resistant and that are resistant to corrosion by fluids that will come into contact with the surface during use.

SUMMARY OF THE INVENTION

Accordingly, the present invention provides a ~~process for~~method of producing a fluid transfer surface, which, in operation, is in constant or repeated contact with a secondary surface to transfer fluid onto the secondary surface, the fluid transfer surface having an engineered topography that is capable of receiving and transferring a consistent and uniform quantity of fluid, ~~which process comprises~~the method comprising:

providing a titanium or titanium alloy surface;

subjecting the titanium or titanium alloy surface to surface hardening by interstitial element absorption to provide a hardened surface; and, if required, engraving the surface to provide a desired surface topography.

In relation to the engraving step, if this is required it may be carried out before and/or after the step in which the titanium/titanium alloy surface is subjected to surface hardening.

Titanium and titanium alloys have outstanding resistance to atmospheric corrosion and attack by aggressive solutions, including alkaline media. The density of titanium is 4.5 g/cm^3 and in the current context this makes it an attractive choice for large dies and press rolls, where excessive weight makes handling cumbersome. However, titanium and titanium alloys tend to have poor tribiological properties, rendering them unsuitable for situations where surfaces slide against each other, such as for fluid transfer surfaces.

The present invention seeks to leverage off the desirable properties of titanium and titanium alloys whilst addressing the issue of their poor wear resistance. In accordance with the invention this is done by processing the titanium or titanium alloy to effect surface hardening. In accordance with the invention this is achieved by a mechanism of interstitial element absorption.

The present invention also provides a fluid transfer surface produced by the method of the invention, and to the use of such a surface in a fluid transfer process. Thus, according to

another aspect, there is provided a fluid transfer surface which, in operation, is in constant or repeated contact with a secondary surface to transfer fluid onto the secondary surface, the fluid transfer surface comprising titanium or titanium alloy hardened surface enriched with one or more interstitial elements and an engineered topography that is capable of receiving and transferring a consistent and uniform quantity of fluid.

The invention further provides a method of providing a fluid on a secondary surface, which method comprises providing a fluid to be transferred on a fluid transfer surface in accordance with the present invention, and contacting the fluid transfer surface with the secondary surface to transfer the fluid from the fluid transfer surface to the secondary surface. Herein the term "secondary surface" is used to denote the surface on to which fluid is to be transferred. The secondary surface may be a surface that is itself used to transfer the fluid on to a final product/substrate surface, for example a printing plate, blanket cylinder or roller. Rollers are typically formed of a natural or synthetic polymer, usually rubber, or a metal. Alternatively, the secondary surface may be a final product/substrate per se on to which the fluid is to be applied. Examples of final product/substrates include plastics films and sheets (e.g. PE, PET, PP, BOPP, vinyl, PVC, polycarbonate, polystyrene, Nylon and PTFE) and metallised films. The films may be cast or blown films or a laminate. Alternatively, the final product/substrate may be a paper sheet or roll, timber or a metal sheet or metal foil. The present invention may have particular utility in relation to the production of surfaces for fluid transfer in the context of a printing operation.

Throughout this specification and the claims which follow, unless the context requires otherwise, the word "comprise", and variations such as "comprises" and "comprising", will be understood to imply the inclusion of a stated integer or step or group of integers or steps but not the exclusion of any other integer or step or group of integers or steps.

The reference in this specification to any prior publication (or information derived from it), or to any matter which is known, is not, and should not be taken as an acknowledgment or admission or any form of suggestion that that prior publication (or information derived from it) or known matter forms part of the common general knowledge in the field of endeavour to which this specification relates.

CLAIMS:

1. A ~~process for~~method of producing a fluid transfer surface which, in operation, is in constant or repeated contact with a secondary surface to transfer fluid onto the secondary surface, the fluid transfer surface having an engineered topography that is capable of receiving and transferring a consistent and uniform quantity of fluid, ~~which process comprises~~the method comprising:
providing a titanium or titanium alloy surface;
subjecting the titanium or titanium alloy surface to surface hardening by interstitial element absorption to provide a hardened surface; and, if required, engraving the hardened surface to provide a desired surface topography.

2. The ~~process~~ method of claim 1, wherein surface hardening ~~may be~~is achieved by localised melting of the surface in the presence of a gas including the relevant element(s).

3. The method ~~process~~ of claim 2, wherein the gas including the relevant element(s) is used as a mixture with an inert gas.

4. The method ~~process~~ of claim 2 or 3, wherein the gas is nitrogen.

5. The method ~~process~~ of claim 2 or 3, wherein the gas is carbon dioxide.

6. The method ~~process~~ of claim 2 or 3, wherein the gas is air.

7. The method ~~process~~ of any one of the preceding claims, wherein localised melting of the surface is carried out using a laser.

8. The method ~~process~~ of any one of the preceding claims, wherein the hardened surface is engraved using a laser.

9. The method ~~process~~ of any one of the preceding claims, wherein the hardened surface is engraved by embossing or knurling.

10. The method ~~process~~ of any one of the preceding claims, wherein the hardened surface is engraved by chemical etching.

11. The method ~~process~~ of any one of the preceding claims, wherein the titanium or

titanium alloy surface is the outer surface of a cylinder.

12. The method ~~process~~ of any one of the preceding claims, wherein the titanium or titanium alloy surface has been produced by cold spraying titanium or titanium alloy powder.

13. The method ~~process~~ of any one of the preceding claims, wherein the titanium or titanium alloy surface has been produced by cold spraying of titanium or titanium alloy particles onto the surface of a base component.

14. The method ~~process~~ of claim 13, wherein the base component is a cylinder, plate or die.

15. The method ~~process~~ of any one of the preceding claims, wherein the titanium or titanium alloy surface is a composite material comprising one or more functionally effective additives.

16. The method ~~process~~ of claim 1, wherein the titanium or titanium alloy surface is subjected to treatment cycles comprising one or more engraving steps and one or more hardening steps.

17. A method of repairing a fluid transfer surface which, in operation, is in constant or repeated contact with a secondary surface to transfer fluid onto the secondary surface, the fluid transfer surface having an engineered topography that is capable of receiving and transferring a consistent and uniform quantity of fluid, which method comprises providing on the fluid transfer surface a layer of titanium or titanium alloy by cold spraying onto the surface titanium or titanium alloy particles and subjecting the titanium or titanium alloy layer to surface hardening by interstitial element absorption to provide a hardened surface and, if required, engraving the hardened surface to provide a desired surface topography.

18. A fluid transfer surface which, in operation, is in constant or repeated contact with a secondary surface to transfer fluid onto the secondary surface, the fluid transfer surface comprising titanium or titanium alloy hardened surface enriched with one or more interstitial elements and an engineered topography that is capable of receiving and transferring a consistent and uniform quantity of fluid.~~, the fluid transfer surface being when produced by the process of any one of claims 1 to 17.~~

19. A method of providing a fluid on a secondary surface, which method comprises providing a fluid to be transferred on a fluid transfer surface as claimed in claim 18, and

contacting the fluid transfer surface with the secondary surface to transfer the fluid from the fluid transfer surface to the secondary surface.

20. The use of a fluid transfer surface as claimed in claim 18 in a fluid transfer process.