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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

GENERAL ELECTRIC COMPANY,
Petitioner,

v.

UNITED TECHNOLOGIES CORPORATION,
Patent Owner.

Case IPR2016-01289
Patent 7,060,360 B2

Before GRACE KARAFFA OBERMANN, CHRISOPHER M. KAISER, and MICHELLE N. ANKENBRAND, *Administrative Patent Judges*.

OBERMANN, *Administrative Patent Judge*.

FINAL WRITTEN DECISION
Finding Claims 1–14 Unpatentable
35 U.S.C. § 318 and 37 C.F.R. § 42.73

I. INTRODUCTION

This is a Final Written Decision in an *inter partes* review of claims 1–14 of U.S. Patent No. 7,060,360 B2 (Ex. 1001, "the '360 patent"). We instituted trial under 35 U.S.C. § 314 based on challenges asserted in the Petition (Paper 1 ("Pet.")). Paper 7 (Institution Decision ("Dec.")). Patent Owner filed a Response under 37 C.F.R. § 42.120. Paper 12 ("Resp."). Petitioner filed a Reply to Patent Owner's Response. Paper 16 ("Reply").

Patent Owner does not seek to amend any challenged claim under 37 C.F.R. § 42.121. Although Petitioner filed objections to the admissibility of evidence served with Patent Owner's Response (Paper 13), neither party filed a motion to exclude evidence.

An oral hearing was conducted on September 18, 2017, and a transcript was made of record. Paper 24, ("Tr."). After the hearing, with Board pre-authorization (Paper 20), Petitioner filed a supplemental brief (Paper 21) and Patent Owner filed a responsive supplemental brief (Paper 22). For reasons that follow, we conclude that Petitioner shows by a preponderance of evidence that claims 1–14 are unpatentable under 35 U.S.C. § 103.

A. Related Matters

The parties do not identify any related district court actions or administrative proceedings. Pet. 1; Paper 4, 2.

B. The '360 Patent

The '360 patent is titled "Bond Coat for Silicon Based Substrates." Ex. 1001, Title. The '360 patent relates to an environmental barrier coating for protecting a silicon-containing substrate, such as combustor and turbine

sections of gas turbine engines. *Id*. at 1:7–18. Specifically, the coating protects the substrate from the adverse effects of oxidation in high temperature, aqueous environments, thereby increasing the service life of the components. *Id*. That coating comprises an alkaline earth aluminosilicate based on barium and strontium (also known as "BSAS"), or yttrium silicate. *Id*. at 1:22–24, claim 1; Pet. 9. A "bond layer" is located between the substrate and the BSAS coating. *Id*. at 1:19–47; claim 1.

The '360 patent discloses that the BSAS coating was known in the prior art. *Id*. at 1:22–25. The specification also identifies, as prior art, a bond layer (located between the BSAS coating and the substrate) comprising "a dense continuous layer of silicon metal." *Id*. at 21–22; Fig. 1. The inventors claim to have discovered that, by using a bond layer that includes an alloy comprising a refractory metal disilicide/silicon eutectic, instead of "a simple phase silicon metal bond coat," the fracture toughness of the bond coat is increased, resulting in "more resistance to crack propagation." *Id*. at 1:50–2:3; *see* claim 1 (specifying a bond layer including an alloy comprising a refractory metal disilicide/silicon eutectic).

C. Illustrative Claim

Claim 1, reproduced below, is illustrative of the subject matter:

> 1. An article comprising a silicon based substrate, at least one environmental barrier layer selected from the group consisting essentially of an alkaline earth aluminosilicate based on barium and strontium, and yttrium silicate, and a bond layer between the substrate and the environmental barrier layer, the bond layer comprises an alloy comprising a refractory metal disilicide/silicon eutectic.

Ex. 1001, 2:55–62.

D. Asserted Prior Art and Other Evidence

The Petition asserts the following prior art references:

1. Valentina Sergeevna Terentieva, et al., U.S. Patent No. 5,677,060, issued Oct. 14, 1997 (Ex. 1005, "Terentieva");

2. Harry Edwin Eaton, Jr., et al., U.S. Patent No. 6,387,456 B1, issued May 14, 2002 (Ex. 1006, "Eaton");

3. J.D. Webster, et al., *Oxidation Protection Coatings for C/SiC Based on Yttrium Silicate*, 18 J. EUR. CERAM. SOC. 2345–2350 (1998) (Ex. 1025, "Webster");

4. Yoshikazu Suzuki, et al., *Improvement in Mechanical Properties of Powder-Processed $MoSi_2$ by the Addition of Sc_2O_3 and Y_2O_3*, 18(12) J. AM. CERAM. SOC. 3141–3149 (Dec. 1998) (Ex. 1024, "Suzuki").

The Petition is supported by the Declaration of Dr. Andreas M. Glaeser. Ex. 1003. Patent Owner's Response is supported by the Declaration of Dr. David R. Clarke (Ex. 2001) and the Supplemental Declaration of Dr. Clarke (Ex. 2013).

E. The Asserted Grounds of Unpatentability

Petitioner challenges the patentability of claims 1–14 of the '360 patent on the following grounds:

Claims	Basis	References
1–14	§ 103	Terentieva and Eaton
1–14	§ 103	Terentieva, Webster, Suzuki, and Allegedly Admitted Prior Art

II. ANALYSIS

> Under 35 U.S.C. § 103, subject matter is unpatentable
>
> if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.

The Supreme Court explains that, to determine obviousness,

> [o]ften, it will be necessary for a court to look to interrelated teachings of multiple patents; the effects of demands known to the design community or present in the marketplace; and the background knowledge possessed by a person having ordinary skill in the art, all in order to determine whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue. To facilitate review, this analysis should be made explicit. . . . As our precedents make clear, however, the analysis need not seek out precise teachings directed to the specific subject matter of the challenged claim, for a court can take account of the inferences and creative steps that a person of ordinary skill in the art would employ.

KSR Int'l Co. v. Teleflex Inc., 550 U.S. 398, 418 (2007). We analyze the evidence presented by Petitioner and Patent Owner in light of the Supreme Court's guidance.

A. Level of Ordinary Skill in the Art

We consider patentability in view of the understanding of a person of ordinary skill in the art. The prior art in this case itself is sufficient to demonstrate the level of ordinary skill in the art at the time of the invention. *See Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001) (prior art itself can reflect appropriate level of ordinary skill in the art). Further, based on the record developed during trial, we find that Petitioner's witness, Dr. Glaeser, and Patent Owner's witness, Dr. Clarke, both are qualified to opine from the perspective of an ordinary artisan at the time of the invention.

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