The opinion in support of the decision being entered today was not written for publication and is not binding precedent of the Board.

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte GARY EUGENE WHEAT,
TERRI KAY BROWN,
ROGER DALE WUSTMAN,
and
JOSEPH DAVID RIGNEY

Appeal No. 2004-2027
Application No. 09/670,189

ON BRIEF

Before PAK, WARREN, and DELMENDO, Administrative Patent Judges.

DELMENDO, Administrative Patent Judge.

DECISION ON APPEAL

This is a decision on an appeal under 35 U.S.C. § 134 (2003) from the examiner's final rejection of claims 1 through 20 (final Office action mailed Apr. 25, 2003), which are all of the claims pending in the above-identified application.[1]

The subject matter on appeal relates to a method for coating an article (e.g., airfoils of gas turbine blades and vanes).

[1] In reply to the final Office action, the appellants submitted two amendments pursuant to 37 CFR § 1.116 (2003)(effective Feb. 5, 2001). The first, which was filed on Jul. 21, 2003, was refused entry. (Advisory action mailed Aug. 4, 2003.) The second, which was filed on Aug. 25, 2003, was entered for purposes of this appeal. (Advisory action mailed Oct. 8, 2003.)

(Specification, page 2, lines 15-24.) According to the appellants, "[t]he present invention provides a method for coating an article with an aluminide coating that is modified with at least one other element to enhance oxidation resistance and other environmental performance of the coating. (Id. at lines 15-17.) Further details of this appealed subject matter are recited in representative claims 1 and 12, the only independent claims on appeal, reproduced below:

> 1. A method for coating an article, comprising the steps of:
> providing the article having a surface;
> preparing a coating source comprising:
> a solid aluminum halide,
> a solid fluoride or a solid iodide of a modifying element as a source of the modifying element, the modifying element being selected from the group consisting of zirconium, hafnium, and yttrium, and combinations thereof, and
> a carrier gas;
> producing a coating gas from the coating source, the coating gas comprising a gaseous aluminum halide, a gaseous fluoride or a gaseous iodide of the modifying element, and the carrier gas; and
> contacting the coating gas to the article; and simultaneously
> heating the coating gas and the article to a coating temperature of at least about 1850°F for a period of time sufficient to permit aluminum and the modifying element to coat onto the surface of the article.
>
> 12. A method for coating an article, comprising the steps of:
> providing the article having a surface, the article being an airfoil;
> preparing a coating source comprising:
> a solid aluminum halide,
> a solid fluoride of a modifying element as a

source of the modifying element, the fluoride of the modifying element being selected from the group consisting of a zirconium fluoride and a hafnium fluoride, and combinations thereof, and

a carrier gas;

producing a coating gas from the coating source, the coating gas comprising a gaseous aluminum halide, a gaseous fluoride of the modifying element, and the carrier gas; and

contacting the coating gas to the surface of the airfoil; and simultaneously

heating the coating gas and the article to a coating temperature of from about 1850°F to about 2000°F for a period of time sufficient to permit aluminum and the modifying element to coat onto the surface of the airfoil.

The examiner relies on the following prior art references as evidence of unpatentability:

Chang et al. (Chang)	3,951,642	Apr. 20, 1976
Speirs et al. (Speirs)	4,066,806	Jan. 03, 1978
Bornstein et al. (Bornstein)	4,142,023	Feb. 27, 1979
Smith et al. (Smith)	4,180,400	Dec. 25, 1979
Basta et al. (Basta ’963)	5,261,963	Nov. 16, 1993
Basta et al. (Basta ’614)	5,658,614	Aug. 19, 1997
Warnes et al. (Warnes)	5,989,733	Nov. 23, 1999 (filed Jul. 23, 1996)

The appealed claims stand rejected under 35 U.S.C. § 103(a) as follows:

I. claims 1, 2, and 4 through 11 as unpatentable over Warnes in view of Basta '963 and Smith (examiner's answer mailed Jan. 16, 2004, pages 3-9);

II. claims 3 and 12 through 20 as unpatentable over Warnes in view of Basta '963, Smith, and Basta '614 (id. at 9-12); and

III. claims 1, 3, 5 through 7, 9, 11, 12, 15, 17, 18, and 20 as unpatentable over Chang in view of Speirs and Bornstein (id. at 12-15).[2]

We reverse all three rejections for essentially the reasons set forth in the appeal brief filed on Oct. 23, 2003 and the reply brief filed on Feb. 17, 2004.

Regarding rejections I and II, the examiner concedes that Warnes "does not explicitly teach preparing a coating source that comprises a solid aluminum halide and a solid fluoride or iodide of zirconium, hafnium, and/or yttrium." (Answer at 4.) Notwithstanding this difference between the claimed invention and the method described in Warnes, it is the examiner's basic position that one of ordinary skill in the art would have been led, prima facie, to combine the teachings of Warnes with Smith and Basta '963 so as to arrive at a method encompassed by

[2] The final rejection under 35 U.S.C. § 112, ¶2, of claims 9 and 20 has been withdrawn. (Advisory action mailed Oct. 8, 2003.)

appealed claim 1 or 12.

We cannot agree with the examiner's analysis and conclusion.

Warnes discloses a method of making CVD [chemical vapor deposition] active element modified platinum aluminide diffusion coatings on a nickel or cobalt base superalloy substrate, wherein a platinum layer is first deposited on the substrate and then Al+Si+Hf+ optionally Zr and/or other active elements are CVD codeposited to produce diffusion coatings useful in, e.g., service applications in the hot turbine section of a gas turbine aircraft engine. (Column 2, lines 55-64.) Warnes further teaches:

> The substrate first was electroplated with Pt (9-11 milligrams/centrimeter [sic] squared) as described above without any diffusion heat treatment of the platinum layer prior to CVD codeposition...The second step was conducted at a substrate temperature of 1080° C. using coating gas mixture comprising 4 volume % silicon tetrachoride [sic] and aluminum trichloride (greater than 90% by volume aluminum trichloride), 79.5 volume % hydrogen, 15 volume % Ar, and 1.5 volume % $HfCl_4$ and $ZrCl_4$ [(coating gas flow rate of 200 standard cubic feet per hour (scfh) and total pressure of 150 Torr]. <u>The coating gas mixture was generated by passing high purity hydrogen (e.g. less than 30 ppb impurities) and high purity hydrogen chloride (e.g. less than 25 ppm impurities) in mixture of hydrogen/10 volume % HCl over a high purity 99.999% pure source of aluminum and then passing the mixture over a high purity 99.999% pure source of silicon with both sources at 290° C. (sources external of retort) to form a mixture of aluminum trichloride and silicon tetratrichloride [sic]</u> as disclosed in copending application Ser. Nos. 08/197,349 and 08/197,497 of common assignee herewith, the teachings of which are incorporated herein by reference to this end. <u>A</u>

> mixture of Ar/10 volume % HCl was flowed in an external chloride generator through a hafnium bed at 430 °C. to form hafnium tetrachloride containing a small amount (e.g. less than 1 volume %) of zirconium tetrachloride. The hafnium bed included a small concentration of zirconium, such as less, than 1 weight % Zr. Alternately, the coating gas mixture can be flowed through a cogenerator having a hafnium bed and a zirconium bed downstream of the hafnium bed to form coating gas mixture... [Underscoring added.]

Smith discloses "sintered cemented carbide bodies coated with thin and extremely wear resistant surface layers." (Column 1, lines 6-8.) Specifically, Smith teaches a method of making an aluminum oxide-coated cemented carbide body, wherein: a cemented carbide substrate is contacted with a gas containing an aluminum halide and a reducing agent at high temperature; titanium, zirconium, and/or hafnium ions are added as dopants to the gas in an amount of 0.03-0.5% of the total amount of supplied gas; and the cemented carbide is coated with aluminum oxide, at least 85% of which is in the kappa form. (Column 2, lines 26-37.) According to Smith, the aluminum chloride may be provided in the gas form by evaporation of the solid or liquid form. (Column 5, lines 18-21.)

Basta '963 discloses a CVD method in which a substrate (e.g., nickel base superalloy) to be coated is supported in a coating region of a reactor chamber and is heated to an elevated reaction temperature. (Column 3, lines 19-23.) According to Basta '963, the method is especially useful for CVD aluminizing

one or more substrates with an aluminum halide gaseous reactant stream. (Column 3, lines 34-37; column 4, lines 31-40.) Basta '963 further teaches the use of other chemical species such as chromium halides, hafnium halides, zirconium halides, or yttrium halides in addition to or in lieu of the aluminum halide species. (Column 9, lines 23-32.)

As pointed out by the appellants (appeal brief at 6), none of the relied upon references contains any teaching or suggestion as to the provision of "a solid fluoride or a solid iodide" of the specified modifying element. Absent any evidence supporting the allegation that one of ordinary skill in the art would have been led to use "a solid fluoride or a solid iodide" of the specified modifying element, we cannot uphold rejections I and II.[3]

Turning to rejection III, the examiner admits that Chang does not teach the preparation of a coating source comprising solid aluminum halide. (Answer at 13.) Nevertheless, the examiner held (id.):

> [I]t would have been obvious to one of ordinary skill in the art...to have included aluminum halide with the energizer in the aluminum pack diffusion process of

[3] While the examiner relies on an additional reference, namely Basta '614, to reject appealed claims 3 and 12-20, this reference does not make up for the deficiency in the combination of Warnes, Smith, and Basta '963.

> Chang '642 with a reasonable expectation of success and with the expectation of similar results because Speirs '806 teaches that energizers comprising aluminum chloride are also known as energizers in aluminum pack diffusion processes.

We cannot agree with the examiner's conclusion for the reasons stated in the reply brief at 14-15.[4]

In summary, we reverse the examiner's rejections under 35 U.S.C. § 103(a) of: (i) claims 1, 2, and 4 through 11 as unpatentable over Warnes in view of Basta '963 and Smith; (ii) claims 3 and 12 through 20 as unpatentable over Warnes in view of Basta '963, Smith, and Basta '614; and (iii) claims 1, 3, 5 through 7, 9, 11, 12, 15, 17, 18, and 20 as unpatentable over Chang in view of Speirs and Bornstein.

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[4] The examiner states "Bornstein...is extraneous to the rejection." (Answer at 14.) Accordingly, we see no reason to discuss this reference.

The decision of the examiner is reversed.

REVERSED

Chung K. Pak Administrative Patent Judge	)	
	)	BOARD OF PATENT
Charles F. Warren Administrative Patent Judge	)	APPEALS AND
	)	INTERFERENCES
Romulo H. Delmendo Administrative Patent Judge	)	

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