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Miller, Matthias & Hull, LLP-Pratt & Whitney
c/o: Miller, Matthias & Hull, LLP
One North Franklin Street
Suite 2350
Chicago, IL 60606

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ELLIS, RYAN H	

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tmiller@millermatthiashull.com
bmatthias@millermatthiashull.com
fdamsa@millermatthiashull.com

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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Ex parte MATTHEW A. DEVORE, JOSEPH W. BRIDGES JR., and CORNEIL S. PAAUWE.

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Appeal 2010-006760
Application 11/529,113
Technology Center 3700

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Before PHILLIP J. KAUFFMAN, MICHAEL L. HOELTER, and JILL D. HILL, *Administrative Patent Judges*.

HILL, *Administrative Patent Judge.*

DECISION ON APPEAL

STATEMENT OF THE CASE

Matthew A. Devore et al. (Appellants) seek our review under 35 U.S.C. § 134 of the Examiner's decision rejecting claims 1, 3, 5, and 6. App. Br. 2. Claims 1, 3, 5, and 6 are independent claims. We have jurisdiction under 35 U.S.C. § 6(b).

We AFFIRM.

THE INVENTION

Appellants' claimed invention relates to impingement cooling of a large platform-to-airfoil fillet radius on a turbine airfoil. Spec. 1, para. [0002]. Claims 1 and 5 are method claims, claim 3 is directed to a system for impingement cooling, and claim 6 is directed to a turbine airfoil. Claim 1 is illustrative of the subject matter on appeal and is reproduced below with the key disputed limitations emphasized.

> 1. A method of impingement cooling a turbine airfoil with a large platform to airfoil fillet radius which contains a plurality of cooling holes through the airfoil wall which comprises:
>
> (a) coring the airfoil fillet such that the fillet wall is maintained at a minimum thickness;
>
> (b) *inserting* into the airfoil *an impingement tube* which follows the fillet contour to platform transition;
>
> (c) applying impingent air through the impingement tube to the airfoil walls and
>
> (d) using the impinged air to subsequently flow through airfoil and fillet holes to provide film cooling to the airfoil fillet.

THE EVIDENCE

The Examiner relies on the following evidence:

Cunha	US 2006/0083613 A1	Apr. 20, 2006
Harding	US 2006/0034679 A1	Feb. 16, 2006
Beabout	US 5,511,309	Apr. 30, 1996

THE REJECTIONS

Appellants seek review of the following rejections: [1]

Claim 1 as rejected under 35 U.S.C. § 103(a) as unpatentable over Harding, Cunha, and Beabout. Ans. 4-5.

Claims 3, 5, and 6 as rejected under 35 U.S.C. § 103(a) as unpatentable over Harding and Cunha. Ans. 7.

Claims 3 and 6 as rejected under 35 U.S.C. § 102(a) as anticipated by Cunha. Ans. 3.

ANALYSIS

Claim 1 as Unpatentable over Harding, Cunha, and Beabout

The Examiner finds that Harding teaches a method of impingement cooling a turbine airfoil 18 with a large platform-to-airfoil fillet radius, the method comprising: forming the airfoil fillet such that the fillet wall (flared portions 24) is maintained at a minimum thickness; (b) inserting into the airfoil an impingement tube (baffle 26) that follows the fillet contour to platform transition (¶0020, lines 4-7); and (c) applying impingement air through the impingement tube to the airfoil walls (¶0023). Ans. 5. Paragraph [0023] of Harding teaches coolant entering baffle inlets 36, flowing through holes 28, and impinging on the vane wall 22 to

[1] Appellants seek to appeal claims 1, 3, 5, and 6, and are not seeking review of the rejection of claims 2 and 7. *See* Supp App. Br. dated Dec 14, 2009; Reply Br. 2. Therefore, we dismiss the appeal as to claims 2 and 7. *See Ex parte Ghuman*, 88 USPQ2d 1478, 1480 (BPAI 2008) (precedential). We note that § 1215.03 of the Manual of Patent Examining Procedure states that a "withdrawal of the appeal as to some of the claims on appeal operates as an authorization to cancel those claims from the application."

impingement cool the vane. The baffles are inserted as shown in Figure 2. *Id*. The Examiner finds that Harding fails to teach using impinged air to subsequently flow through airfoil fillet holes and provide film cooling to the airfoil fillet, and coring the airfoil to form the fillet. *Id*.

The Examiner finds, however, that Cunha teaches a method of impingement cooling a turbine airfoil comprising using impinged air to subsequently flow through fillet holes and provide film cooling to the airfoil fillet (¶0022). Ans. 5-6. The Examiner concludes that it would have been obvious to one having ordinary skill in the art at the time the invention was made to incorporate Cunha's film cooling holes into Harding's airfoil blade to provide more efficient cooling of the blade. Ans. 6. The Examiner also finds that Beabout teaches coring an airfoil to form cooling passages (col. 2, ll. 1-15), and that a desired shape of an airfoil can be manufactured by coring. *Id*. The Examiner reasons that if Beabout's manufacturing method, which includes coring, was used to manufacture the airfoil of Harding as modified by Cunha, the claimed airfoil would be produced. *Id*. The Examiner concludes that it would have been obvious to one having ordinary skill in the art at the time the invention was made to form the airfoil of Harding as modified by Cunha using the coring method taught by Beabout for the purpose of making the airfoil with less machining. *Id*.

In the Response to Arguments section of the Answer, regarding obviousness of combining Harding and Cunha, the Examiner states that supplying film cooling holes with air from an upstream impingement process is known as taught by Cunha and therefore adding film cooling holes to Harding to cool the airfoil skin would have been obvious to one having ordinary skill in the art. Ans. 11.

Appellants argue that Harding does not disclose the claimed impingement tube, but rather teaches a vane assembly 10 having no fillets with a large platform-to-fillet radius. Reply Br. 5. To the extent that Appellants are arguing that Harding does not teach the claimed large platform-to-fillet radius, Appellants fail to explain the metes and bounds of a large platform-to-fillet radius and why Harding's teachings do not fall within those metes and bounds.

Appellants also argue that Harding's baffles 26 are dissimilar to the impingement tubes of the claimed invention because they are fastened together by a rigid fastener 48, and air enters the baffles from opposite directions and leaves the impingement cavity 46 without film cooling a fillet with a large radius. Reply Br. 6. To the extent that Appellants are arguing that Harding does not teach the claimed large platform-to-fillet radius, as explained above, Appellants fail to explain the metes and bounds of a large platform-to-fillet radius and why Harding's teachings do not fall within those metes and bounds. To the extent that Appellants are arguing that Harding's baffles are not the claimed impingement tube because they are fastened together by a rigid fastener 48 and air enters the baffles from opposite directions, Appellants are arguing limitations that are not present in the claims.

Appellants further argue that there is no reason to combine Harding and Cunha because there is no rational basis to add the film cooling holes of Cunha to the airfoil of Harding, as Harding does not have large radius fillets and therefore does not need film cooling holes to provide cooling to an airfoil fillet. *Id*. As stated above, Appellants fail to explain why Harding's teachings do not fall within the metes and bounds of a large platform-to-

fillet radius. In addition, Appellants have not stated that the Examiner erred in reasoning that it would have been obvious to one having ordinary skill in the art at the time of the invention to incorporate Cunha's film cooling holes into Harding's airfoil blade to provide "more efficient cooling of the blade".

Regarding the Examiner's reason for combining the teachings of Beabout with Harding and Cunha, Appellants argue that Beabout discloses a turbine stator vane whose structure is otherwise dissimilar to the structure of Appellants' airfoil, and the difference in structure renders it unobvious to one skilled in art to adapt Beabout's coring step to any of the other cited references in order to obtain the applicant's invention. *Id.* Appellants fail to explain how the difference in structure would render adaption of Beabout's coring step to the structure of Harding as modified by Cunha unobvious.

Appellants also argue that Beabout discloses coring to form serpentine cooling passages, but not to form an airfoil fillet such that the fillet wall is maintained at a minimum thickness, and that Beabout also does not disclose coring a fillet with a large radius. Reply Br. 6, 7. The Examiner does not allege that Beabout teaches a large radius fillet, but rather finds such structure in Harding. Further, Appellants fail to explain the metes and bounds of "minimum thickness," and why the cited references do not disclose a fillet wall that falls within those metes and bounds.

Appellants also argue that since fillets with large radiuses have not been previously cored, despite that coring is generally known in the art, there is strong evidence that coring a fillet with a large radius is not obvious. *Id.* We do not find this argument persuasive. Appellants have not defined a fillet with a "large radius," have not supplied evidence that fillets with large radiuses have not been cored, and have not explained how these facts show

error in the Examiner's reasoning that it would have been obvious to one having ordinary skill in the art at the time the invention was made to form the airfoil of Harding as modified by Cunha using the coring method taught by Beabout for the purpose of making the airfoil with less machining.

We are not persuaded by Appellants' arguments for the reasons set forth above, and we therefore sustain the rejection of claim 1 as unpatentable over Harding, Cunha, and Beabout.

Claims 3, 5, and 6 as Unpatentable over Harding and Cunha

As discussed above, the Examiner finds that Harding discloses a system for impingement cooling a turbine airfoil with a large platform-to-fillet radius, the system comprising the claimed airfoil, fillet, and inserted impingement tube with holes for delivering impingement air to the fillet. Ans. 7. The Examiner also finds that Harding teaches applying impingement air through the impingement tube to the fillet walls. Ans. 8. The Examiner admits that Harding does not teach a plurality of cooling holes through the airfoil wall, but finds that Cunha discloses a plurality of cooling holes through the airfoil wall, and concludes that it would have been obvious to one having ordinary skill in the art at the time the invention was made to incorporate Cunha's film cooling holes into Harding's airfoil blade to more efficiently cool the airfoil blade. Ans. 7.

Appellants maintain the same arguments set forth above with respect to the disclosure of Harding and the combination of Harding and Cunha, additionally stating that "because of the complexities of airfoil cooling needs and cooling air flow patterns, it would not be obvious to adapt the film cooling holes of Cunha et al. to the vane of Harding et al." Reply Br. 7-8. Appellants do not provide, however, any description of such structural

complexities or why they render it non-obvious to adapt Cunha's film cooling holes to Harding's airfoil. We therefore are not persuaded by the Examiner's arguments and we sustain the rejection of claims 3, 5, and 6 as unpatentable over Harding and Cunha.

Claims 3 and 6 as Anticipated by Cunha

Our affirmance of the rejection of claims 3 and 6 on one ground specified by the Examiner, namely, under § 103(a) as unpatentable over Harding and Cunha, constitutes a general affirmance of the decision of the Examiner on those claims. 37 C.F.R. § 41.50(a). We do not address the rejection of claims 3 and 6 under § 102(a) as anticipated by Cunha separately, since the rejection under § 103(a) is dispositive as to all of the claims involved in the rejection under § 102(a).

DECISION

We affirm the rejection of claim 1 under 35 U.S.C. § 103(a) as unpatentable over Harding, Cunha, and Beabout.

We affirm the rejection of claims 3, 5, and 6 under 35 U.S.C. § 103(a) as unpatentable over Harding and Cunha.

We do not reach the merits of the rejection of claims 3 and 6 under 35 U.S.C. § 102(a) as anticipated by Cunha.

AFFIRMED

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