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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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*Ex parte* ROBERT E. ERICKSON

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Appeal 2015-006571  
Application 12/696,540  
Technology Center 2100

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Before ST. JOHN COURTENAY III, KRISTEN L. DROESCH, and  
JOYCE CRAIG, *Administrative Patent Judges*.

COURTENAY, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF THE CASE

This is an appeal under 35 U.S.C. § 134(a) from the Examiner's Final Rejection of claims 1–23. We have jurisdiction under 35 U.S.C. § 6(b).

We affirm.

*Invention*

The invention on appeal relates to a method of:

machining a rotor disk [that] includes the process steps of detecting accessible contact areas on a rotor surface and corresponding abrasive disk orientation at contact points within the contact area. The method utilizes the detected accessible area and orientations to map a machining path and corresponding abrasive disk movements. The mapped machining path and detected accessible area is then utilized to generate machine tool executable instructions for driving the abrasive disk during machining operations

(Spec. ¶ 4).

*Representative Claim*

1. A method of machining a rotor having a disk and a plurality of integral airfoils projecting outwardly from the disk surface, the method comprising the steps of:

[L] *detecting a range of acceptable orientations of an abrasive disk rotatable about an axis substantially parallel to a rotor surface between two airfoils when in contact with a fixed position on the rotor surface between two airfoils, wherein detecting the range of acceptable orientations of the abrasive disk includes determining acceptable orientations by twisting the abrasive disk about a yaw axis at the fixed position on the rotor surface;*

mapping a pattern of machining points on the rotor surface; and

removing material from the rotor surface by moving a contact point between an outer surface of the abrasive disk and the rotor surface along the mapped pattern of machining points and orientating the abrasive disk along the mapped pattern within the detected range of acceptable orientations.

(Bracketed matter and emphasis added regarding the contested limitation, labeled as “L.”)

*Rejections*

- A. Claims 1–8 and 10–23 are rejected under 35 U.S.C. § 103(a) over the combined teachings and suggestions of Erickson et al. (US 2009/0285647 A1; Nov. 19, 2009), Lamphere et al. (US 6,562,227 B2; May 13, 2003), and Hsueh et al., *Automatic selection of cutter orientation for preventing the collision problem on a five-axis machining*, 32 INT. J. ADV. MANUF. TECHNOLOGY 66, 66–77 (2007) (“Hsueh”).
- B. Claim 9 is rejected under 35 U.S.C. § 103(a) over the combined teachings and suggestions of Erickson, Lamphere, Hsueh, and Suttor et al. (US 2005/0019121 A1; Jan. 27, 2005).

*Grouping of Claims*

Based on Appellant’s arguments, we decide the appeal of rejection A of independent claims 1, 10, and 16 on the basis of representative claim 1. We address rejection A of dependent claims 2–8, 11–15, and 17–23, *infra*. We address rejection B of claim 9, *infra*. To the extent Appellant has not advanced separate, substantive arguments for specific claims on appeal, such arguments are considered waived. *See* 37 C.F.R. § 41.37(c)(1)(iv).

ANALYSIS

We have considered all of Appellant’s arguments and any evidence presented. We highlight and address specific findings and arguments for emphasis in our analysis below.

*Rejection A of Representative Claim 1 under 35 U.S.C. § 103(a)*

**Issue:** Under 35 U.S.C. § 103(a), did the Examiner err in finding the cited combination of Erickson, Lamphere, and Hsueh would have taught or suggested contested limitation L:

[L] *detecting a range of acceptable orientations of an abrasive disk rotatable about an axis substantially parallel to a rotor surface between two airfoils when in contact with a fixed position on the rotor surface between two airfoils, wherein detecting the range of acceptable orientations of the abrasive disk includes determining acceptable orientations by twisting the abrasive disk about a yaw axis at the fixed position on the rotor surface;*

within the meaning of independent claim 1?<sup>1</sup> (Emphasis added.)

Appellant contends, *inter alia* (App. Br. 6):

Lamphere would not suggest detecting allowable orientations as the process actually forms the slots and *does not begin with a plurality of integral airfoils.*

Erickson also discloses a method of cutting into a blank form airfoils of an integrally bladed rotor. Accordingly, *there is no reason to detect a range of acceptable orientations as is recited in the claims.*

Neither Lamphere nor Erickson discloses the detecting step required by claim 1. The addition of Hsueh does not provide the missing disclosures, *because Hsueh teaches away*

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<sup>1</sup> We give the contested claim limitations the broadest reasonable interpretation consistent with the Specification. *See In re Morris*, 127 F.3d 1048, 1054 (Fed. Cir. 1997). *See, e.g.*, (Spec. ¶ 48) (“Although a preferred embodiment of this invention has been disclosed, a worker of ordinary skill in this art would recognize that certain modifications would come within the scope of this invention. For that reason, the following claims should be studied to determine the true scope and content of this invention.”).

*from the disk machining operations disclosed in both Lamphere and Erickson.*

(Emphasis added.)

As found by the Examiner (Final Act. 5), Erickson teaches the cutter or “abrasive disk,” as claimed (*see, e.g.*, Erickson, Fig. 6 (super abrasive cutter 34).) The Examiner looks to Lamphere for teaching “twisting the abrasive disk,” as recited in claim 1. (*See* Lamphere, Abstract (“The cutter is rotated and *plunge twisted* into the workpiece to form a *twisted slot* therein, with adjacent ones of such slots *forming twisted blanks* therebetween. The individual blanks may then be subsequently machined to *final shape* such as an airfoil configuration.”)) (Emphasis added).

We note Erickson describes both the initial removal of material and subsequent finishing (§ 23):

The spiral cut removes a significant amount of material, which facilitates eliminating the additional *rough contouring* of the adjacent blades. The contour of the blades 28 is *finished using a finish machining process*, as indicated at block 64, as is known. (Emphasis added).

*See also* Erickson (§ 19):

Although the disclosed machining method is described with respect to integral bladed compressor rotors, it should be appreciated that the disclosed machining method may also be used to form integral bladed turbine rotors.

We note Lamphere (col. 2, ll. 39–44) also addresses both stages of turbine blade machining (e.g., (1) rough material removal and (2) subsequent final blade finishing):

Illustrated schematically in FIG. 1 is an electromachining apparatus or machine 10 configured in accordance with an exemplary embodiment of the present invention for *rough*

*machining* an annular workpiece blank or disk 12 which is *subsequently finish machined* to form a fan or compressor blisk 14 for an aircraft gas turbine engine.

Hsueh is relied upon by the Examiner (Final Act. 6–7) to teach or suggest “detecting a range of acceptable orientations of an abrasive disk” (claim 1) (as taught by Erickson, Fig. 6 (super abrasive cutter 34)) by twisting (as taught by Lamphere<sup>2</sup>), including determining acceptable orientations about a *yaw* axis at the fixed position on the rotor surface (as taught or suggested by Hsueh), for example:

The first stage is to obtain the tilting and collision-free angle range in the plane that is normal to the tool path obtained. Next, a checking cone generated from this collision-free tool axis range is used for the second collision check. The collision region is formed by the intersection of the neighboring surfaces. *This implies a collision-free yaw angle range.*

(Hsueh, Abstract (emphasis added).)

As an initial matter of claim construction, we consider claim 1 as a whole and conclude all the recited steps of claim 1 (including the “mapping” and “removing” steps) broadly but reasonably read on both stages of machining: (1) the initial rough material removal stage to form the “integral airfoil” shapes, and (2) the subsequent final finishing stage for the recited “integral airfoils” (e.g., turbine blades (*see* Spec. ¶ 3)). Thus, we conclude claim 1 is not limited in scope to *only* final airfoil finishing steps, as imputed by Appellant’s arguments. (*See* App. Br. 5–6; Reply Br. 2.)

Contrary to Appellant’s contentions (*id.*), we find the method of claim 1 could be applied to a blank rotor “blisk” (i.e., a bladed disk machined

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<sup>2</sup> *See* Lamphere, Abstract (“The cutter is rotated and plunge *twisted* into the workpiece to form a *twisted* slot therein . . . .”) (Emphasis added).

and/or cast from a single part) with partially formed (rough) airfoils (blades).<sup>3</sup> (See App. Br. 5–6.) To the extent Erickson and Lamphere may be *arguendo* primarily focused on such *initial* rough airfoil (blade) forming operations (App. Br. 5–6; Reply Br. 2), our reviewing court guides: “[t]he prior art’s mere disclosure of more than one alternative does not constitute a teaching away from any of these alternatives because such disclosure does not criticize, discredit, or otherwise discourage the solution claimed.” *In re Fulton*, 391 F.3d 1195, 1201 (Fed. Cir. 2004).

Here, Appellant has not shown Erickson and Lamphere criticize, discredit, or otherwise discourage *final airfoil blade finishing*, as would be required to produce an *operational, fully balanced* turbine blade. Even assuming *arguendo* that Erickson and Lamphere may be principally directed to the initial rough material removal stage (and not final blade finishing), as urged by Appellant (App. Br. 5–6; Reply Br. 2), our reviewing court guides: “[a] finding that two inventions were designed to resolve different problems . . . is insufficient to demonstrate that one invention teaches away from another.” *Nat’l Steel Car, Ltd. v. Canadian Pac. Ry., Ltd.*, 357 F.3d 1319, 1339 (Fed. Cir. 2004). Moreover, “[i]n determining whether the subject matter of a patent claim is obvious, neither the particular motivation nor the avowed purpose of the . . . patentee controls” in an obviousness analysis. *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 419 (2007).<sup>4</sup>

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<sup>3</sup> Because “applicants may amend claims to narrow their scope, a broad construction during prosecution creates no unfairness to the applicant or patentee.” *In re ICON Health and Fitness, Inc.*, 496 F.3d 1374, 1379 (Fed. Cir. 2007) (citation omitted).

<sup>4</sup> It is sufficient that the references suggest doing what Appellant did, although the Appellant’s particular purpose was different from that of the

We find each reference contemplates both the initial rough material removal stage and the final airfoil blade finishing stage. Because Appellant has not identified any disclosure in Erickson or Lamphere that criticizes, discredits, or otherwise discourages the solution claimed, we do not find persuasive Appellant's arguments that these references "teach away" from the claimed invention, or from Hsueh. (Appeal Br. 5).

Therefore, we find Appellant's argument that "[n]either Lamphere nor Erickson discloses the detecting step required by claim 1" is grounded on the erroneous premise that "Hsueh does not provide the missing disclosures, because Hsueh *teaches away* from the disk machining operations disclosed in both Lamphere and Erickson." (App. Br. 6 (emphasis added).) Based upon a preponderance of the evidence, as discussed above, we find Appellant's contention unpersuasive.

Regarding Appellant's additional argument, "[t]he claims require that the range be detected with regard to an abrasive disk, not a cutting tool as is disclosed in Hsueh" (Reply Br. 3), we emphasize the Examiner's rejection is based on the *combined* teachings and suggestions of the cited references. The Examiner relies on Erickson (Final Act. 5), not Hsueh, for teaching an abrasive disk. (*See* Erickson, Fig. 6 (super abrasive cutter 34).) Moreover, Appellant has not provided a definition for "abrasive disk" in the claim or

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references. *In re Heck*, 699 F.2d 1331, 1333 (Fed. Cir. 1983) (*citing In re Gershon*, 372 F.2d 535, 538–39 (CCPA 1967)). "Obviousness is not to be determined on the basis of purpose alone." *In re Graf*, 343 F.2d 774, 777 (CCPA 1965).

Specification that would preclude reading this claim element on Hsueh's cutting tool under a broad but reasonable interpretation. (Hsueh, Abstract.)<sup>5</sup>

Therefore, on this record, we are not persuaded of error regarding the Examiner's ultimate legal conclusion of obviousness regarding contested limitation L of representative claim 1. Accordingly, we sustain the Examiner's rejection of representative claim 1, and the rejection of the grouped independent claims 10 and 16 (not separately argued), which fall with claim 1. (*See Grouping of Claims, supra.*)

*Rejection A of Claims 2–8, 11–15, and 17–23*

Appellant recites the claim language for claims 2, 3, 5, and 11 and repeatedly urges that the references “teach away” from the combination. We find this argument unpersuasive for the reasons discussed above regarding claim 1. (App. Br. 7–8.) To the extent Appellant asserts purported shortcomings of the references, Appellant fails to provide any citation to any specific portion of any reference, as evidence in support. (*Id.*)<sup>6</sup> Mere

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<sup>5</sup> Nonobviousness cannot be established by attacking the references individually when the rejection is predicated upon a combination of prior art disclosures. *In re Merck & Co.*, 800 F.2d 1091, 1097 (Fed. Cir. 1986). The test for obviousness is not whether the claimed invention is expressly suggested in any one or all of the references, but whether the claimed subject matter would have been obvious to those of ordinary skill in the art in light of the *combined teachings* of those references. *In re Keller*, 642 F.2d 413, 425 (CCPA 1981).

<sup>6</sup> *See In re Lovin*, 652 F.3d 1349, 1357 (Fed. Cir. 2011) (“[W]e hold that the Board reasonably interpreted Rule 41.37 to require more substantive arguments in an appeal brief than a mere recitation of the claim elements and a naked assertion that the corresponding elements were not found in the prior art.”). *Accord Ex parte Belinne*, No. 2009-004693, 2009 WL 2477843,

attorney arguments and conclusory statements that are unsupported by factual evidence are entitled to little probative value. *In re Geisler*, 116 F.3d 1465, 1470 (Fed. Cir. 1997); *In re De Blauwe*, 736 F.2d 699, 705 (Fed. Cir. 1984). Therefore, on this record, we are not persuaded the Examiner erred regarding rejection A of claims 2–8, 11–15, and 17–23.

*Rejection B of Claim 9*

Regarding the rejection of dependent claim 9, Appellant urges: “The addition of Suttor et al. (US 20050019121) does not correct the problems with the base combination.” (App. Br. 8.) For the reasons discussed above regarding claim 1, we find this argument unpersuasive. Accordingly, we sustain the Examiner’s rejection B of claim 9.

*Reply Brief*

To the extent Appellant advances new arguments in the Reply Brief not in response to a shift in the Examiner’s position in the Answer, we note arguments raised in a Reply Brief that were not raised in the Appeal Brief or are not responsive to arguments raised in the Examiner’s Answer will not be considered except for good cause. *See* 37 C.F.R. § 41.41(b)(2).

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at \*4 (BPAI Aug. 10, 2009) (“Informative”) (“Appellant[’s] argument . . . repeatedly restates elements of the claim language[] and simply argues that the elements are missing from the reference.”)

*Conclusion*<sup>7</sup>

For at least the aforementioned reasons, on this record, we are not persuaded the Examiner erred. We find a preponderance of the evidence supports the Examiner's legal conclusion of obviousness.

DECISION

We affirm the Examiner's rejections of claims 1–23 under 35 U.S.C. § 103(a). No time for taking any action connected with this appeal may be extended under 37 C.F.R. § 1.136(a)(1). *See* 37 C.F.R. § 41.50(f).

AFFIRMED

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<sup>7</sup> In the event of further prosecution of this application, we leave it to the Examiner to consider whether at least claim 1 should be rejected under 35 U.S.C. § 112, second paragraph, as being indefinite. Specifically, it appears the claim 1 language “*detecting a range of **acceptable** orientations*” (emphasis added) is a **subjective**, term of degree subject to plural plausible interpretations under a broad but reasonable interpretation. *See Ex parte Miyazaki*, 89 USPQ2d 1207, 1211 (BPAI 2008) (precedential). Claim scope cannot depend solely on the unrestrained, subjective opinion of a particular individual purported to be practicing the invention. *See Datamize LLC v. Plumtree Software, Inc.*, 417 F.3d 1342, 1350 (Fed. Cir. 2005); *see also Manual of Patent Examining Procedure* (MPEP) § 2173.05(b)(IV). Although the Board is authorized to reject claims under 37 C.F.R. § 41.50(b), no inference should be drawn when the Board elects not to do so. *See* MPEP § 1213.02.