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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte STEPHANIE SANTORO, MATTHEW A. DEVORE,
and STEVEN B. GAUTSCHI

Appeal 2017-005652
Application 13/328,733
Technology Center 3700

Before LISA M. GUIJT, ERIC C. JESCHKE, and PAUL J. KORNICZKY,
Administrative Patent Judges.

GUIJT, *Administrative Patent Judge.*

DECISION ON APPEAL

STATEMENT OF THE CASE

Appellants¹ seek our review under 35 U.S.C. § 134(a) of the Examiner's decision² rejecting claims 1, 2, 4–6, 9–11, 13, and 14. We have jurisdiction over the appeal under 35 U.S.C. § 6(b).

We AFFIRM.

¹ Appellants identify the real party in interest as United Technologies Corp. Appeal Br. 3.

² Appeal is taken from the Final Office Action dated June 23, 2016.

THE CLAIMED SUBJECT MATTER

Claims 1 and 9 are the independent claims on appeal. Claim 1, reproduced below, is illustrative of the subject matter on appeal.

1. An air-cooled turbine component comprising:

an outer surface adapted to be cooled by a film of cooling air flowing thereover;

a radial cooling air passage extending through the interior of said component; and

a plurality of film cooling holes extending between said outer surface and said radial cooling passage;

each of said film cooling holes having a substantially constant cross-sectional area along the length thereof;

each of said film cooling holes intersecting said radial cooling passage such that said film cooling hole and that portion of said radial cooling passage immediately upstream from said intersection thereof with said film cooling hole defining an acute angle, whereby cooling air entering said film cooling holes from said radial cooling passage is angularly displaced greater than 90° from the flow of cooling air through said radial cooling passage for decreasing the momentum of airflow through said film cooling hole and any tendency of cooling air discharged from said film cooling hole at said outer airfoil surface to separate therefrom;

wherein said turbine component comprises a rotor blade.

THE REJECTIONS

- I. Claims 1, 4–6, 9–11, 13, and 14 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Spangler (US 7,712,316 B2; issued May 11, 2010) and Lee (US 5,458,461; issued Oct. 17, 1995).

- II. Claim 2 stands rejected under 35 U.S.C. § 103(a) as unpatentable over Spangler, Lee, and Sreekanth (US 2008/0156943 A1; published July 3, 2008).

OPINION

Rejection I

Independent claim and claims 4–6 depending therefrom

Regarding independent claim 1, the Examiner finds, *inter alia*, that Spangler discloses an air-cooled turbine component, including film cooling holes that intersect a radial cooling passage as claimed. Final Act. 3–4 (citing Spangler, Fig. 3). The Examiner determines, however, that Spangler fails to disclose cooling holes having a substantially constant cross-sectional area along the length thereof. *Id.* at 4.³ The Examiner relies on Lee for teaching film cooling holes 44, radial cooling passage (or cooling circuit) 42, and an elongate slot 46 that “helps provide diffusion of the cooling air over the airfoil surface, wherein the film cooling holes have a substantially

³ We note, for example, that Spangler’s cooling holes 36 have a meter section 38 with a constant cross-sectional area, but also a diffused section 40. *See, e.g.*, Spangler 2:46–47.

constant cross-sectional area along their length.” *Id.* at 5 (citing Lee, Fig. 1).

The Examiner reasons that it would have been obvious to substitute Lee’s diffusing slot for the diffused sections of Spangler’s cooling holes, “thus making the film cooling holes of Spangler with substantially constant cross-sectional areas along their lengths, for the purpose of improving diffusion on the outer surface of the blade.” *Id.* (citing Lee 5:7–13). The Examiner also reasons that

[t]he diffusing sections of the film cooling holes of Spangler and the elongate diffusing slot of Lee are both known elements for enabling diffusion of the cooling air onto the blade outer surface, thus improving the effectiveness of the film cooling, and substituting the elongate slot of Lee in for the diffusion sections of Spangler result in the cooling air flowing through the film cooling holes still to be diffused onto the blade surface.

Id.; *see also* Ans. 2–3 (“Although modifying the cooling holes of Spangler to have a constant cross section, as taught by Lee, would eliminate the diffused section, . . . [b]oth the elongate slot [of Lee] and the diffusing sections of Spangler are known elements and enable diffusion of cooling air onto the blade outer surface, thus improving the effectiveness of the film cooling.”).

Appellants submit that Spangler addresses the problem of centrifugal forces forcing air from the meter section of a film cooling hole away from the diffused section of the film cooling hole, such that the diffused section is not always filled with cooling air. Appeal Br. 8–9 (citing Spangler 2:52–58); Reply Br. 2. Appellants also submit that because Spangler’s solution is to reorient the meter section to ensure air is driven into and fills the diffused

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section, Spangler’s meter section is “specifically tailored to diffused cooling holes; i.e., cooling holes with flared geometries.” Appeal Br. 9 (citing Spangler 3:8–10); Reply Br. 2. Appellants argue that because an inventive aspect of Spangler is “ensuring a diffused section 54 of a cooling hole is filled with air, . . . Spangler *teaches away* from a modification which would remove its diffused section 54, which the meter section 52 is being re-orientated to fill.” Appeal Br. 9 (emphasis added).

Prior art does not teach away from claimed subject matter merely by disclosing a different solution to a similar problem unless the prior art also criticizes, discredits or otherwise discourages the solution claimed. *See In re Fulton*, 391 F.3d 1195, 1201 (Fed. Cir. 2004). Here, although Spangler solves the problem of the inefficient use of the diffusion sections of the cooling holes, such that “air exits the film cooling hole at a greater velocity, and does not stay on the face of the blade as long as would be desired” (Spangler 1:44–51), Spangler does not criticize, discredit or otherwise discourage the use of slots in place of the diffusion section, as proposed by the Examiner—also to reduce the velocity of the film cooling air. *See, e.g.*, Lee 2:5–10 (“it is known to provide tapered film cooling holes which reduce the velocity of the film cooling air . . . for improving the effectiveness of the film of the film cooling air discharged from the hole”); *id.* at 2:14–21 (“It is also conventionally known to provide a longitudinally extending slot . . . being fed by . . . cooling metering holes [to] provide[] a plenum of increased are [for] reduc[ing] the velocity of the film cooling air therein by diffusion prior to discharge from the slot.”). Moreover, Lee specifically discloses that

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“[v]arious embodiment of film cooling holes feeding diffusion holes *or* slots are *known* and have varying degrees of complexity and effectiveness in a crowded art.” Lee 2:27–30 (emphasis added). In other words, Lee supports the Examiner’s determination that diffusion holes (as disclosed in Spangler) and slots (as disclosed in Lee) are known substitutes. Thus, we are not persuaded that Spangler teaches away from the Examiner’s proposed modification. *See KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 416 (2007) (citing *United States v. Adams*, 383 U.S. 39, 50-51 (1966)) (holding that when a patent claims a structure already known in the prior art that is altered by the mere substitution of one element for another known in the field, the combination must do more than yield a predictable result).

Appellants also argue that because “there is no teaching or suggestion in Spangler that the orientation of its meter section 52 as shown in FIG. 3 would provide any benefit to a cooling hole without a diffused section 54 or a cooling hole leading into a channel, . . . a person of skill in the art would have no motivation to combine the teachings of Spangler and Lee,” as proposed by the Examiner. Appeal Br. 9. However, Appellants’ argument appears to be holding the Examiner to the old TSM (teaching, suggestion, or motivation) standard; such a standard is not the only basis to demonstrate obviousness. *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 415 (2007). As discussed *supra*, the Examiner’s rationale (i.e., improving the effectiveness of the film cooling by substituting known structures for improving diffusion) is supported by factual findings in the prior art. *See, e.g.*, Lee 2:14–22 (disclosing that known, conventional slots fed by cooling metering holes

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reduce the velocity of the film cooling air therein *by diffusion* prior to discharge from the slot).

Appellants further argue, for the first time in their Reply Brief, that the Examiner's proposed modification "takes away the inventive and advantageous features of Spangler and, thus, renders the invention of Spangler incapable of performing its intended purpose." Reply Br. 2 (citations omitted). In support, Appellants submit that "due to the geometry of the elongated slot of Lee, the slot 46 has no radial outer surface near the holes 48," and "[t]hus there is/are no surface(s) to restrain the cooling air radially when it comes out of the holes 48." *Id.* at 3. Appellants submit that "[i]n contrast, the meter section 52 of Spangler is operable to ensure a diffused section 54 of a cooling hole is filled with air since the diffused section has an outer surface near the meter section 52." *Id.* Appellants conclude that "the meter sections 52 of Spangler would no longer be able to perform their intended purpose if the teachings of Spangler were modified as alleged in the Examiner's Answer." *Id.*

Appellants, however, have not demonstrated good cause as to why these arguments were not raised earlier in the Appeal Brief. Upon our review of the record, we find that Appellants had adequate notice of the Examiner's proposed modification in the Final Action, and these new arguments raised in the Reply Brief are not responsive to a new argument raised in the Examiner's Answer. Without the benefit of having the Examiner's response to these arguments, we decline to consider them. *See* 37 C.F.R. § 41.41(b)(2) ("Any argument raised in the reply brief which was

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not raised in the appeal brief, or is not responsive to an argument raised in the examiner's answer, . . . will not be considered by the Board for purposes of the present appeal, unless good cause is shown.”).

Accordingly, we sustain the Examiner’s rejection of independent claim 1 under 35 U.S.C. § 103(a) as unpatentable over Spangler and Lee. Appellants chose not to present separate arguments for the patentability of claims 4–6, which depend from claim 1, and therefore, for the same reasons stated *supra*, we sustain the Examiner’s rejection of claims 4–6. Appeal Br. 10.

Independent claim 9 and claims 10, 11, 13, and 14 depending therefrom

Regarding independent claim 9, Appellants submit that “Spangler teaches away from such a turbine component for at least similar reasons set forth [] with respect to claim 1.” Appeal Br. 11. We do not agree that Spangler teaches away from the Examiner’s proposed modification of Spangler, in view of Lee, with respect to claim 1, and therefore, for the reasons stated *supra*, we also sustain the Examiner’s rejection of independent claim 9.

Appellants chose not to present separate arguments for the patentability of claims 10, 11, 13, and 14, which depend from claim 9, and therefore, for the same reasons stated *supra*, we sustain the Examiner’s rejection of claims 10, 11, 13, and 14. Appeal Br. 10.

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Rejection II

Appellants rely on their arguments with respect to independent claim 1, from which claim 2 depends. Appeal Br. 11. Therefore, for the same reasons stated *supra*, we sustain the Examiner's rejection of claim 2.

DECISION

The Examiner's rejection of claims 1, 2, 4-6, 9-11, 13, and 14 is affirmed.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(1)(iv).

AFFIRMED