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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/037,917	07/17/2018	Ryan B. Noraas	79732US02 (U420894USC)	6358
135291	7590	10/07/2020	EXAMINER	
Cantor Colburn LLP - Pratt & Whitney 20 Church Street 22 Floor Hartford, CT 06103			HA, STEVEN S	
			ART UNIT	PAPER NUMBER
			1735	
			NOTIFICATION DATE	DELIVERY MODE
			10/07/2020	ELECTRONIC

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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte RYAN B. NORAAS and STEVEN J. BULLIED

Appeal 2020-000113
Application 16/037,917
Technology Center 1700

Before JEFFREY T. SMITH, BRIAN D. RANGE, and
JANE E. INGLESE, *Administrative Patent Judges*.

RANGE, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF THE CASE

Pursuant to 35 U.S.C. § 134(a), Appellant¹ appeals from the Examiner's decision to reject claims 1–16. We have jurisdiction under 35 U.S.C. § 6(b).

We AFFIRM.

¹ We use the word “Appellant” to refer to “applicant” as defined in 37 C.F.R. § 1.42. Appellant identifies the real party in interest as United Technologies Corporation. Appeal Br. 2. In an April 22, 2020, filing, Appellant indicates that the real party in interest is now Raytheon Technologies Corporation.

CLAIMED SUBJECT MATTER²

Appellant describes the invention as relating to open-cell reticulated foam for use in creation of gas turbine engine fan blades. Spec. ¶ 2.

Appellant explains that engine designers have reduced fan blade weight “by employing an open-cell reticulated metal foam core enveloped by an outer shell of a resilient second material that forms the airfoil.” *Id.* ¶ 3–4.

Appellant states that metal foams created with high void fraction open-cell reticulated foams “lack the strength and mechanical properties necessary for use in a fan blade.” *Id.* ¶ 5. Appellant thus states that a need exists for modified, open-cell reticulated foams that can be used as a precursor to manufacture open-cell reticulated metal foams. *Id.* Claims 1 and 7 are the only independent claims on appeal, and we reproduce those claims below and add emphases to certain key recitations:

1. A foam for forming a gas turbine engine fan blade using a lost-foam casting process, **the foam having a void fraction less than or equal to ninety five percent**, comprising:

a first layer, **the first layer comprising a polymer foam having an open-cell structure and a void fraction greater than ninety five percent**;

a second layer, the second layer comprising an adhesive adhered to the first layer; and

a third layer, the third layer comprising a particulate material, the third layer adhered to the second layer.

² In this Decision, we refer to the Final Office Action dated September 21, 2018 (“Final Act.”), the Appeal Brief filed February 21, 2019 (“Appeal Br.”), the Examiner’s Answer dated July 29, 2019 (“Ans.”), and the Reply Brief filed September 30, 2019 (“Reply Br.”).

7. A method of manufacturing foam for forming a gas turbine engine fan blade using a lost-foam casting process, **the foam having a void fraction less than or equal to ninety five percent**, comprising:
providing a polymer foam having an open-cell structure and a void fraction greater than ninety five percent;
coating the polymer foam with an adhesive; and
applying a particulate material to the adhesive.

Appeal Br. 14–15 (Claims App.) (emphases added).

REFERENCES

The Examiner relies upon the prior art below in rejecting the claims on appeal:

Name	Reference	Date
Kamigata et al. ("Kamigata")	US 5,881,353	Mar. 9, 1999
Rabiei	US 2012/0196147 A1	Aug. 2, 2012

REJECTIONS

The Examiner maintains (Ans. 3) the following rejections on appeal:

- A. Claims 1–3, 7–9, and 13–16 under 35 U.S.C. § 103 as obvious over Kamigata in view of applicant’s admitted prior art (“AAPA”). Final Act. 3.
- B. Claims 4–6 and 10–12 under 35 U.S.C. § 103 as obvious over Kamigata in view of applicant’s admitted prior art (“AAPA”) and Rabiei. *Id.* at 7–8.

OPINION

We review the appealed rejections for error based upon the issues identified by Appellant and in light of the arguments and evidence produced

thereon. *Ex parte Frye*, 94 USPQ2d 1072, 1075 (BPAI 2010) (precedential), cited with approval in *In re Jung*, 637 F.3d 1356, 1365 (Fed. Cir. 2011) (“[I]t has long been the Board’s practice to require an applicant to identify the alleged error in the examiner’s rejections.”). After considering the evidence presented in this Appeal and each of Appellant’s arguments, we are not persuaded that Appellant identifies reversible error. Thus, we affirm the Examiner’s rejections for the reasons expressed in the Final Office Action and the Answer. We add the following primarily for emphasis.

Appellant presents a substantively identical argument for claims 1 and 7 and does not present distinct arguments for any dependent claims. *See* Appeal Br. 6–12. Therefore, consistent with the provisions of 37 C.F.R. § 41.37(c)(1)(iv) (2013), we limit our discussion to claims 1 and 7, and all other claims on appeal stand or fall together with the claim from which it depends.

The Examiner finds that Kamigata teaches a foam having most of the structure of claim 1 and meeting most method steps of claim 7. Final Act. 3 (citing Kamigata). The Examiner finds that Kamigata is silent with regard to polymer foam having a void fraction greater than ninety five percent. *Id.* The Examiner finds that the AAPA teaches that open-cell foam used to manufacture metal foam commonly has about ninety seven percent void fraction. *Id.* at 3–4 (citing Spec. ¶ 5). The Examiner determines that it would have been obvious to modify Kamigata to provide a foam having void fraction greater than ninety five percent as taught by the AAPA “because it is common to utilize a foam wherein the void fraction is about ninety seven percent.” *Id.*

Appellant argues that Kamigata does not teach the void fraction recitations by claims 1 and 7. Appeal Br. 6–10; Reply Br. 2–5. In particular, Appellant argues that in Kamigata the foam layer is removed and that Kamigata, thus, does not teach a polymer foam void fraction. *Id.* at 6–7, 9–10. Reply Br. 2–3.

Appellant’s argument is unpersuasive. To the extent Appellant argues that Kamigata alone does not teach the claims’ recited void fractions, the argument is unpersuasive because the Examiner relies on the combined teachings of Kamigata and the AAPA to reach these recitations. Ans. 4. One cannot show nonobviousness by attacking references individually when the rejection is based on a combination of references. *In re Keller*, 642 F.2d 413, 425 (CCPA 1981).

Moreover, the Examiner’s finding that Kamigata teaches various polymer foam void fractions is supported by the preponderance of the evidence. Final Act. 3. Below, we reproduce the relevant portion of Kamigata’s description of its example 9 to illustrate:

As the result, the nickel powder was sintered, and a blocklike nickel porous body was obtained, having such a form that the pattern of polyurethane foam was transferred. The porous body obtained had a size of 80 mmx80 mmx50 mm, and a porosity of 95%.

Kamigata 8:20–24. Based on this passage, Appellant is correct Kamigata’s reference to porosity only *directly* refers to porosity of the “metal porous body obtained.” Kamigata is also clear, however, that the form of the polyurethane foam “was transferred” to the metal porous body obtained. *Id.* Thus, a person of skill in the art would have understood that the polyurethane foam also had a porosity of 95% (before being decomposed and before its form transfers to the metal). *See also, e.g., id.* at 8:54–58

(providing a similar passage establishing porosity of 93% for example 11 polyurethane foam).

Appellant also argues that a person of skill in the art would not have modified Kamigata with the AAPA because the Specification states that “ligaments and nodes of metal foams created with the use of such high void fraction open-cell reticulated foams [i.e., 97%] lack the strength and mechanical properties necessary for use in a fan blade.” Appeal Br. 7–8 (quoting Spec. ¶ 5). Appellant’s argument is unpersuasive because the Specification also states that the data regarding strength and mechanical properties is “not necessarily conclusive.” Spec. ¶ 5; *see also* Ans. 5. Even more importantly, the Specification admits that, “[t]he void fraction of the open-cell reticulated foam utilized to manufacture such metal foam [for fan blades] is commonly about ninety seven percent.” Spec. ¶ 5. Even if use of ninety seven percent void fraction might have strength or mechanical problems, this does not diminish the obviousness of using ninety seven percent when this percentage is “commonly” used. *Id.*; *see also* Ans. 5.

Moreover, Appellant admits that use of foam cores were known to have the advantage of decreasing fuel consumption. Spec. ¶ 3. A person of skill in the art would have recognized the trade-off between, for example, decreasing weight and increasing strength. The existence of trade-offs does not obviate motivation to combine. *Medichem, S.A. v. Rolabo, S.L.*, 437 F.3d 1157, 1165 (Fed. Cir. 2006) (“a given course of action often has simultaneous advantages and disadvantages, and this does not necessarily obviate motivation to combine”).

Because Appellant’s arguments do not establish error, we sustain the Examiner’s rejections.

DECISION SUMMARY

In summary:

Claims Rejected	35 U.S.C. §	Reference(s)/Basis	Affirmed	Reversed
1-3, 7-9, 13-16	103	Kamigata, AAPA	1-3, 7-9, 13-16	
4-6, 10-12	103	Kamigata, AAPA, Rabiei	4-6, 10-12	
Overall Outcome			1-16	

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