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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte ROBERT A. RESS, JR., JAMES MORTON, and DAN MOLNAR

Appeal 2015-004001
Application 12/978,843
Technology Center 3700

Before JENNIFER D. BAHR, LINDA E. HORNER, and
BRANDON J. WARNER, *Administrative Patent Judges*.

WARNER, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF THE CASE

Robert A. Ress, Jr. et al. ("Appellants")[1] appeal under 35 U.S.C. § 134(a) from the Examiner's decision rejecting claims 1, 2, 4–17, and 19–22, which are all the pending claims. *See* Appeal Br. 4–8. We have jurisdiction over the appeal under 35 U.S.C. § 6(b).

We AFFIRM.

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[1] According to Appellants, the real party in interest is Rolls-Royce North American Technologies, Inc. Appeal Br. 2.

CLAIMED SUBJECT MATTER

Appellants' disclosed invention relates to "gas turbine engines with variable camber vane systems." Spec. 2.[2] Claims 1, 10, and 16 are independent. Claim 1, reproduced below, is illustrative of the subject matter on appeal.

> 1. A variable camber vane system for a gas turbine engine, comprising:
>
> a first airfoil portion having a first tip portion, a first root portion, a face extending at least partially between the first tip portion and the first root portion, and a groove in the face extending at least partially between the first tip portion and the first root portion, wherein the groove has a groove width;
>
> a second airfoil portion arranged to rotate to a plurality of pivot positions with respect to the first airfoil portion about a pivot axis, wherein the second airfoil portion includes a second tip portion; a second root portion; and a crown extending at least partially between the second tip portion and the second root portion, wherein the crown includes a crown radius centered about the pivot axis and positioned opposite the groove; and
>
> a seal strip having a seal width greater than the groove width and a preformed concave rubbing surface such that prior to installation the rubbing surface includes a radius complementary to and opposite the crown radius, wherein the seal strip is at least partially disposed in the groove with an interference fit; and wherein the seal strip is arranged to seal against fluid flow between the first airfoil portion and the second airfoil portion in any of the plurality of pivot positions.

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[2] We note that Appellants' Specification does not provide line or paragraph numbering; accordingly, reference herein is made only to page numbers.

EVIDENCE

The Examiner relied on the following evidence in rejecting the claims on appeal:

Amos	US 3,990,810	Nov. 9, 1976
Horvath	US 6,045,325	Apr. 4, 2000
Sobel	US 6,099,281	Aug. 8, 2000
Wood	US 2007/0119150 A1	May 31, 2007
Campbell	US 7,316,539 B2	Jan. 8, 2008

REJECTIONS

The following rejections are before us for review:

I. Claims 1, 4–7, 10, 11, 15, 16, and 19–22 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Amos and Campbell. Final Act. 4–9.

II. Claims 2, 12, 13, and 17 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Amos, Campbell, and Sobel. *Id.* at 9–10.

III. Claims 8 and 14 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Amos, Campbell, and Horvath. *Id.* at 10–11.

IV. Claim 9 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Amos, Campbell, and Wood. *Id.* at 11–12.

ANALYSIS

Rejection I – Claims 1, 4–7, 10, 11, 15, 16, and 19–22 as unpatentable over Amos and Campbell

Appellants argue against the rejection of claims 1, 4–7, 10, 11, 15, 16, and 19–22 as a group. *See* Appeal Br. 5–8. We select independent claim 1 as representative of the issues that Appellants present in the appeal of this rejection, with claims 4–7, 10, 11, 15, 16, and 19–22 standing or falling therewith. *See* 37 C.F.R. § 41.37(c)(1)(iv).

The Examiner found that Amos discloses a variable camber vane system for a gas turbine engine, substantially as claimed, including

> a seal strip (Amos, 50) having a seal width greater than the groove width (Amos, Fig. 4) and a rubbing surface (Amos, 50a) opposite the crown radius, wherein the seal strip (Amos, 50) is at least partially disposed in the groove with an interference fit (Amos, Fig. 4); and wherein the seal strip is arranged to seal against fluid flow between the first airfoil portion and the second airfoil portion in any of the plurality of pivot positions (Amos, col 3 ln. 34-42).

Final Act. 4–5. Next, the Examiner acknowledged that "Amos does not teach that the rubbing surface is a preformed concave shape with a radius complementary to the crown radius." *Id.* at 5. However, the Examiner found that "Campbell teaches a vane assembly wherein the vane has two distinct segments (Campbell, 12 and 14) joined together by a seal (Campbell, 50) having a preformed concave shape." *Id.* (citing Campbell, Figs. 2A–B).[3] The Examiner concluded that, given the teachings of the prior

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[3] The Examiner also cited to Horvath and Sobel (*see* Final Act. 5), which we understand to provide additional evidence as to knowledge of complementary concave seals being within the level of understanding of one of ordinary skill in the art at the time of the invention.

art, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the rubbing surface of Amos's seal to have "a preformed concave shape with a radius complementary to the crown radius . . . in order to mate with the convex crown of a vane segment and fully seal against the penetration of hot combustion gases penetrating the gap between the pressure and suction sides of the vane." *Id.* (citing Campbell, col. 7, ll. 38–48).

Appellants argue that Campbell does not disclose or suggest

> a second airfoil portion being pivoted relative to a first airfoil portion, let alone a seal having a concave rubbing surface with a radius substantially identical to and opposite the crown radius, wherein the seal strip is arranged to seal against fluid flow between the first airfoil portion and the second airfoil portion in any of the plurality of pivot positions.

Appeal Br. 6. In particular, Appellants assert that "insert (50) of Campbell is explicitly configured to permit internal fluid flow between . . . forward and aft segments (12, 14) at certain radial cross section locations as shown in Figs. 2A and 2B." *Id.* This argument is not persuasive because it is not responsive to the rejection as presented. Namely, the Examiner did not rely on Campbell for teaching a pivoting second airfoil portion or a seal strip that seals fluid flow between airfoil portions. *See* Final Act. 4–5. Instead, as the Examiner explains, "Campbell is merely used to teach that the shape of a seal between two segments of an airfoil may have a preformed concave shape." Ans. 11. We additionally note that Appellants do not contest the Examiner's finding that Campbell discloses a preformed concave-shaped seal. *See id.* at 5; Appeal Br. *passim*.

Appellants assert that Campbell's "insert (50) is not configured to permit rotation between . . . forward and aft segments (12, 14) and therefore

would clearly not be operable with Amos." Appeal Br. 6. We are not persuaded by Appellants' argument because this assertion is merely speculative, and it appears to rely on bodily incorporation of specific structural details of Campbell (i.e., the entirety of insert 50) into Amos, which is neither the standard for an obviousness determination, nor is it an accurate characterization of the rejection presented. *See In re Keller*, 642 F.2d 413, 425 (CCPA 1981).

Moreover, Appellants do not explain how combining the teachings of Amos and Campbell in an operable manner would be beyond the level of ordinary skill in the art. *See KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 417 (2007). As the Examiner explains, the rejection proposed modifying "[t]he seal of Amos . . . according to Campbell to have a concave shaped seal that perfectly mates with the convex crown of an airfoil portion in order to fully seal against the penetration of hot combustion gases between the pressure and suction sides of the vane." Ans. 11. Appellants do not offer any factual evidence or persuasive technical reasoning to explain why modifying Amos's seal to have a preformed concave shape would prevent rotation of the second airfoil portion or render Amos's system inoperable.

Appellants also argue that Campbell is non-analogous art. *See* Appeal Br. 6–7. In particular, Appellants assert that "Campbell is not in the field of variable camber vanes," and "the teachings of Campbell are not reasonably pertinent to the problems faced by the inventor of the present application." *Id.* at 7. We are not persuaded by Appellants' argument. The proper two-prong test to define the scope of analogous prior art is (1) "whether the art is from the same field of endeavor, regardless of the problem addressed," and (2) even "if the reference is not within the field of the inventor's endeavor,

whether the reference still is reasonably pertinent to the particular problem with which the inventor is involved." *In re Klein*, 647 F.3d 1343, 1348 (Fed. Cir. 2011) (internal citation omitted).

In this regard, Campbell is analogous art at least because the reference is in the field of Appellants' endeavor of gas turbine engines. In particular, Campbell "relates in general to turbine engines and, more particularly, to turbine vanes." Campbell, col. 1, ll. 6–7. Appellants' Specification describes that "[t]he present invention relates to gas turbine engines, and more particularly, to gas turbine engines with variable camber vane systems." Spec. 2. Additionally, claim 1 calls for "[a] variable camber vane system for a gas turbine engine," and independent claims 10 and 16 each call for "[a] gas turbine engine." Appeal Br. 9, 11, 12, Claims App. Appellants' contention that the field of endeavor should be restricted to "variable camber vanes" (*see id.* at 7) is too narrow a field of endeavor in light of Appellants' full disclosure.

After careful consideration of all the evidence, Appellants' arguments do not apprise us of error in the Examiner's findings or reasoning in support of the conclusion of obviousness. Accordingly, we sustain the rejection of claim 1, and of claims 4–7, 10, 11, 15, 16, and 19–22 falling therewith, under 35 U.S.C. § 103(a) as being unpatentable over Amos and Campbell.

Rejections II–IV – Claims 2, 8, 9, 12–14, and 17 as unpatentable over Amos, Campbell, and one of Sobel, Horvath, and Wood

With respect to the rejections of claims 2, 8, 9, 12–14, and 17, Appellants do not set forth any additional substantive arguments separate from the arguments discussed *supra*; instead, relying on dependency from

independent claims 1, 10, and 16. *See* Appeal Br. 7–8. Thus, for the same reasons that Appellants' arguments do not apprise us of error in Rejection I, Appellants also do not apprise us of error in Rejections II–IV. We likewise sustain the rejections of claims 2, 8, 9, 12–14, and 17 under 35 U.S.C. § 103(a) as being unpatentable over Amos, Campbell, and one of Sobel, Horvath, and Wood.

DECISION

We AFFIRM the Examiner's decision rejecting claims 1, 4–7, 10, 11, 15, 16, and 19–22 under 35 U.S.C. § 103(a) as being unpatentable over Amos and Campbell.

We AFFIRM the Examiner's decision rejecting claims 2, 12, 13, and 17 under 35 U.S.C. § 103(a) as being unpatentable over Amos, Campbell, and Sobel.

We AFFIRM the Examiner's decision rejecting claims 8 and 14 under 35 U.S.C. § 103(a) as being unpatentable over Amos, Campbell, and Horvath.

We AFFIRM the Examiner's decision rejecting claim 9 under 35 U.S.C. § 103(a) as being unpatentable over Amos, Campbell, and Wood.

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