied to said first metal deposition coating;

a barrier coating applied to said second metal deposition coating, wherein said second metal deposition coating is applied in a plurality of stages including a first stage and a second stage and wherein a surface produced in said first stage has a surface roughness less than a surface roughness produced in said second stage.

14. A coating according to claim 13, wherein said first coating further comprises at least one second doping material.

15. A coating according to claim 14, wherein said second doping material comprises at least one of zinc, molybdenum, Gallium, tin and indium.

16. A coating according to anyone of claims 13 to 15, wherein said first metal deposition coating has a thickness of between 75 and 200 µm.

17. A coating according to anyone of claims 13 to 16, wherein said first doping material comprises at least one of titanium, chromium, manganese, boron, aluminium oxide, titanium oxide, chromium oxide, manganese oxide, boron oxide, boron nitride, boron carbide and tungsten carbide.

18. A coating according to anyone of claims 13 to 17, wherein said second metal deposition coating is applied to a thickness of between 150 and 300 µm.

19. A coating according to anyone of claims 13 to 18, wherein said barrier coating comprises an inorganic heat resistant coating material.

20. A coating according to anyone of claims 13 to 19, wherein said barrier coating comprises a potassium silicate coating material.

21. A coating according to anyone of claims 13 to 20, wherein said barrier coating is applied to a thickness of between 5 and 25 µm.

22. A sheet material comprising:-

a sheet of steel material; and

a coating according to any of claims 13 to 24 applied to said sheet of steel material.

23. A sheet material according to claim 22, wherein said steel comprises hardened steel.

24. A sheet material according to claim 22 or 23, wherein said steel comprises carbon manganese steel.

25. An article comprising at least one sheet material according to any of claims 22 to 24.

26. An article according to claim 25, wherein said sheet material forms a weight bearing surface.

27. An article according to claim 25 or 26, wherein said article is any of a helicopter landing platform, a submarine, an oil rig, a chemical processing plant, an energy production plant, a shipping container and a munitions box.