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TREATMENT OF TITANIUM

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2 Claims. (Cl. 148—13.1)

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My invention relates to shaped or molded hard materials for use as abrasion- or impact-resisting surfaces. It relates especially to the preparation of formed or molded shapes from metals having, as a major constituent, metallic titanium.

I have found that metals consisting mainly of titanium, and, particularly, pure or substantially pure metallic titanium, can be converted into a very hard and tough substance by treatment with molten alkali metal cyanides. A typical example of such treatment is the immersion of a sheet of pure titanium in molten potassium cyanide. Under these conditions, a very hard, tough, adherent coating is formed on the titanium sheet which can then be used for any purpose where resistance to abrasion or penetration is required.

The formed or molded article of titanium may be made by any of the methods known in the art. For example, I have made sheets of titanium by rolling ductile titanium which is formed by the decomposition of titanium bromide on a hot tungsten wire. I have also utilized the powder metallurgy technique to produce a relatively pure titanium, for example, by treating titanium dioxide with calcium hydride, removing the lime by an acid treatment, decomposing the titanium hydride to form pure titanium in powder form and compacting and sintering said titanium powder into a solid non-porous coherent object.

In the practice of my invention, the reaction to form the hard titanium compound may be allowed to proceed, for example, so as to form only a very thin, hard coating on the titanium, or it may be allowed to proceed until the entire mass of titanium is converted into the hard compound. In the case where only part of the titanium is converted to the hard compound, the duplex material so formed has a remarkable degree of ductility and can be deformed and bent without breaking or removing the hard coating. Since titanium has a specific gravity of only half that of steel and since the hard compound formed has a slightly lower specific gravity, it will be seen that very hard objects of low specific gravity can be obtained. The advantages of such materials are clear in the light of my teachings. Objects

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made in accordance with my invention may be used, for example, for the production of aircraft parts where the saving of weight is an important factor. Hard, shaped objects produced in accordance with my invention may also be used for cutting tools, dies, bearings, impact-resistant elements and, in general, for all manner of uses where hardened steel surfaces, diamonds and cemented carbides have heretofore been employed.

What I claim as new and desire to protect by Letters Patent of the United States is:

1. The process of producing a hard, tough and adherent coating on objects consisting at least mainly of titanium which comprises subjecting said objects to the action of a molten alkali metal cyanide.

2. A shaped object comprising a body portion of ductile metallic titanium and having a hard, adherent, abrasion-resistant surface resulting from the action on the ductile metallic titanium of a molten alkali metal cyanide.

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