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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte CRAIG M. BEERS and CHRISTOPHER MCAULIFFE

Appeal 2017-004029
Application 13/869,045¹
Technology Center 3700

Before LINDA E. HORNER, MICHELLE R. OSINSKI, and
ERIC C. JESCHKE, *Administrative Patent Judges*.

HORNER, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF THE CASE

Appellant seeks our review under 35 U.S.C. § 134(a) of the Examiner's decision rejecting claims 1, 6, 7, 12, 13, and 18. Final Office Action (April 4, 2016) (hereinafter "Final Act."). We have jurisdiction under 35 U.S.C. § 6(b).

¹ Hamilton Sundstrand Corporation ("Appellant"), which is owned by United Technologies Corporation, is the applicant as provided for under 37 C.F.R. § 1.46, and is identified as the real party in interest. Appeal Brief 1 (September 1, 2016) (hereinafter "Appeal Br.>").

The claims relate to a turbine nozzle and shroud for use in an air cycle machine. Air cycle machines condition air for use in an aircraft cabin air conditioning and temperature control system. The Examiner found that two prior art patents directed to air cycle machines disclose the claimed nozzle and shroud except for specific design parameters of the vanes. The Examiner found that other prior art patents show that these design parameters were known result-effective variables. The Examiner thus determined that the claimed subject matter would have been obvious to one having ordinary skill in the art as a matter of routine optimization. Appellant challenges the Examiner's determination based on optimization. For the reasons explained in the decision, we find that the Examiner failed to set forth adequate reasoning to support a determination of obviousness. As such, we REVERSE the rejections under 35 U.S.C. § 103.

The Examiner also made a provisional double patenting rejection of the claims over claims of co-pending applications in combination with prior art. Appellant does not contest this rejection. As explained in the decision, we do not reach this provisional rejection.

CLAIMED SUBJECT MATTER

Claims 1, 7, and 13 are the independent claims. Claim 1 is illustrative of the subject matter on appeal and is reproduced below.

1. A nozzle and shroud for use in an air cycle machine comprising:

a plate and a shroud curving in a first axial direction about a center axis of said shroud relative to said plate;

a plurality of vanes extending in a second axial direction away from said plate, with said plurality of vanes extending for a height away from said plate and a width being defined as the

closest distance between two adjacent vanes, with a ratio of said height to said width being between 1.7377 and 2.1612;

wherein there are 19 circumferentially spaced ones of said vanes; and

wherein a total flow area is defined between all 19 of said vanes and said total flow area being between 2.7491 and 3.4191 square inches (17.736-22.058 square centimeters).

Appeal Br. 7 (Claims Appendix).

EVIDENCE

The Examiner's decision relies upon the following evidence:

Smolinski	US 5,142,778	Sept. 1, 1992
Merritt	US 5,249,934	Oct. 5, 1993
Nenov	US 5,460,003	Oct. 24, 1995
Rowe	US 5,522,134	June 4, 1996
Marques	US 6,789,315 B2	Sept. 14, 2004
Barril	US 8,113,787 B2	Feb. 14, 2012
Colson	US 2012/0156028 A1	June 21, 2012

REJECTIONS

The Final Office Action includes the following rejections:

1. Claims 1, 6, 7, 12, 13, and 18 stand rejected under the doctrine of obviousness-type double patenting over various claims of U.S. Application Nos. 13/869,050 and 13/869,051 in view of Marques.
2. Claims 1, 7, and 13 stand rejected under 35 U.S.C. § 103 as unpatentable over Colson and Marques.
3. Claims 6, 12, and 18 stand rejected under 35 U.S.C. § 103 as unpatentable over Colson, Marques, Merritt, and Barril.

4. Claims 1, 7, and 13 stand rejected under 35 U.S.C. § 103 as unpatentable over Merritt and Marques.
5. Claims 6, 12, and 18 stand rejected under 35 U.S.C. § 103 as unpatentable over Merritt, Marques, and Barril.

ISSUE

The issue presented by this appeal is whether the Examiner has articulated adequate reasoning to explain why one having ordinary skill in the art would have modified the air cycle machine of either Colson or Merritt to have the number of vanes, the ratio of vane height to vane width, and total flow area as claimed.

RELATED APPEALS

This appeal is related to three other appeals pending at the Board. *See* Appeal 2017-004034 (Appl. No. 13/869,048); Appeal 2017-004050 (Appl. No. 13/869,050); and Appeal 2017-004053 (Appl. No. 13/869,053). These appeals involve similar subject matter, overlapping prior art, and substantially the same rejections and arguments over the prior art.

ANALYSIS

First Ground of Rejection: Obviousness-type Double Patenting

The Examiner provisionally rejected all of the pending claims on the basis of obviousness-type double patenting in view of claims of the '050 application or claims of the '051 application in view of Marques. Final Act. 5–7. Appellant does not contest this rejection. Appeal Br. 3.

Because this rejection is provisional, we decline to reach it. We leave it to the Examiner to determine at the time when any claims of this

application are otherwise in condition for allowance whether the obviousness-type double patenting rejection remains proper. *See Ex parte Moncla*, 95 USPQ2d 1884 (BPAI 2010) (precedential). The Manual of Patent Examining Procedure (MPEP) § 804(I)(B)(1)(b) (9th ed., January 2018 [R-08.2017]) provides guidance to examiners as to the handling of provisional nonstatutory double patenting rejections.

Second Ground of Rejection: Obviousness over Colson and Marques

The Examiner found that Colson discloses a nozzle and shroud substantially as recited in independent claims 1, 7, and 13, except that Colson does not disclose 19 vanes, a ratio of height to width of 1.7377 – 2.1612, and a total flow area of 2.7491 – 3.4191 square inches.² Final Act. 7–8. The Examiner found Marques teaches that total throat area of a turbine nozzle is a design parameter that determines the performance for the turbine. *Id.* at 8 (finding Marques defines total throat area as the vane length L times the throat width D_o summed for all of the throat areas between adjacent vanes in the nozzle); *id.* at 2–3 (quoting Marques, col. 1, ll. 35–47, discussing that total throat area determines the turbine flow function).³ Based on these teachings in the art, the Examiner found that the parameters of total number of vanes, ratio of height to width, and total flow area were

² The Examiner found that Colson discloses a ratio of width to height of 0.745 – 0.769. Final Act. 8. Colson’s ratio, when inverted, results in a height-to-width ratio of 1.3 – 1.3415.

³ The Examiner additionally cited Nenov and Rowe as evidence that total flow area of a nozzle was known in the art to be a result-effective variable, and Smolinski as evidence that the total number of vanes and the height-to-width ratio of a nozzle were known in the art to be result-effective variables. *Id.* at 3–4.

known result-effective variables. Final Act. 8. The Examiner determined that it would have been obvious to make the nozzle and shroud of Colson with the claimed parameters “to satisfy a design requirement” as a matter of routine optimization. *Id.*

We agree with the Examiner that the claimed parameters are result-effective variables. For example, Colson teaches that the ratio of vane width to vane height facilitates directional control characteristics of the turbine flow into the rotor (Colson ¶ 18), and Marques teaches total flow area through the nozzle determines the turbine flow function (Marques, col. 1, ll. 35–42). But, these facts alone are not enough for a prima face case of obviousness in this case. *See In re Stepan Co.*, 868 F.3d 1342, 1346 (Fed. Cir. 2017) (reversing a rejection based on a rationale of routine optimization because the rejection failed to explain why it would have been routine optimization to arrive at the claimed invention). Here, the Examiner’s explanation that one having ordinary skill in the art would have arrived at the claimed parameters “to satisfy a design requirement” is insufficient. This reasoning simply repackages “routine optimization” using different wording and fails to provide some rational underpinning explaining why a person of ordinary skill would have arrived at the claimed invention through routine optimization.

The Examiner relies in *In re Boesch*, 617 F.2d 272 (CCPA 1980) to support the rejection. Final Act. 8. In *Boesch*, the court held that a prima facie case of obviousness is established when the claimed ranges overlap ranges disclosed in the prior art. 617 F.2d at 275–76. *See also In re Peterson*, 315 F.3d 1325, 1329 (Fed. Cir. 2003) (“A *prima facie* case of

obviousness typically exists when the ranges of a claimed composition overlap the ranges disclosed in the prior art.”) and *In re Applied Materials Inc.*, 692 F.3d 1289, 1295 (Fed. Cir. 2012) (“Such overlap itself provides sufficient motivation to optimize the ranges.”)

Unlike the situation presented in *Boesch*, in this case the Examiner does not point to evidence that the claimed ranges are within or overlap with the ranges taught in the prior art. *See Stepan*, 868 F.3d at 1348 (holding that if the claimed range is not within or does not overlap the prior art range, it is the PTO’s burden to show that the claimed range would have been obvious to a person of ordinary skill in the art). In fact, the nozzle of Colson’s air cycle machine has parameters that differ, in some cases by a significant degree, from the claimed parameters.

Colson teaches a nozzle and shroud for an air cycle machine comprising 23 vanes and a ratio of vane width to vane height of 0.745 – 0.769. Colson ¶¶ 16, 18. This disclosed range, when inverted, represents a ratio of height to width of 1.3004 to 1.3423. In one specific embodiment, Colson discloses that the vanes have a throat width of 0.092 inches and a vane height of 0.120 inches. *Id.* ¶ 18. In this embodiment, the ratio of the width to height is 0.767, which, when inverted, represents a ratio of height to width of 1.3043. Colson teaches that the ratio of width to height “facilitates directional control characteristics of the turbine flow into the turbine rotor.” *Id.* As such, Colson teaches that the width and height dimensions of the vanes, and specifically, the ratio of these two dimensions, is a result-effective variable. That said, Colson’s range does not overlap with and is considerably lower than the claimed range of 1.7377 to 2.1612.

Further, in Colson's embodiment, the total flow area, calculated by multiplying the vane throat width (i.e., 0.092 inches) by the vane height (i.e., 0.120 inches) by the total number of vanes (i.e., 23), equals 0.25392 square inches. This total flow area is considerably lower than the claimed range of 2.7491 to 3.4191 square inches.

The Examiner has failed to explain why a person having ordinary skill in the art would have been led to modify the air cycle machine of Colson to decrease the number of vanes, increase the ratio of vane height to vane width, and increase the total flow area to arrive at the claimed invention.

Marques does not provide such a reason. Marques uses "total throat area" to refer to the width between adjacent vane pairs of a turbine nozzle multiplied by the length (i.e., height) of the vanes multiplied by the number of vane pairs. Marques, col. 4, l. 51 – col. 5, l. 13. Marques describes that the "total throat area, a design parameter of the gas turbine engine, determines the turbine flow function, which in turn sets the compressor pressure ratio and operating line, and is an important parameter in determining compressor stall margin." *Id.* at col. 1, ll. 35–47. Marques teaches that the final total throat area target range is a parameter "selected by engine designers to optimize the performance of the gas turbine engine." *Id.* at col. 5, ll. 9–12. Marques, at most, provides a suggestion that total flow area can be used to optimize turbine flow function.

We have no reason to believe that Colson did not optimize the parameters for its disclosed nozzle design. Colson's embodiment, as explained above, results in a total flow area considerably lower than the claimed range. Assuming that the teachings of Marques are applicable to the

air cycle turbine of Colson, the Examiner does not identify any reason, based on the teachings in Marques, to modify Colson to increase total flow area through the nozzle.

In addition to reliance on routine optimization, the Examiner made a statement nominally based on design choice. Final Act. 5 (stating that because Appellant's Specification does not disclose that the claimed number of vanes, height to width ratio, and total flow area solve a stated problem or are designed for a particular purpose, the limitations are considered a design choice). We understand this statement to be an attempt by the Examiner to bolster a routine optimization determination by pointing out that the Specification does not show criticality of the claimed parameters. The Examiner appears by this statement to have shifted the burden of proving patentability to Appellant. Such a shift in the burden of production does not occur until once the Examiner has set forth a prima facie case of obviousness. As the Examiner failed to provide adequate reasoning to support a determination of obviousness, the fact that Appellant did not provide rebuttal evidence is not determinative of the outcome in this appeal.

In summary, the Examiner has failed to explain adequately why a person having ordinary skill in the art would have been led to modify the air cycle machine of Colson to decrease the number of vanes, increase the ratio of vane height to vane width, and increase the total flow area to arrive at the claimed invention. As such, we do not sustain the second ground of rejection.

Third Ground of Rejection: Obviousness over Colson, Marques, Merritt, and Barril

This rejection of dependent claims 6, 12, and 18 suffers from the same deficient rationale for the proposed modification of Colson with the teachings of Marques discussed above. Final Act. 10. The Examiner's reliance on Merritt and Barril for the base material and coating limitations of these dependent claims does not cure this deficiency. *Id.* As such, we do not sustain the third ground of rejection.

Fourth Ground of Rejection: Obviousness over Merritt and Marques

In this alternate rejection of claims 1, 7, and 13, the Examiner relies on the disclosure of an air cycle machine in Merritt combined with the teachings of Marques to determine obviousness of the claimed subject matter. Final Act. 11–13. Merritt generally discloses an air cycle machine, but it contains no specific discussion about the design of the vanes of the turbine nozzle. As such, this patent appears to provide even less support than Colson to explain why one having ordinary skill in the art would have arrived at the claimed number of vanes, ratio of vane height to vane width, or total flow area recited in the claims. As such, we do not sustain the fourth ground of rejection.

Fifth Ground of Rejection: Obviousness over Merritt, Marques, and Barril

This rejection of dependent claims 6, 12, and 18 suffers from the same deficient rationale for the proposed modification of Merritt with the teachings of Marques discussed above. Final Act. 13. The Examiner's reliance on Barril for the coating limitations of these dependent claims does not cure this deficiency. *Id.* As such, we do not sustain the fifth ground of rejection.

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DECISION

The rejections of claims 1, 6, 7, 12, 13, and 18 under 35 U.S.C. § 103 are reversed.

We do not reach the provisional obviousness-type double patenting rejection of claims 1, 6, 7, 12, 13, and 18.

REVERSED