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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte MATTHEW A. BENNINGTON

Appeal 2019-006780
Application 15/027,562
Technology Center 3700

Before STEFAN STAICOVICI, MICHAEL L. HOELTER, and WILLIAM A. CAPP, *Administrative Patent Judges*.

STAICOVICI, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF THE CASE

Appellant[1] appeals under 35 U.S.C. § 134(a) from the Examiner's decision in the Final Office Action (dated Jan. 29, 2019, hereinafter "Final Act.") rejecting claims 1, 4–6, and 8–24.[2] We have jurisdiction over this appeal under 35 U.S.C. § 6(b).

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[1] We use the word "Appellant" to refer to "applicant" as defined in 37 C.F.R. § 1.42. United Technologies Corporation is identified as the real party in interest in Appellant's Appeal Brief (filed July 8, 2019, hereinafter "Appeal Br.") 1.

[2] Claims 2, 3, and 7 are canceled. *See* Appellant's Amendment (filed Mar. 21, 2019, hereinafter "Amdt.") 2.

SUMMARY OF DECISION

We REVERSE.

INVENTION

Appellant's invention relates to a casing of a gas turbine engine. Spec. para. 3.

Claims 1, 11, and 16 are independent. Claim 1 is illustrative of the claimed invention and reads as follows:

> 1. A gas turbine engine component comprising:
>
> a casing;
>
> an airfoil fixed to the casing to extend from a leading edge to a trailing edge, the airfoil having a pressure side and a suction side; and
>
> a trench formed within the casing adjacent the suction side of the component, the trench having a maximum depth that is positioned at or aft of the leading edge; and
>
> wherein the trench is defined by a length extending in a longitudinal direction from the leading edge to the trailing edge and a width extending in a lateral direction from the airfoil toward an adjacent airfoil fixed to the casing, and wherein the width of the trench is less than a distance between the airfoil and the adjacent airfoil.

REJECTIONS

I. The Examiner rejects claims 9, 15, and 20 under 35 U.S.C. § 112(a) as failing to comply with the enablement requirement.

II. The Examiner rejects claims 9, 15, and 20 under 35 U.S.C. § 112(a) as being indefinite.[3]

[3] The indefiniteness rejection of claims 21, 22, and 24 is withdrawn. Examiner's Answer (dated Aug. 8, 2019, hereinafter "Ans.") 7–8.

III. The Examiner rejects claims 1, 4–6, 8, 10–14, and 23 under 35 U.S.C. § 102(a)(1) as being anticipated by Staubach.[4,5,6]

IV. The Examiner rejects claims 9, 13, and 15 under 35 U.S.C. § 103 as being unpatentable over Staubach.[7]

V. The Examiner rejects claims 16–21 under 35 U.S.C. § 103 as being unpatentable over Bunker[8] and Staubach.

ANALYSIS

Rejection I

The Examiner finds the limitation of an "aerodynamic loading factor that is greater than or equal to a value of 0.5," as recited in each of claims 9, 15, and 20, is not enabled because "there is no upper bounds defined for this range," and, thus, "the aerodynamic loading factor could theoretically approach infinity . . . and the [S]pecification fails to provide explanations of how this would be achieved." Final Act. 7; *see also* Appeal Br. 14–16 (Claims App.). According to the Examiner,

> [O]ne of ordinary skill would have to greatly experiment with the materials, geometry, etc. to achieve a large amount of the claimed scope. Even taking the level of ordinary skill and the

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Appellant's amendment of claims 21, 22, and 24 (*see* Amdt. 6) was entered by the Examiner in the Advisory Action dated April 19, 2019.

[4] Staubach et al., US 2003/0170124 A1, published Sept. 11, 2003.

[5] The anticipation rejection of claims 22 and 24 based upon Staubach is withdrawn. *See* Ans. 3.

[6] As claim 13 depends indirectly from claim 11 and includes all the limitations of claim 11, we have included here the rejection of claim 13 under 35 U.S.C. § 102(a)(1). *See* Final Act. 27.

[7] For simplicity, we have included here the rejection of claim 13 under 35 U.S.C. § 103. *See* Final Act. 27–28.

[8] Bunker et al., US 6,183,197 B1, issued Feb. 6, 2001.

> predictability of the art in a light most favorable to the Applicant, the sheer breadth of the claims coupled with the lack of direction and working examples throughout the scope amounts to *undue experimentation*.

Final Act. 9 (emphasis added).

Appellant argues that "one of ordinary skill in the art would recognize that the aerodynamic loading factor has an inherent upper limit based on the practical physical limitations and basic architecture of a bypass turbine engine." Appeal Br. 4 (citing *Ex parte Feulner*, Appeal No. 2013-010469 (PTAB Oct. 23, 2015), *Ex parte Kohlenberg*, Appeal No. 2017-000822 (PTAB June 8, 2018)). According to Appellant, a skilled artisan would recognize from the description of the aerodynamic loading factor in paragraphs 42 and 43 of the Specification that it "has an *inherent* practical and physical upper limit." *Id.* at 5 (emphasis added). Moreover, Appellant notes that "[t]he Examiner's focus on infinity with regard to enablement is simply not supported" because in *Scripps Clinic & Research Foundation v. Genentech, Inc.*, 927 F.2d 1565 (Fed. Cir. 1991)[9] "the Federal Circuit clearly held that open-ended ranges may be enabled even if the inherent limit is 'not precisely known.'" *Id.* at 6 (citing *Scripps Clinic*, 927 F.2d at 1572).

Insofar as the enablement requirement is concerned, the dispositive issue is whether Appellant's disclosure, considering the level of ordinary skill in the art as of the filing date of the application, would have enabled a person of such skill to make and use Appellant's invention without undue experimentation. *In re Strahilevitz*, 668 F.2d 1229, 1232 (CCPA 1982).

[9] Overruled on other grounds in *Abbott Labs v. Sandoz*, 556 F.3d 1282 (Fed. Cir. 2009).

Here, the Specification defines the aerodynamic loading factor as the ratio between the difference of static pressures at an exit (P_{Sexit}) and at an inlet (P_{Sinlet}) of the blade row and the difference between the total pressure (P_{Oexit}) at an exit and the static pressure at the inlet (P_{Sinlet}) of the blade row. *See* Spec. paras. 42, 43. Although mathematically it may be true that the resulting aerodynamic loading factor generated from the equation shown in Appellant's Specification may extend to infinity, the determination of enablement is not merely a mathematical or theoretical exercise, as the Examiner asserts. *See* Ans. 5 ("[R]egarding the formula provided by Appellant, an analysis of this formula quickly concludes there is no upper limit to the resulting values this formula produces."). Rather, the claimed aerodynamic loading factor must be considered in the context in which is it is being applied, namely, highly loaded stator blades "in the compressor section 24 and/or turbine section 28" of gas turbine engine 20. Spec. paras. 33, 41.

Here, to approach infinity, a skilled artisan would have to reasonably believe that the static pressure differential across a blade row would equal infinity. Appellant is correct that "[o]ne of ordinary skill in the art would understand the *pressure differentials* across the blades that would be required within the atmosphere during engine operation makes an infinite aerodynamic loading factor impractical." Reply Brief (filed Sept. 17, 2019, hereinafter "Reply Br.") 2 (emphasis added). Although we appreciate the Examiner's position that "impractical is not the same as impossible" (*see* Final Act. 3), nonetheless, we do not agree with the Examiner that "the limitation requiring . . . 'an aerodynamic loading factor that is greater than or equal to a value of 0.5', [reasonably] includes a value of infinity." Ans. 6.

Furthermore, although Appellant "makes no declaration of what this [upper] limit is" (*see* Ans. 5), we note that when rejecting a claim for lack of enablement, the PTO bears the initial burden of setting forth a reasonable explanation as to why the scope of the claim is not adequately enabled by the description provided in the specification. *In re Wright*, 999 F.2d 1557, 1561–62 (Fed. Cir. 1993). Here, the Examiner has failed to present any evidence to support a finding of an infinite aerodynamic loading factor in the context of highly loaded stator blades of a gas turbine engine.

A skilled artisan would further recognize that there is an upper limit *less* than infinity because the static and total gas pressure across the blades of a turbine engine are determined by their *configuration*, i.e., geometry, which in turn "alter[] the inner and outer surface of the flow path." Spec. para. 41. In particular, as the Examiner has not identified any other value less than infinity for the aerodynamic loading factor that is not enabled, Appellant is correct that "one of ordinary skill in the art would recognize that the aerodynamic loading factor has an *inherent* practical and physical upper limit." Reply Br. 2 (emphasis added). In contrast to the Examiner (*see* Ans. 4; Final Act. 3), such a position is similar to *Feulner* where in the context of an *enablement* rejection the Board found that "there is an upper limit that a skilled artisan would recognize as being less than infinity because the hydraulic diameter is defined by actual **physical parts** within . . . a turbine engine." *Feulner* 9 (emphasis added).

Finally, even though determining an appropriate blade configuration that would have an aerodynamic loading factor greater than or equal to 0.5 would require some experimentation on the part of ordinarily skilled artisans, a disclosure may nonetheless be enabling despite the need for

experimentation. As noted above, the test is whether such experimentation is *undue*. *In re Angstadt*, 537 F.2d 498, 504 (CCPA 1976). Although the Examiner refers to the factors in *In re Wands*, 858 F.2d 731, 737 (Fed. Cir. 1988), the Examiner does not discuss any of these factors in establishing that the disclosure is non-enabling. *See* Final Act. 4–5. As such, even though "[t]he physical limitations of gas-turbine engines are constantly being advanced as new materials and configurations are developed" (*see* Ans. 5), Appellant is correct that the static and total gas pressures across the blades of a turbine engine "are easily discernible by one of ordinary skill within the mechanical working environment of a gas turbine engine." Appeal Br. 7. Thus, the Examiner does not set forth the requisite findings and analysis to show adequately that a person of ordinary skill in the art would not have been able to determine the aerodynamic loading factor by measuring static and total gas pressures across the blades of a turbine engine; and instead would have had to rely upon undue experimentation to do so.

In conclusion, for the foregoing reasons, we do not sustain the rejection under 35 U.S.C. § 112(a) of claims 9, 15, and 20 as failing to comply with the enablement requirement.

Rejection II

The Examiner finds the limitation of an "aerodynamic loading factor that is greater than or equal to a value of 0.5," as recited in each of claims 9, 15, and 20, is indefinite because "there is no upper bounds defined for this range." Final Act. 10. Thus, according to the Examiner, "the scope of the claim[s] cannot be ascertained which renders the claim[s] indefinite." Ans. 7.

The test for definiteness under 35 U.S.C. § 112, second paragraph, is whether "those skilled in the art would understand what is claimed when the claim is read in light of the specification." *Orthokinetics, Inc. v. Safety Travel Chairs, Inc.*, 806 F.2d 1565, 1576 (Fed. Cir. 1986). In this case, by not specifying an upper limit to the aerodynamic loading factor of claims 9, 15, and 20, the claims are merely broad, not indefinite. *See In re Johnson*, 558 F.2d 1008, 1016 n.17 (CCPA 1977) ("[B]readth is not indefiniteness"). In other words, the claims are not made unclear simply because an upper boundary is not specified. Here, the claims expressly reach any aerodynamic loading factor having values "greater than or equal to a value of 0.5," no matter how large the aerodynamic loading factor may be. The fact that in the context of the claimed invention there may be *practical* upper limits of the claimed range does not impart any indefiniteness as to the scope of the claim because an upper limit is not explicitly claimed. "A patent claim to a fishing pole would not be invalid on indefiniteness grounds if it contained a limitation requiring that the pole be 'at least three feet long,' even though a 50 foot long fishing pole would not be very practical." *Exxon Res. & Eng'g Co. v. U.S.*, 265 F.3d 1371, 1382 (Fed. Cir. 2001).

Hence, as the scope of the claims, although it is broad, is nonetheless clear, we do not sustain the rejection under 35 U.S.C. § 112(b) of claims 9, 15, and 20 as being indefinite.

Rejection III

Each of independent claims 1 and 11 requires, *inter alia*, a "trench" having a width extending "from" an airfoil towards an adjacent airfoil. Appeal Br. 14, 15 (Claims App.).

The Examiner finds Staubach discloses a gas turbine engine component including, *inter alia*, a trench adjacent suction side 22 of the component 10, extending from airfoil 14 to an adjacent airfoil 14, and having a width less than a distance between adjacent airfoils 14. Final Act. 11. The Examiner explains that the trench in Staubach is the portion of trough 30 located below the dotted line in Staubach's Figure 2, and which does not include sections 37 and 38. In order to better illustrate, the Examiner provides an annotated Figure 2 of Staubach, as shown below:

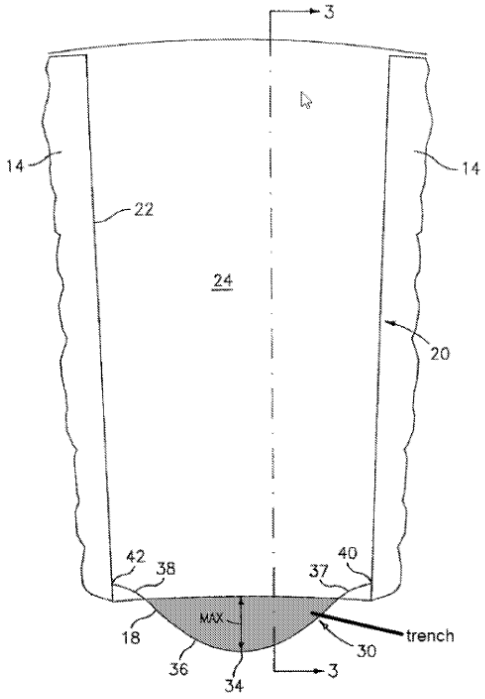

FIG. 2

The Examiner's annotated Figure 2 of Staubach illustrates a "trench" located below the dotted line and having a width that does not include portions 37, 38. *Id.* at 12. In other words, we understand the Examiner's position to be that central concave portion 36 of trough 30 in Staubach's Figure 2 constitutes the claimed "trench."

Appellant argues that "Staubach discloses a trough 30 that spans the *entire* distance between adjacent airfoils [14]" because trough 30 includes central concave portion 36 *and* convex portions 37, 38. Appeal Br. 9 (emphasis added) (citing Staubach, para. 14). According to Appellant, the Examiner's arbitrary selection of Staubach's central concave portion 36 of trough 30 as the claimed "trench" is merely "an attempt to read on the language of claim[s] 1" and 11. Reply Br. 3.

In response, the Examiner asserts that the area noted as "trench" in the above annotated Figure 2 of Staubach "is consistent with the definition of trench provided by Appellant's Specification because it is shown . . . to be a width extending in a lateral direction *between* two adjacent airfoils." Ans. 9 (emphasis added) (citing Spec. paras. 5, 45).

We do not agree with the Examiner's finding that central concave portion 36 of trough 30 in Staubach's Figure 2 constitutes a "trench," as called for by each of independent claims 1 and 11. In particular, we note that claims 1 and 11 do not require the trench width to extend *between* two adjacent airfoils, as the Examiner asserts, but rather that it extend *from* an airfoil to an adjacent airfoil.

Claim language should be read in light of the Specification, as it would be interpreted by a person of ordinary skill in the art. *In re Suitco Surface, Inc.*, 603 F.3d 1255, 1260 (Fed. Cir. 2010). Here, an ordinary and customary usage of the preposition "from" is to indicate "a starting point in measuring."[10] As such, in each of claims 1 and 11, the trench width starts at an airfoil and then extends towards an adjacent airfoil. Such a construction

[10] *See* https://www.merriam-webster.com/dictionary/from (last visited June 9, 2020).

is consistent with Appellant's Specification, which describes trench 84 as having "a width 94 that extends *from* the suction side 72 of the blade 60 and terminates prior to reaching a pressure side 74 of an adjacent blade 60." Spec. para. 47 (emphasis added).

In contrast, the width of Staubach's central concave portion 36 of trough 30, which the Examiner equates with the claimed "trench," does not start at airfoil 14, but rather somewhere between adjacent airfoils 14, 14. *See* Staubach, Fig. 2. Therefore, Staubach's central concave portion 36 of trough 30 does not have a width that extends "from" an airfoil to an adjacent airfoil, as called for by each of independent claims 1 and 11.

Accordingly, as Staubach fails to disclose a "trench" having a width extending "from" an airfoil towards an adjacent airfoil, we do not sustain the rejection under 35 U.S.C. § 102(a)(1) of independent claims 1 and 11, and their respective dependent claims 4–6, 8, 10, 12–14, and 23, as anticipated by Staubach.

Rejections IV and V

These rejections rely on the same erroneous finding that Staubach discloses a "trench" having a width extending "from" an airfoil towards an adjacent airfoil. *See* Final Act. 17–28. Accordingly, because neither the Examiner's modification of Staubach, as per Rejections IV, nor the use of the disclosure of Bunker, as per Rejection V,[11] remedy the deficiency discussed *supra*, we also do not sustain Rejections IV and V.

[11] Similar to independent claims 1 and 11, independent claim 16 also requires a "trench" having a width extending "from" an airfoil towards an adjacent airfoil. Appeal Br. 16 (Claims App.).

CONCLUSION

Claim(s) Rejected	35 U.S.C. §	Reference(s)/ Basis	Affirmed	Reversed
9, 15, 20	112(a)	Enablement		9, 15, 20
9, 15, 20	112(b)	Indefiniteness		9, 15, 20
1, 4–6, 8, 10–14, 23	102(a)(1)	Staubach		1, 4–6, 8, 10–14, 23
9, 13, 15	103	Staubach		9, 13, 15
16–21	103	Bunker, Staubach		16–21
Overall Outcome				1, 4–6, 8–21, 23

REVERSED