

The opinion in support of the decision being entered today was *not* written for publication and is *not* binding precedent of the Board.

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte ROBERT D. GREGG III, JOHN CHARLES VASSBERG, and
DAVID M. PITERA

Appeal 2007-0118
Application 10/175,612
Technology Center 3600

Decided: April 23, 2007

Before JENNIFER D. BAHR, LINDA E. HORNER, and ANTON W. FETTING,
Administrative Patent Judges.

HORNER, *Administrative Patent Judge*.

DECISION ON APPEAL
STATEMENT OF THE CASE

Robert D. Gregg, III et al. (“Appellants”) seek our review under 35 U.S.C. § 134 of the Examiner’s final rejection of claims 1-20. We have jurisdiction under 35 U.S.C. § 6(b).

SUMMARY OF DECISION

We REVERSE and REMAND.

THE INVENTION

Appellants invented a trailing edge device for transonic wings for aircraft and a method for designing a wing by tailoring a spanwise variation of airfoil segments (Specification 1:[0002] and 7:[0023]). Claim 1, reproduced below, is representative of the subject matter on appeal.

1. A method for forming an improved trailing edge wedge for a wing having a chord and a span, the method comprising the steps of:
 - a) providing a baseline trailing edge wedge;
 - b) coupling the baseline trailing edge wedge to the wing to form a baseline assembly;
 - c) segregating the baseline assembly into a plurality of airfoil segments, each of the airfoil segments being defined by a set of characteristics including a trailing edge bluntness, a trailing edge included angle and a trailing edge wedge height; and
 - d) tailoring a spanwise variation of the baseline trailing edge wedge in terms of a trailing edge bluntness, a trailing edge included angle and a trailing edge wedge height at each of the airfoil segments to form the improved wing assembly.

THE REJECTION

The Examiner relies upon the following as evidence of unpatentability:

Henne	US 4,858,852	Aug. 22, 1989
Vijgen	US 5,088,665	Feb. 18, 1992
Allen	US 5,265,830	Nov. 30, 1993

Claims 1-20 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Henne in view of Allen or Vijgen.

ISSUE

Appellants contend Henne teaches away from combining its teachings with Allen or Vijgen (Br. 8-9), there is no motivation to combine Henne with Allen or Vijgen (Br. 9-11), one having ordinary skill in the art would have no reasonable expectation of success when combining Henne with Allen or Vijgen (Br. 11-12), and even when combined, the combination fails to teach or suggest all of the claim limitations (Br. 12-16). The Examiner contends Henne does not teach away from the combination because Henne is relied upon to show the trailing edge wedge of the claims, and Allen and Vijgen are relied upon merely to teach that it is known to provide spanwise modifications to trailing edge wedges on a wing (Answer 3-4). The issue before us is whether Appellants have shown that the Examiner erred in holding claims 1-20 unpatentable under 35 U.S.C. § 103(a) over Henne in view of Allen or Vijgen.

FINDINGS OF FACT

We find that the following enumerated findings are supported by at least a preponderance of the evidence. *Ethicon, Inc. v. Quigg*, 849 F.2d 1422, 1427, 7 USPQ2d 1152, 1156 (Fed. Cir. 1988) (explaining the general evidentiary standard for proceedings before the Office).

1. Henne discloses an airfoil trailing-edge design to improve airfoil effectiveness in terms of increased thickness, increased lift capability, and decreased drag (Henne, col. 1, ll. 13-15).
2. Henne recognizes that prior efforts have been made to increase camber in airfoil design, including the use of flaps and wedges used to change airfoil section lift. Henne notes, “However, all of these devices produce surface discontinuities which produce earlier boundary layer separation, drag penalties and the loss in camber effectiveness resulting from these discontinuities.” (Henne, col. 1, ll. 55-65.)
3. Henne discloses that an object of the Henne airfoil design is “to produce increased camber effectiveness in airfoil design while avoiding the surface discontinuities associated with the prior designs” (Henne, col. 1, ll. 66-68).
4. Henne avoids the surface discontinuities associated with the prior art devices by providing an airfoil trailing edge design which features a blunt base, a region of high local concave curvature, typically on the lower or higher pressure surface at or near the trailing edge, and upper

- surface and lower surface slopes at the airfoil trailing edge that diverge from each other (Henne, col. 2, ll. 8-15).
5. “Couple” is defined as “to join, connect” or “to fasten together.” Webster’s Third International Dictionary (unabridged) 521, G. & C. Merriam Co. (1971) (Appendix A).
 6. Henne does not teach or suggest coupling a trailing edge wedge to an airfoil and, in fact, teaches away from coupling a trailing edge wedge to its airfoil because Henne’s airfoil is specifically intended to avoid the surface discontinuities associated with trailing edge wedge devices.
 7. The Examiner states that Allen and Vijgen are not relied upon to provide a different trailing edge wedge to the structure of Henne. Instead, the Examiner relies on Henne for the claimed trailing edge wedge and relies on Allen and Vijgen “merely to teach that it is known to provide spanwise modifications to trailing edge wedges on a wing” (Answer 3).
 8. One having ordinary skill in the art at the time of the invention would not have been motivated by the prior art to couple a trailing edge wedge to the airfoil of Henne.
 9. Allen discloses adding a splitter plate extending from the blunt trailing edge of a wing for a transonic airplane (Allen, col. 1, ll. 7-9).
 10. Allen teaches that blunt trailing edge airfoils, such as found in diverging trailing edges and trailing edge wedges, suffer from

- increased base drag that offsets gains otherwise afforded by these airfoil designs (Allen, col. 2, ll. 1-19).
11. Allen discloses adding a splitter plate to the blunt trailing edge to reduce the base drag (Allen, col. 2, ll. 20-25).
 12. Allen teaches that lift may vary across the span of a wing due to the twist of a wing about its spanwise axis and changes in its camber, and that near the tip of many wings, the lift approaches a minimum value, and at 60% of the distance between the wing root and wing tip, the wing has the maximum lift (Allen, col. 5, ll. 19-29).
 13. As such, Allen teaches varying the height, h , at which the splitter plate is attached to the blunt trailing edge to optimize the drag reducing effect across the span (Allen, col. 5, ll. 30-43).
 14. Vijgen teaches connecting a serrated panel 30 to the trailing edge 24 of an airfoil (Vijgen, col. 3, ll. 49-50).
 15. Vijgen teaches that “the depth, planform shape and thickness of the serratia can vary in the span-wise direction as a function of the wing planform shape, wing twist distribution, and wing-tip shape” (Vijgen, col. 4, ll. 41-44).
 16. Vijgen provides examples of shapes of serrations in Figures 4 and 6-9 and states that size and shape of the serrations “may be varied according to aerodynamic and geometric parameters of the airfoil” (Vijgen, col. 5, ll. 20-22).

PRINCIPLES OF LAW

In rejecting claims under 35 U.S.C. § 103(a), the examiner bears the initial burden of establishing a *prima facie* case of obviousness. *In re Oetiker*, 977 F.2d 1443, 1445, 24 USPQ2d 1443, 1444 (Fed. Cir. 1992). *See also In re Piasecki*, 745 F.2d 1468, 1472, 223 USPQ 785, 788 (Fed. Cir. 1984). The examiner can satisfy this burden by showing that some objective teaching in the prior art or that knowledge generally available to one of ordinary skill in the art would lead that individual to combine the relevant teachings of the references such that they would teach or suggest the claimed subject matter. *In re Fine*, 837 F.2d 1071, 1074, 5 USPQ2d 1596, 1598 (Fed. Cir. 1988). It is incumbent upon the examiner to establish a factual basis to support the legal conclusion of obviousness. *See id.* at 1073, 5 USPQ2d at 1598.

The prior art as a whole must “suggest the desirability” of the combination. *In re Beattie*, 974 F.2d 1309, 1311, 24 USPQ2d 1040, 1042 (Fed. Cir. 1992) (internal quotation omitted); *Winner Int'l Royalty Corp. v. Wang*, 202 F.3d 1340, 1349, 53 USPQ2d 1580, 1587 (Fed. Cir. 2000) (“Trade-offs often concern what is *feasible*, not what is, on balance, *desirable*. Motivation to combine requires the latter.” (emphasis added)).

A reference may be said to teach away when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant. The degree of teaching away will of course depend on the particular facts; in general, a reference will teach away if it suggests that the line of development flowing from the reference's

Appeal 2007-0118
Application 10/175,612

disclosure is unlikely to be productive of the result sought by the applicant.

In re Gurley, 27 F.3d 551, 552-53, 31 USPQ2d 1130, 1131 (Fed. Cir. 1994) (citations omitted).

ANALYSIS

The Examiner has failed to set forth a *prima facie* case of obviousness because he failed to explain how Henne teaches or suggests coupling a baseline trailing edge wedge to a wing, as required in independent claims 1, 2, 11, and 12, and a trailing edge wedge coupled to a wing structure, as required in independent claims 6 and 16. While we agree with the Examiner that Allen and Vijgen demonstrate that it was known at the time of the invention to provide spanwise modifications to trailing edges of wings to optimize the aerodynamic properties of an airfoil (Findings of Fact 9-16), we find that Henne fails to teach or suggest coupling a trailing edge wedge to a wing and, in fact, Henne teaches away from such a coupling (Finding of Fact 6). We also find no motivation in the prior art to modify the airfoil design of Henne by coupling a trailing edge wedge to Henne's airfoil (Finding of Fact 8).

REMAND

With regard to claims 1-20, we note that U.S. Patent No. 4,542,868 to Boyd ("Boyd") discloses a wedge-shaped flap (20) for attachment to or near the trailing edge (14) of an airfoil (10) to improve the coefficient of lift and reduce the coefficient of drag providing an overall increase in fuel economy at cruise

Appeal 2007-0118
Application 10/175,612

conditions (Boyd, Abstract). We further note that Boyd teaches preferred measurements for the wedge (20) height (26), included angle (30), and distance (24) the wedge is attached from the trailing edge (14). *See id.*

This application is remanded, pursuant to 37 C.F.R. § 41.50(a)(1), for the Examiner to consider whether claims 1-20 should be rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 4,542,868 to Boyd in view of Allen or Vijgen. In other words, in response to the remand, the Examiner should consider whether there is motivation to combine the teachings of Boyd with Allen or Vijgen and whether such a combination would have led one having ordinary skill in the art at the time of the invention to tailor a spanwise variation of the baseline trailing edge wedge as claimed.

CONCLUSIONS OF LAW

We conclude that the Appellants have shown that the Examiner erred in rejecting claims 1-20 under 35 U.S.C. § 103(a) as unpatentable over Henne in view of Allen or Vijgen.

DECISION

The decision of the Examiner to reject claims 1-20 under 35 U.S.C. § 103(a) is reversed and the application is remanded for the reason provided *supra*.

Appeal 2007-0118
Application 10/175,612

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) (2006).

REVERSED and REMANDED

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