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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte JOHN S. TU, JAMES P. BANGERTER, ROBERT SZE, JAMES B. HOKE, and MONICA PACHECO-TOUGAS

Appeal 2019-003301
Application 14/908,751
Technology Center 3700

Before LINDA E. HORNER, CHARLES N. GREENHUT, and MICHAEL J. FITZPATRICK, *Administrative Patent Judges*.

FITZPATRICK, *Administrative Patent Judge*.

DECISION ON APPEAL

Appellant, United Technologies Corporation,[1] appeals under 35 U.S.C. § 134(a) from the Examiner's final decision rejecting claims 1, 8, 11–13, 16, 17, 20, 22, and 23. We have jurisdiction under 35 U.S.C. § 6(b).

We affirm.

[1] Appellant is the "applicant" under 37 C.F.R. § 1.42(b) and identifies itself as the sole real party in interest. Appeal Br. 1.

STATEMENT OF THE CASE

The Specification

The Specification's disclosure "relates to improved cooling techniques for combustor panels for use in a gas turbine engine." Spec. ¶2.

The Claims

Claims 1, 8, 11–13, 16, 17, 20, 22, and 23 are rejected. Final Act. 1. No other claims are pending. *Id.* Claim 1 is illustrative and reproduced below.

> 1. A combustor for use in a gas turbine engine comprising:
>
> a panel with effusion cooling holes extending through said panel, said effusion cooling holes communicating with an inner face of said panel to deliver cooling air to said inner face of said panel, and an outer shell attached to said panel, said outer shell having impingement cooling holes extending to deliver air to a chamber between said outer shell and said panel, and then into said effusion cooling holes;
>
> there being a nominal average spacing of said effusion cooling holes per an entire surface area of said panel, and a reduced spacing area of said effusion cooling holes adjacent to at least one edge on said panel, and said effusion cooling holes in said reduced spacing area being spaced by a distance less than said nominal average spacing;
>
> a rail is provided about an outer face of said panel;
>
> said at least one edge being circumferential edges of said panel; and
>
> at least at said circumferential edges, said effusion cooling holes extending from said outer face of said panel to an outlet at said inner face at a location circumferentially aligned with said rail at said circumferential edges.

Appeal Br. 7.

The Examiner's Rejections

The following rejections are before us:

1. claims 22 and 23, under 35 U.S.C. § 112(b), as indefinite (Ans. 3)[2];

2. claims 1, 8, 11, and 22, under 35 U.S.C. § 102(a)(1), as anticipated by Pacheco-Tougas[3] (Final Act. 3)[4];

3. claims 13, 16, 17, 20, and 23, under 35 U.S.C. § 103, as unpatentable over Pacheco-Tougas (*id.* at 7); and

4. claim 12, under 35 U.S.C. § 103, as unpatentable over Pacheco-Tougas and Kraft[5] (*id.* at 10).

DISCUSSION

Rejection 1 — Indefiniteness

Claims 22 and 23 depend from independent claims 1 and 16, respectively. Appeal Br. 8–9. Claims 22 and 23 additionally recite "wherein *said outlets* are at a common circumferential location as said rail at said circumferential edges." *Id.* (emphasis added). Claims 1 and 16, however, refer to the singular "an outlet." *Id.* at 7–8. The Examiner thus rejected claims 22 and 23 for lack of antecedent basis for a plurality of outlets. Final Act. 3; Advisory Act. 2; Ans. 3.

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[2] The Final Action includes numerous typographical errors regarding other claims not actually rejected under 35 U.S.C. § 112(b). Final Act. 3. Appellant and Examiner ultimately agree that only claims 22 and 23 are so rejected. *See* Appeal Br. 3; Ans. 3.

[3] US 2003/0213250 A1, published Nov. 20, 2003 ("Pacheco-Tougas").

[4] Claim 22 is not listed at the beginning of the Examiner's rejection. Final Act. 3. However, claim 22 is rejected in the analysis provided by the Examiner. *Id.* at 6.

[5] US 6,427,446 B1, issued Aug. 6, 2002 ("Kraft").

Against this rejection, Appellant presents only conclusory attorney argument that "a worker of ordinary skill in this art would certainly recognize that what is meant by the claims 22 and 23 is the outlet as recited in the independent claim," coupled with a statement that Appellant is willing to amend claims 22 and 23 if and when the issue raised by the Examiner in this rejection becomes "the sole remaining issue." Appeal Br. 3.

Appellant's conclusory argument does not apprise us of error. We see no reason why one skilled in the art would understand the plural recitation of "outlets" in claims 22 and 23 to necessarily refer to the singularly recited "outlet" of claims 1 and 16. Referencing a plurality of outlets when only one outlet has been previously set forth, in this case, amounts to an improper indirect limitation rendering claims 22 and 23 indefinite. *See* MPEP § 2173.05(e). We accordingly affirm Rejection 1.

Rejection 2 — Anticipation

Appellant argues the patentability of the rejected claims, namely claims 1, 8, 11, and 22, together. Appeal Br. 3. We select claim 1 as representative. *See* 37 C.F.R. § 41.37(c)(1)(iv).

The Examiner found that Pacheco-Tougas discloses a combustor (10) within the scope of claim 1. Final Act. 3–5 (citing Pacheco-Tougas Figs. 1–13, with particular focus on Figs. 5 and 13).

Appellant argues against the rejection solely on the basis that Pacheco-Tougas does not teach cooling holes that are "circumferentially aligned," as recited in claim 1. Appeal Br. 3. For this limitation, the Examiner cited Figures 5 and 13 and paragraph 41 of Pacheco-Tougas. *See* Final Act. 4–5.

Pacheco-Tougas discloses that "the film cooling holes 32 in the outer

front heat shield panels 18 all have a positive circumferentially oblique orientation, whereas the film cooling holes 32 in the inner front heat shield panels 22 all have a negative circumferential oblique orientation." Pacheco-Tougas ¶40. But Pacheco-Tougas discloses an "exception to the cooling hole orientation described [in paragraph 40]." *Id.* ¶41. The exception "occurs in the vicinity of the axially extending rails 50." *Id.* "As shown in FIGS. 5 and 5A, the orientation of the cooling holes 32 on each side of each rail 50 is towards the respective rail 50." *Id.* The Examiner annotates Figure 13 to show the location of the asserted circumferentially aligned cooling holes. Final Act. 5.

Appellant's Appeal Brief argument is reproduced below in its entirety:

> The claims require effusion cooling holes that are "circumferentially aligned" *under rails*.
>
> The Examiner attempts to read "aligned" so broadly as to take any meaning away from the word. However, a worker reading this application would understand that much more is required. Pacheco-Tougas does not disclose effusion cooling holes *extending underneath the rail* to be at the claimed location.
>
> The claims require more. A unique structure is disclosed and claimed that provides benefits. The art does not meet these claims. The rejection should be reversed.

Appeal Br. 3 (emphasis added).

The Examiner answers Appellant's argument, in part, by pointing out that "the claimed term 'circumferentially aligned' is not used in the specification or the drawings." Ans. 6. The Examiner is correct in that regard. *See generally* Spec.

Appellant nonetheless argues that "paragraph 54 [sic, 55] in [sic, Appellant's] specification should be taken into account along with Figure

4D to interpret 'aligned.' This makes clear what is meant by aligned. It means actually physically aligned, not just pointing in the direction." Reply Br. 1.

Prior to the Final Action, Appellant sought to amend the Specification, including paragraph 55, as well as various drawings and claims. *See* May 22, 2018, Amendment. In the Final Action, entered June 29, 2018, the Examiner explicitly objected to the proposed replacement drawings but did not mention the proposed amendments to the Specification. *See* Final Act. Office Action Summary ¶¶10–11. In a September 19, 2018, Advisory Action, the Examiner entered the amendments to the claims, again not mentioning the proposed amendments to the Specification. Advisory Act. ¶12. Hence, Appellant's May 22, 2018, amendments to the Specification have not been entered. Nonetheless, we reproduce below Figure 4D along with Appellant's proposed amendment to paragraph 55, as it better elucidates Appellant's claim construction position.

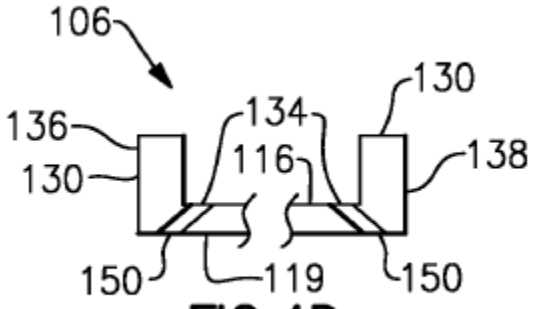

FIG.4D

> [0055] Figure 4D shows details of the holes 134. As shown, an inlet to the holes 134 on the outer face 116 extends at an angle that is non-perpendicular and non-parallel to the face 116, and each extend generally outwardly toward their respective edges 136 and 138 such that the outlet 150 is circumferentially aligned with the location of the rails 130. That is, the outlet 150

> is at a common circumferential location at the rails 130. The holes 134 extend at the edge 136 and 138, at each of the circumferential directions such that outlets 150 are ~~is~~ spaced closer to each of the circumferential edges than is an inlet to the effusion cooling holes 134.

Spec. Fig. 4D; May 22, 2018, Amendment 2 (underlining denoting material to be added; strikethrough denoting material to be deleted).

All told, we understand Appellant's argument to be that "circumferentially aligned" requires cooling holes that extend under the circumferential rail as shown in Appellant's Figure 4D. *See* Appeal Br. 3 ("The claims require effusion cooling holes that are 'circumferentially aligned' under rails."). However, Appellant's Specification does not support construing "circumferentially aligned" so narrowly.

Although we must read Appellant's claims in light of the Specification, we will not read limitations from the Specification into the claims. *See Sjolund v. Musland*, 847 F.2d 1573, 1581–82 (Fed. Cir. 1988) ("[W]hile it is true that claims are to be interpreted *in light of* the specification . . . , it does not follow that limitations from the specification may be read into the claims. . . . [T]he claims define the invention."). Reading a requirement that the cooling holes must extend under the circumferential rail into the term "circumferentially aligned" is particularly inappropriate given that the Specification does not describe Figure 4D as showing such a relationship. Indeed, nowhere does the Specification use the term "circumferentially aligned." Furthermore, Appellant's Figure 3 shows the absence of such a feature. There, the illustrated cooling hole 134 closest to the circumferential rail 130 does not extend below (or above per the inverted orientation shown) the rail 130.

For the foregoing reasons, we are not apprised of error in the Examiner's interpretation of "circumferentially aligned with" to include Pacheco-Tougas's hole locations that are "angled toward" (Ans. 4 (quoting Pacheco-Tougas ¶¶41, 65)) the circumference. Elements are reasonably considered "aligned" in this fashion the way something is considered "aligned" with a target. *See* Ans. 5 (quoting dictionary.com). Furthermore, as the Examiner points out, even under Appellant's proposed narrow interpretation of "circumferentially aligned with," Pacheco-Tougas appears to disclose this arrangement of "effusion holes (32) having outlets (shown as a '+') extending underneath the rails." Ans. 6. Despite Pacheco-Tougas being assigned to Appellant,[6] putting Appellant in the best position to explain any errors this determination, Appellant has left the Examiner's position in this regard uncontroverted.

Accordingly, Appellant does not apprise us of error. Accordingly, we affirm the rejection of claim 1, as well as that of claims 8, 11, and 22, which fall therewith. *See* 37 C.F.R. § 41.37(c)(1)(iv).

Rejection 3 — Obviousness In View of Pacheco-Tougas
Claims 13, 16, 17, and 20

Appellant argues the patentability of the rejected claims, namely claims 13, 16, 17, and 20 together. Appeal Br. 3. We select claim 13 as representative. *See* 37 C.F.R. § 41.37(c)(1)(iv).

Claim 1 recites "said effusion cooling holes adjacent to at least one edge on said panel." Appeal Br. 7. Claim 13 depends from claim 1 and adds "wherein adjacent is defined by being spaced by a distance from said at

[6] Reel/Frame: 012913 / 0045; Received: 05/24/2002.

least one edge equal to or less than ten (10) average diameter of said effusion cooling holes." *Id*. at 8.

The Examiner acknowledges that Pacheco-Tougas does not explicitly teach claim 13's recitation. Final Act. 7. The Examiner found that "Pacheco-Tougas does teach, however, that a relatively small axial distance between consecutive rows of holes and a first row of the holes being located extremely close to the peripheral rail wall segment increases heat extraction through convection in this region of the panels." *Id.* (citing Pacheco-Tougas ¶47). Thus, according to the Examiner, Pacheco-Tougas discloses that the spacing between effusion cooling holes and the circumferential edges is a result-effective variable. *Id.*; *see* Pacheco-Tougas ¶47 ("a relatively small axial distance between consecutive rows of holes and [] the first row [being] located *extremely close to the peripheral rail* wall segment . . . increases the heat extraction through convection in this critical region of the panels" (emphasis added)). The Examiner concluded that "since the general conditions of the claim, i.e. that the spacing between the cooling holes and the circumferential edges can be reduced, were disclosed in the prior art by Pacheco-Tougas, it is not inventive to discover the optimum workable range by routine experimentation" [and] "it would have been obvious to one of ordinary skill" to employ the spacing recited in claim 13. *Id.* at 8.

Appellant argues that the Examiner's citations and analysis are insufficient "to render the *definition* of 'adjacent' a result effective variable at all." Appeal Br. 4 (emphasis added); *see also id.* at 5 ("[W]ithout more, the Examiner's argument that the *definition* is a 'result-effective variable' must fail." (emphasis added). Appellant's argument is inapposite to the Rejection as articulated by the Examiner. The result-effective variable

identified by the Examiner is not the "definition" of "adjacent" recited in claim 13 (i.e., it is not "being spaced by a distance from said at least one edge equal to or less than ten (10) average diameter of said effusion cooling holes."). Rather, the result-effective variable identified by the Examiner is "the spacing between the cooling holes and the circumferential edges." Final Act. 8. The Examiner found that Pacheco-Tougas discloses that when this variable is reduced, it has the effect of increasing heat extraction. *Id.*

That Appellant's claim 13 recites its purported optimum range for the result-effective variable is measured or expressed as a fraction of the average diameter of the cooling holes does not apprise us of error in the Examiner's reasoning. First, it remains that, for any given hole diameter, the relationship between hole proximity and heat extraction is taught by the prior art. Pacheco-Tougas ¶47. Second, the cited portion of Pacheco-Tougas also recognizes the importance of diameter optimization. *Id.*

Appellant does not apprise us of error in the rejection of claim 13. Accordingly, we affirm the rejection of claim 13, as well as that of claims 16, 17, and 20, which fall therewith. *See* 37 C.F.R. § 41.37(c)(1)(iv).

Claim 23

Claim 23 recites: "The combustor section as set forth in claim 16, wherein said outlets are at a common circumferential location as said rail at said circumferential edges." Appeal Br. 9. Although Appellant argues this claim separately from claims 13, 16, 17, and 20, Appellant does so in a conclusory fashion, which does not apprise us of error. *See* Appeal Br. 3.

Accordingly, we affirm the rejection of claim 23.

Rejection 4 — Obviousness In View of Pacheco-Tougas and Kraft

Claim 12 recites: "The combustor as set forth in claim 1, wherein a spacing between adjacent ones of said effusion cooling holes in said reduced spacing area being equal to or less than ten (10) average diameter of said effusion cooling holes."

For this claim, the Examiner additionally relies on Kraft, and specifically its teaching "that the diameter of each of the holes and the spacing of the hole from each other is sized to maximize the cooling effectiveness of the hole pattern, improve fuel/air mixing, while at the same time not sacrificing the structural integrity of the liner." Final Act. 10 (citing Kraft 2:61–3:16). Thus, according to the Examiner, Kraft discloses that the "the spacing of adjacent holes is recognized as a result-effective variable." *Id.*; *see* Kraft 3:12–16 ("The diameter of each of the holes and the spacing of the holes from each other is sized to maximize the cooling effectiveness of the hole pattern, improve fuel/air mixing, while at the same time not sacrificing the structural integrity of the combustion liner."); *see also* Pacheco-Tougas ¶47 ("*a relatively small axial distance between consecutive rows of holes* and [] the first row [being] located extremely close to the peripheral rail wall segment . . . increases the heat extraction through convection in this critical region of the panels" (emphasis added)). The Examiner concluded that "it would have been obvious to one of ordinary skill in the art before the effective filing date of the claimed invention to modify Pacheco-Tougas to provide the spacing of the cooling holes as taught by Kraft in order to maximize the cooling effectiveness of the hole pattern, while not sacrificing the structural integrity of the liner." Final Act. 11.

Appellant's arguments against the rejection of claim 12 merely echo those presented for claim 13. More specifically, Appellant argues that the limitation added by claim 12 renders the claim nonobvious because it recites the optimum spacing, not in direct units of length, but rather in terms of a fraction of the average diameter of the cooling holes. Appeal Br. 5. For reasons similar to those expressed above, this argument does not apprise us of error.

Accordingly, we affirm the rejection of claim 12.

SUMMARY

Claims Rejected	35 U.S.C. §	References/Basis	Affirmed	Reversed
22, 23	112(b)	Indefiniteness	22, 23	
1, 8, 11, 22	102(a)(1)	Pacheco-Tougas	1, 8, 11, 22	
13, 16, 17, 20, 23	103	Pacheco-Tougas	13, 16, 17, 20, 23	
12	103	Pacheco-Tougas, Kraft	12	
Overall Outcome			1, 8, 11–13, 16, 17, 20, 22, 23	

TIME PERIOD FOR RESPONSE

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

AFFIRMED