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UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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*Ex parte* KEVIN WESTON MCMAHAN  
and JOSEPH V. CITENO

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Appeal 2014-007493  
Application 12/719,674  
Technology Center 3700

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Before EDWARD A. BROWN, GEORGE R. HOSKINS, and  
MICHAEL L. WOODS, *Administrative Patent Judges*.

WOODS, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF THE CASE

Kevin Weston McMahan and Joseph V. Citeno (“Appellants”) appeal under 35 U.S.C. § 134 from the Examiner’s decision rejecting claims 1–12, 14–18, and 25. Appeal Br. 2. Claims 13 and 19–24 are objected to but indicated as allowable. Final Act. 34. We have jurisdiction over this appeal under 35 U.S.C. § 6(b).

SUMMARY OF THE DECISION

We AFFIRM.

### CLAIMED SUBJECT MATTER

Appellants' invention relates to "preferential cooling of gas turbine nozzles." Spec. ¶ 1. Claims 1, 11, and 16 are independent and claim 1 is reproduced below, with emphasis added to a particular limitation at issue in this appeal.

1. A turbine engine, comprising:
  - a turbine nozzle assembly with a plurality of circumferentially spaced first components and second components; and
  - a plurality of transition pieces each defining a hot gas path from a combustor to the turbine nozzle assembly, wherein the plurality of transition pieces are arranged circumferentially about a rotational axis of the turbine engine, and each pair of adjacent transition pieces of the plurality of transition pieces has an interface circumferentially between the pair of adjacent transition pieces;wherein the first components are generally aligned with the interfaces between pairs of the adjacent transition pieces of the plurality of transition pieces, the second components are disposed between the interfaces and are generally aligned with the hot gas paths from the combustors through openings of individual transition pieces of the plurality of transition pieces, and *the second components are configured to provide more cooling than the first components.*

Appeal Br. 18 (emphasis added) (Claims App.).

### THE REJECTIONS

- I. Claims 1, 2, 7, 9–11, 14, and 25 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Han (US 6,840,048 B2, issued Jan. 11, 2005) and Lee (US 2008/0317585 A1, published Dec. 25, 2008). Final Act. 4.

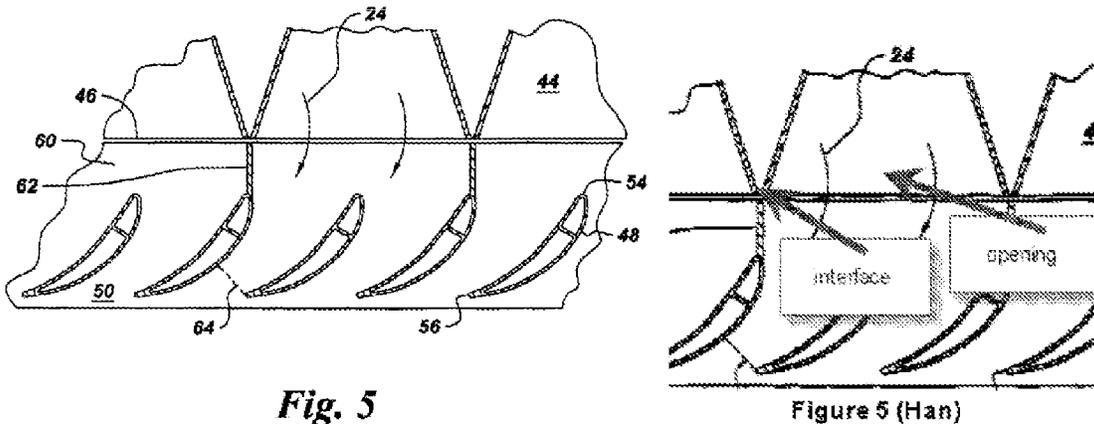
- II. Claim 6 stands rejected under 35 U.S.C. § 103(a) as unpatentable over Han, Lee, and O'Connor (US 6,071,363, issued June 6, 2000). Final Act. 12.
- III. Claim 8 stands rejected under 35 U.S.C. § 103(a) as unpatentable over Han, Lee, and design choice. Final Act. 13.
- IV. Claim 4 stands rejected under 35 U.S.C. § 103(a) as unpatentable over Han, Lee, and Brassfield (US 6,382,906 B1, issued May 7, 2002). Final Act. 14.
- V. Claims 1–3, 5, 7, 9–12, 14–16, and 25 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Han, Lee, and Bash (US 7,101,150 B2, issued Sept. 5, 2006). Final Act. 15, 31.
- VI. Claim 4 stands rejected under 35 U.S.C. § 103(a) as unpatentable over Han, Lee, Bash, and Brassfield. Final Act. 27.
- VII. Claim 6 stands rejected under 35 U.S.C. § 103(a) as unpatentable over Han, Lee, Bash, and O'Connor. Final Act. 28.
- VIII. Claim 8 stands rejected under 35 U.S.C. § 103(a) as unpatentable over Han, Lee, Bash, and design choice. Final Act. 29–30.
- IX. Claims 17 and 18 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Han, Lee, Bash, and engineering expedient. Final Act. 32.

## ANALYSIS

### *Rejection I: Claims 1, 2, 7, 9–11, 14, and 25 as Unpatentable over Han and Lee*

Appellants contest the rejection of claims 1, 2, 7, 9–11, 14, and 25 collectively as a group. *See* Appeal Br. 7–10. In accordance with 37 C.F.R. § 41.37(c)(1)(iv), we select claim 1 as the representative claim to decide the appeal of the rejection, with claims 2, 7, 9–11, 14, and 25 standing or falling with claim 1.

In rejecting claim 1, the Examiner finds that Han discloses the claimed turbine engine comprising, *inter alia*, a turbine nozzle assembly with a plurality of first components (vanes 48 aligned with interfaces between transition pieces 44) and second components (vanes 48 aligned with openings). Final Act. 5 (citing Han, Figs. 4, 5). To illustrate these findings, the Examiner provides a marked-up version of Han's Figure 5, which we reproduce below, alongside Han's original Figure 5 (*id.* at 6):



The above-left figure is an unaltered version of Han's Figure 5, and depicts a sectional view through a turbine nozzle (Han, col. 2, ll. 43–44) including plenum 60 that is segmented by baffles 62 downstream from transition pieces 44 to corresponding leading edges 54 of vanes 48 (*id.* at

col. 6, ll. 20–24). The above-right figure is the Examiner’s marked-up version of Han’s Figure 5, and illustrates the Examiner’s findings with respect to the claimed “interfaces” “between the pair of adjacent transition pieces” 44. Final Act. 5–6.

Notably, Han discloses multiple vanes 48, each having leading edge 54. *See* Han, col. 6, ll. 20–24, Fig. 5. Some of Han’s vanes 48 and leading edges 54 extend from baffles 62, while other vanes 48 have leading edges 54 that appear to be positioned centrally with respect to the openings of transition pieces 44. *See id.* at Fig. 5. In rejecting claim 1, the Examiner finds that the vanes “aligned with the interfaces” and that extend from baffles 62 satisfy the claimed “first components,” while the other vanes “aligned with the openings” satisfy the claimed “second components.” *See* Final Act. 5.

The Examiner acknowledges that Han does not disclose that the “second components are configured to provide more cooling than the first components,” as required by claim 1. *Id.* at 6. In satisfying this limitation, the Examiner relies on Lee’s disclosure of a turbine nozzle assembly 20 with vanes (36, 38) having more cooling holes on certain regions of the vanes that experience elevated temperatures (*id.* (citing Lee ¶¶ 36, 58, 67, Figs. 1–3)).

Notably, Lee discloses that “the outboard sides of the vanes have a greater density or number of film cooling holes 76 per unit area than found on the corresponding inboard sides” (Lee ¶ 67) to “preferentially accommodate[] the hot and cold streaks in the combustion gases for improving performance of the gas turbine engine” (*id.* at ¶ 22).

In combining Han and Lee, the Examiner reasons that:

it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the turbine engine of Han to make the second components provide more cooling than the first components since the second components are more directly exposed to the hot combustion gases than the first components for the purpose of preventing damage to components that are inline with hot combustion gases as disclosed by Lee.

Final Act. 6–7.

In contesting this rejection, Appellants present several arguments, which we address separately, below.

First, Appellants argue that “Lee appears to disclose that each vane around the full perimeter of the nozzle provides the same total amount of cooling [and, therefore,] one component would not provide more or less cooling than another component,” as required by claim 1. Appeal Br. 10.

Appellants’ first argument is not persuasive, as the Examiner’s rejection is not premised on Lee disclosing vanes (or components) with differing amounts of cooling. *See* Final Act. 5–7. In fact, the Examiner agrees with Appellants’ characterization of Lee, in that each vane provides the same total amount of cooling. *See* Ans. 25. As explained correctly by the Examiner, however, “Lee is broadly concerned with preferential cooling of vane regions that experience elevated temperatures due to the temperature distribution constituted by relative hot streaks and cold streaks produced by the clocking of fuel injectors.” *Id.* at 25–26 (citing Lee ¶¶ 7, 12, 22). As explained by the Examiner, one of ordinary skill in the art “would appreciate that [Han’s] configuration produces a temperature distribution whereby [Han’s] in-line vanes are exposed to relative hot streaks while [Han’s] interface vanes are exposed to relative cold streaks.” *Id.* at 26 (citing Lee ¶ 7). We further agree with the Examiner that it would have been obvious

“to apply the teachings of Lee to Han [to] provide preferential cooling to [Han’s second components 48] in relative hot streaks over [Han’s first components 48] in relative cold streaks, the result of which is preferential cooling of Han’s in-line vanes relative to the interface vanes.” *Id.*

Second, Appellants argue, “the Examiner has not shown objective evidence of the requisite motivation or suggestion to modify or combine the cited references.” Reply Br. 2 (citing in-part *In re Lee*, 277 F.3d 1338, 1343 (Fed. Cir. 2002) (citing *Brown & Williamson Tobacco Corp. v. Philip Morris Inc.*, 229 F.3d 1120, 1124–25 (Fed. Cir. 2000) (“a showing of a suggestion, teaching, or motivation to combine the prior art references is an ‘essential component of an obviousness holding’”)); *see also* Reply Br. 7 (“neither reference teaches or suggests any reason to provide differential cooling from one vane to another”).

Appellants’ second argument is not persuasive. *If* Appellants’ argument is based on a belief that there must be an explicit teaching or suggestion to combine Han with Lee, this argument is foreclosed by *KSR International Co. v. Teleflex Inc.*, 550 U.S. 398 (2007). In *KSR*, the Court rejected the rigid requirement of a teaching, suggestion, or motivation to combine known elements in order to show obviousness. *KSR*, 550 U.S. at 415. The Court noted that an obviousness analysis “need not seek out precise teachings directed to the specific subject matter of the challenged claim, for a court can take account of the inferences and creative steps that a person of ordinary skill in the art would employ.” *Id.* at 418.

Rather, the proper test requires that “rejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to

support the legal conclusion of obviousness.” *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006), cited with approval in *KSR*, 550 U.S. at 418.

In the present case, the Examiner provided evidence to demonstrate that the following were known in the art: (1) vanes of a nozzle that are clocked relative to a combustor such that some vanes are located in-line with the combustor outlet, while other vanes are located at the interface between the combustors (Han); and (2) preferential cooling of vane regions that experience elevated temperatures due to hot streaks produced by the clocking of fuel injectors of a combustor (Lee). *See* Ans. 25–26 (citations omitted). Further, we find the Examiner’s conclusion that a person of ordinary skill in the art would modify Han so that its “second components provide more cooling than the first components” (Final Act. 6–7) is articulately reasoned with some rational underpinning to support the legal conclusion of obviousness (*KSR*, 550 U.S. at 418).

Third, Appellants argue that the Examiner’s proposed modification of Han would render it unsatisfactory for its intended purpose. Reply Br. 6 (citation omitted). Appellants explain, “Han teaches a multi-combustor can configuration, while Lee discloses a single annular combustor” and that “Han teaches internal cooling of vanes . . . whereas Lee teaches a discharge of cooling flow from each vane.” *Id.* at 6–7. Appellants assert, “since the principles of operation are different between Han and Lee, one of ordinary skill in the art would not think to combine them to teach or suggest a component/vane with more cooling than another component/vane” as required by the claims. *Id.* at 7.

Appellants’ third argument is not persuasive. Notwithstanding the differences between Han’s and Lee’s combustor configuration, Appellants

fail to explain how the Examiner’s proposed modification—which includes simply providing more cooling to the second components than to the first components—would render Han’s device unsatisfactory for its intended purpose. *See* Reply Br. 5–7.

Accordingly, we sustain the rejection of claim 1, and claims 2, 7, 9–11, 14, and 25, which fall with claim 1, under 35 U.S.C. § 103(a) as unpatentable over Han and Lee.

*Rejection II: Claim 6 as Unpatentable Over Han, Lee, and O’Connor*

In contesting the rejection of dependent claim 6, Appellants rely on the same arguments presented under Rejection I. Appeal Br. 10.

Accordingly, and for the same reasons we sustain Rejection I, we also sustain the rejection of claim 6 under 35 U.S.C. § 103(a) as unpatentable over Han, Lee, and O’Connor.

*Rejection III: Claim 8 as Unpatentable Over Han, Lee, and Design Choice*

Claim 8 depends from claim 1 and further requires that “each of the first components is disposed between a pair of the second components.” Appeal Br. 19 (Claims App.). In rejecting claim 8, the Examiner finds that the cited art does not disclose this limitation (Final Act. 13), but explains that “one having ordinary skill in the art specifying the number of vanes and combustors as a routine matter of design is also implicitly specifying the number of vanes that are inline with a combustor opening” and that it would have been obvious “to design the two inline vanes to have the claimed characteristics . . . for the purpose of matching the degree of cooling with the need for cooling” (*id.* at 14).

In contesting the rejection of dependent claim 8, Appellants rely on the same arguments presented under Rejection I, and further argue that the “Examiner’s rejection does not provide any objective evidence to support the Examiner’s conclusion regarding design choice.” Appeal Br. 10–11.

Appellants’ argument is not persuasive. Instead, we find that the Examiner provided adequate evidence, including by citing to Han’s disclosure regarding the number of combustor cans and vanes, in support of the rejection. *See, e.g.*, Final Act. 5; Ans. 27 (citing Han col. 4, ll. 50–col. 6, ll. 35). Furthermore, Appellants fail to submit any evidence to contradict the Examiner’s determination that the additional limitation is nothing more than a minor difference between the cited art and the claimed device. *See In re Rice*, 341 F.2d 309, 314 (CCPA 1965) (minor differences between the prior art and a claimed device may be a matter of design choice absent evidence to the contrary).

Accordingly, we sustain the rejection of claim 8 under 35 U.S.C. § 103(a) as unpatentable over Han, Lee, and design choice.

*Rejection IV: Claim 4 as Unpatentable Over Han, Lee, and Brassfield*

Claim 4 depends from claim 1 and further requires that “the first components and the second components comprise inserts for turbine nozzle vanes.” Appeal Br. 18 (Claims App.). In rejecting claim 4, the Examiner relies on Brassfield’s disclosure of nozzle vanes having perforated inserts to provide impingement cooling, and reasons that it would have been obvious to modify further Han and Lee “to include inserts in the nozzle vanes, as disclosed by Brassfield, for the purpose of providing impingement cooling to the nozzle vanes.” Final Act. 15 (citing Brassfield, Fig. 2).

In contesting the rejection of dependent claim 4, Appellants rely on the same arguments presented under Rejection I, and further argue that the “the Examiner did not provide any objective evidence or articulated reasoning with a rational underpinning to support the conclusion of obviousness” and that “the proposed modification may require a substantial redesign of Han.” Appeal Br. 11.

Appellants’ argument is not persuasive. The Examiner articulated reasons, with some rational underpinnings, that combining Brassfield with Han and Lee would provide for impingement cooling to the nozzle vanes. Final Act. 15; *KSR*, 550 U.S. at 418. Furthermore, Appellants fail to explain with sufficient detail how the proposed modification would somehow require “a substantial redesign of Han.” *See* Appeal Br. 11.

Accordingly, we sustain the rejection of claim 4 under 35 U.S.C. § 103(a) as unpatentable over Han, Lee, and Brassfield.

*Rejections V–VIII: Claims 1–12, 14–16, and 25 as Unpatentable over Han, Lee, Bash, and Other Cited Art*

In contesting these rejections, Appellants rely only on the same arguments discussed *supra* with respect to Rejections I–IV. *See* Appeal Br. 11–16; *see also* Reply Br. 2–7 (contesting the rejections collectively); Ans. 28–29.

For the same reasons we sustain Rejections I–IV, we also sustain the rejections of claims 1–12, 14–16, and 25 under 35 U.S.C. § 103(a) as unpatentable over Han, Lee, Bash, and the other cited art.

*Rejection IX: Claims 17 and 18 as Unpatentable Over Han, Lee, Bash, and Engineering Expedient*

Claims 17 and 18 each depend from independent claim 16, and further recite “wherein the individual first vanes . . . comprise at least 50 percent fewer cooling holes” (claim 17) or “80 percent fewer cooling holes” (claim 18). Appeal Br. 21 (Claims App.). In rejecting claims 17 and 18, the Examiner finds that the cited art does not disclose this limitation (Final Act. 32), but explains that:

one having ordinary skill in the design of turbine components understands the need to design components that can withstand the high temperatures resulting from combustion products entrained in the main flow. Therefore, since Lee discloses varying the density/number of cooling holes in response to the high temperature main flow in order to match the degree of cooling with the need for cooling, then it would have been obvious to one having ordinary skill in the art to include the claimed proportion of holes between different vane types as an engineering expedient.

*Id.* at 32–33.

In contesting the rejection of dependent claims 17 and 18, Appellants rely on the same arguments presented with respect to independent claim 16, and further argue that the “Examiner’s rejection does not provide any objective evidence to support the Examiner’s conclusion regarding engineering expedient.” Appeal Br. 16.

Appellants’ argument is not persuasive. Instead, we find that the Examiner provided adequate evidence, including by citing to Lee’s disclosure of varying the density and number of cooling holes. Final Act. 33; *see also* Final Act. 6 (citing in-part Lee ¶ 67 (“the outboard sides of the vanes have a greater density or number of film cooling holes 76 per unit area than found on the corresponding inboard sides”)).

Accordingly, we sustain the rejection of claims 17 and 18 under 35 U.S.C. § 103(a) as unpatentable over Han, Lee, Bash, and engineering expedient.

#### SUMMARY

The Examiner's decision to reject claims 1, 2, 7, 9–11, 14, and 25 under 35 U.S.C. § 103(a) as unpatentable over Han and Lee is affirmed.

The Examiner's decision to reject claim 6 under 35 U.S.C. § 103(a) as unpatentable over Han, Lee, and O'Connor is affirmed.

The Examiner's decision to reject claim 8 under 35 U.S.C. § 103(a) as unpatentable over Han, Lee, and design choice is affirmed.

The Examiner's decision to reject claim 4 under 35 U.S.C. § 103(a) as unpatentable over Han, Lee, and Brassfield is affirmed.

The Examiner's decision to reject claims 1–3, 5, 7, 9–12, 14–16, and 25 under 35 U.S.C. § 103(a) as unpatentable over Han, Lee, and Bash is affirmed.

The Examiner's decision to reject claim 4 under 35 U.S.C. § 103(a) as unpatentable over Han, Lee, Bash, and Brassfield is affirmed.

The Examiner's decision to reject claim 6 under 35 U.S.C. § 103(a) as unpatentable over Han, Lee, Bash, and O'Connor is affirmed.

The Examiner's decision to reject claim 8 under 35 U.S.C. § 103(a) as unpatentable over Han, Lee, Bash, and design choice is affirmed.

The Examiner's decision to reject claims 17 and 18 under 35 U.S.C. § 103(a) as unpatentable over Han, Lee, Bash, and engineering expedient is affirmed.

Appeal 2014-007493  
Application 12/719,674

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