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METHOD OF SPRAY COATING GAS SEALS OF GAS TURBINES AND THE LIKE

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2 Claims

ABSTRACT OF THE DISCLOSURE

A method, especially useful for coating the gas seals of gas turbines, in which mixtures of powders are sprayed, by means of a plasma arc gun, onto the surface to be coated, under temperature conditions such that one of the powders is melted or partially melted to provide a matrix, and the other powder remains unmelted, but the particles thereof are held tightly in the matrix, to supply a soft material in an otherwise hard mass.

This application is a continuation-in-part of my co-pending application, Ser. No. 459,075, filed May 26, 1965, now abandoned.

This invention relates generally to methods for coating gas seals of gas turbines, and for other purposes.

In Patent No. 3,265,494, of James F. Baldwin and Arthur T. Cape, an alloy is described, known as Coast Metals No. 64, which is a cobalt-base alloy containing substantial amounts of chromium, tungsten and nickel. The alloy is especially adapted for high temperature use, as, for example, for coating the gas seal of a gas turbine. The alloy has a melting point of about 2500° F., and a hardness of 50–60 Rockwell C, and when deposited on such seal is so hard that the turbine blades become worn as a result of their rubbing against the deposit.

I have found that if the foregoing alloy, in powder form, is mixed with cobalt, in powder form, to the extent that the cobalt powder constitutes from 15 to 60% by weight of the mixture, that the mixture, when sprayed by a plasma arc gun onto the gas seal, forms a coating which consists of unmelted cobalt particles held in a matrix of the alloy, which coating is of such a nature that it greatly reduces the wear of the turbine blades. The coating has a hardness of about 35–40 Rockwell C.

In spraying the mixture by means of a plasma arc gun, the alloy particles are melted, or partially melted, but the cobalt particles remain unmelted, and are held tightly in the matrix formed by the alloy particles. In effect, the cobalt particles supply a soft material, in an otherwise hard mass, thus reducing the tendency to wear the ends of the turbine blades.

The coating is thus highly desirable, not only from the viewpoint of adherence to the gas seal, but also from the viewpoint of reducing the wearing or cutting of the turbine blades.

Although it is preferred to use cobalt powder in the mixture, powders other than cobalt may be used, such, for example, as tungsten powder, chromium powder, nickel powder, molybdenum powder, and iron powder, the only limitation, in this respect, being that such powder have a melting point higher than that of the No. 64 alloy, and the property of not reacting rapidly with the molten or semi-molten No. 64 during the deposition.

The invention is applicable generally to all cobalt-base alloys containing chromium and tungsten, with or without

nickel. Examples of such alloys are Coast Metals No. 63, Stellite No. 1, Stellite No. 6.

The invention is also of advantage in all applications where the alloys per se are as hard as those described, but the addition of the cobalt or other powder provides a coating in which the high temperature properties of the alloy per se are retained while maintaining the advantages of a deposit more able to withstand impact, without deterioration of the resistance of the deposit to lead oxide corrosion or oxidation.

For example, the invention is applicable to the facing of the seating portions of poppet valves, especially those which are used in internal combustion engines.

It will be understood that various changes may be made in the methods, without departing from the spirit of the invention or the scope of the appended claims.

Having thus described my invention, I claim:

1. The method which comprises spraying onto a surface to be coated, by means of a plasma arc gun, a mixture consisting of (A) a first powder of a cobalt-base alloy containing chromium and tungsten, and (B) a second powder selected from the group consisting of cobalt powder, tungsten powder, chromium powder, nickel powder, and iron powder, in an amount constituting from 15% to 60% by weight of the mixture, the melting point of the first powder being lower than the melting point of the second powder, the spraying being conducted under temperature conditions such that the cobalt-base alloy powder is melted or partially melted, but the other powder remains unmelted and the particles thereof are held tightly in a matrix of the melted or partially melted material, and supply a soft material, in an otherwise hard mass.

2. The method which comprises spraying onto the gas seal of a gas turbine, by means of a plasma arc gun, a mixture consisting of (A) a first powder of a cobalt-base alloy containing chromium and tungsten, and (B) a second powder selected from the group consisting of cobalt powder, tungsten powder, chromium powder, nickel powder, and iron powder, in an amount constituting from 15% to 60% by weight of the mixture, the melting point of the first powder being lower than the melting point of the second powder, the spraying being conducted under temperature conditions such that the cobalt-base alloy powder is melted or partially melted, but the other powder remains unmelted, and the particles thereof are held tightly in a matrix of the melted or partially melted material, and supply a soft material, in an otherwise hard mass, thereby reducing the tendency to wear the ends of the turbine blades when rubbing against said coated gas seal.

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