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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte KARIN ANGELA HING and WILLIAM BONFIELD

Appeal 2012-000548
Application 12/216,710
Technology Center 1700

Before RICHARD E. SCHAFER, BEVERLY A. FRANKLIN, and
LINDA M. GAUDETTE, *Administrative Patent Judges*.

GAUDETTE, *Administrative Patent Judge*.

DECISION ON APPEAL

Appellants appeal under 35 U.S.C. § 134(a) from the Examiner's decision[1] finally rejecting claims 1-22, 24, 26, 33-39, and 41.[2] We have jurisdiction under 35 U.S.C. § 6(b).

We AFFIRM.

The invention is directed to "a method for the manufacture of porous materials with highly interconnected porosity, which are suitable for use in

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[1] Final Office Action mailed Jan. 6, 2011 ("Final")
[2] Appeal Brief filed Jun. 6, 2011 ("App. Br.")

medical applications." (Spec. 3:24-27.) Claims 1 and 5 are representative of the invention and are reproduced below from the Claims Appendix to the Appeal Brief:

1. A method of producing a macroporous sintered ceramic foam synthetic biomedical bone material, which method comprises:

(a) forming a ceramic slip comprising a substantially homogeneous mixture of a ceramic particular, an organic binder in a liquid carrier, and optionally one or more surfactants, wherein at least one surfactant is present if the organic binder does not function as a surfactant

(b) foaming the ceramic slip using a ball mill;

(c) heating the formed ceramic slip at a temperature sufficient to substantially burn out the organic binder; and

(d) sintering the foamed ceramic flip following burn out of the organic binder thereby forming said macroporous sintered ceramic foam synthetic biomedical bone material, wherein said bone material has an open foam structure containing pores with a modal diameter d_{mode} of from 100 µm to 1000 µm and a bulk porosity of from 40 to 95%.

5. A method as claimed in claim 1, wherein the ceramic slip has a viscosity in the range of from 30 to 100 mPas.

(Ans.[3])

The Examiner relies on the following references in rejecting the claims:

Kim et al. (Kim)	5,043,118	Aug. 27, 1991
Rogers et al. (Rogers)	5,656,217	Aug. 12, 1997
Möltgen et al. (Möltgen)	5,665,127	Sep. 9, 1997
Oishi et al. (Oishi)	5,895,897	Apr. 20, 1999

The Examiner maintains the following grounds of rejection under 35 U.S.C. §103(a): (1) claims 1, 4-7, 10-20, 22, 35-38, and 41 as unpatentable over Oishi; (2) claims 2, 3, and 33 as unpatentable over Oishi in view of Wu; (3) claims 24, 26, and 39 as unpatentable over Oishi in view of Rogers; (4) claim 21 as unpatentable

[3] Examiner's Answer mailed Aug. 4, 2011.

over Oishi in view of Kim; and (5) claims 8, 9, and 34 as unpatentable over Oishi in view of Möltgen. (*See* Ans. 4-11.)

Oishi discloses a "lightweight ceramic acoustic absorber . . . suitable particularly for an acoustic absorber for a jet engine, but . . . [which] can also be applied, for example, to building materials, electronic devices, mechanical components, etc." (Oishi col. 7, ll. 55-60.) Oishi's absorber "consists of a foamed ceramic 21 and a dense layer 22 and the dense layer 22 contains ceramic fibers and is reinforced by the fibers." (*Id.* at col. 10, ll. 23-25.) The foamed ceramic

> is a perforated body with a void ratio in the range of 80 to 92%, and there are voids with a mean diameter in the range of 50 to 450 µm near the surface in contact with the dense layer 12, and as they get closer to the rear surface, the diameters of the voids become larger, and in the proximity of the rear surface, the mean diameter of the voids becomes 500 to 3,400 µm, so the diameters of the voids gradually increase from the front to rear surfaces.

(*Id.* at ll. 26-33.) The Examiner finds "Oishi discloses that the mean [diameter of the voids] changes, depending on the depth in the ceramic (col. 10, lines 26-39). Thus one would infer that the ceramic would have any mean one chooses between 160 and 3200 micron — at the appropriate depth." (Ans. 6.) The "Examiner [] notes that a normal distribution (i.e. bell curve) has its mode and mean diameters equal," finding "it would be reasonable to expect that Oishi's mode is not much different from the mean." (*Id.*)

To manufacture Oishi's foamed ceramic,

> [a] foamed slurry is produced by mixing a solution that contains ceramic powder, a dispersant, an organic binder and a foaming agent in water, and ceramic fibers are placed at the location of the dense layer in the molding dies. The slurry is poured into the molding dies, and the increase in bubble diameters caused by coalescence of the bubbles is controlled by the rates at which the slurry is dewatered and dried.

(Oishi col. 10, ll. 60-67; *see also*, col. 12, ll. 14-23, cited in Ans. 14.)

According to Oishi,

> [w]hen producing the slurry, the preferred amount of water to be added is normally in the range of 25 to 50 parts by weight for every 100 parts by weight of the ceramic powder raw material. If the amount is less than 25 parts by weight, the slurry is difficult to work with, and if the amount exceeds 50 weight parts, the moisture content is excessive, and the slurry takes a long time to solidify after casting, which is not desirable.

(Oishi col. 7, ll. 6-13.) Based on this disclosure, along with Oishi's teaching of using thickeners to provide strong and stabilized voids (*id.* at ll. 30-36), the Examiner concludes "it would have been obvious to optimize the thickener and water to make a strong a stable foam," which the Examiner views as "equivalent to controlling the viscosity to produce a stable foam." (Ans. 16.)[4]

Oishi discloses removing the absorber from the dies and heating at 600 ºC in air for 5 hours and baking at 1650 ºC in air for 1 hour. (*Id.* at col. 8, ll. 22-24.) The Examiner finds Oishi's baking step would inherently cause sintering. (Ans. 5.) Appellants disagree with the Examiner's finding that the material formed by Oishi's method is capable of functioning as a "synthetic biomedical bone material," arguing Oishi's "dense surface layer would mitigate against the required boney ingrowth as well as secure fixation for bone replacement and in fact, teaches away from the method of the claims on appeal" (App. Br. 9).

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[4]Appellants have not shown this finding to be erroneous (*see* App. Br. 14 ("[O]ne of ordinary skill in the art, from the teachings of the reference would understand that the rate of dewatering is the result effective variable and not the viscosity of the slurry, especially when the teachings of the reference as a whole is considered.")). *See In re Applied Materials, Inc.* 692 F.3d 1289, 1297 (Fed. Cir. 2012) ("[T]he prior art need not provide the exact method of optimization for the variable to be result-effective. A recognition in the prior art that a property is affected by the variable is sufficient to find the variable result-effective.").

"[T]erms [that] merely set forth the intended use for, or a property inherent in, an otherwise old composition . . . do not differentiate the claimed composition from those known in the prior art." *In re Pearson*, 494 F.2d 1399, 1403 (CCPA 1974). *See also*, *American Medical Systems, Inc. v Biolitec, Inc.* (Fed Cir, 2009-1323, 9/13/2010) (quoting *IMS Tech., Inc. v. Haas Automation, Inc.*, 206 F.3d 1422, 1434-35 (Fed. Cir. 2000) ("[T]he preamble has no separate limiting effect if, for example, "the preamble merely gives a descriptive name to the set of limitations in the body of the claim that completely set forth the invention.")); *In re Spada*, 911 F.2d 705, 708 (Fed. Cir. 1990) ("The discovery of a new property or use of a previously known composition, even when that property and use are unobvious from the prior art, can not impart patentability to claims to the known composition.").

Appellants have not directed us to evidence in support of their argument, or explained with any degree of specificity how a foamed ceramic produced by Oishi's method differs from the material produced by the claimed method such that Oishi's foamed ceramic would not be expected to function as a synthetic biomedical bone material. (*See* Ans. 11-13 ("Oishi does substantially the same thing that applicant does with alumina (*see* present Specification, page 5, line 20) to make a porous sintered ceramic, so it is a matter of common sense that if one could be use[d] as a synthetic bone material, then so could the other.").)

Appellants argue "the clear teaching of [Oishi] is to require a distribution of voids with diameters which does not suggest the method of the claims on appeal which include the specified modal diameter." (Reply Br.[5] 6.) Appellants argue, more specifically, "the d_{mode} specified in claim 1 refers to the entire material" and that the Examiner is improperly relying on the part of Oishi's absorber near the

[5] Reply Brief filed Oct. 4, 2011.

front surface for a disclosure of pores having a d_{mode} of from 100 µm to 1000 µm as recited in claim 1. (Reply Br. 3.) Appellants direct us to pages 12 and 21 of the Specification in support of their contention that the broadest reasonable interpretation of the claims requires "[t]he [m]odal diameter set forth is with respect to the entire material." (Reply Br. 6-7.)

We agree with the Examiner (*see* Ans. 15) that the broadest reasonable interpretation of claim 1 encompasses a modal diameter determined at a particular depth. Claim 1 recites "wherein said bone material has an open foam structure containing pores with a modal diameter d_{mode} of from 100 µm to 1000 µm," and does not expressly limit the "open foam structure" to the entire bone material. We have considered the Specification in its entirety, and Appellants' discussion of pages 12 and 21 (*see* Reply Br. 6-7), but agree with the Examiner's statement: "[t]here is nothing in the present specification that applicant intended the claim to be limited to materials with a mode throughout the entire ceramic." (Ans. 15.)

Appellants argue Oishi does not disclose forming a homogeneous mixture because Oishi requires the presence of silicon carbide fibers. (App. Br. 10.) This argument is not persuasive because it is not directed to limitations found in the claims. As pointed out by the Examiner (*see* Ans. 14), Oishi forms a mixture containing the same components recited in claim 1 step (a), forms the mixture as recited in step (b), and then adds the mixture to fibers in a mold. Appellants have not directed us to, nor do we find, any disclosure in the Specification which supports an interpretation of claim 1 as precluding an additional step of adding a homogeneous mixture to a mold containing fibers. Nor do we find any support for Appellants' proposed interpretation of claim 1 as requiring formation of a homogeneous product, or product which does not contain fibers. (*See* App. Br. 10; Ans. 13; *cf.* Spec. 8:22-34 ("There are a number of advantages associated with ball

milling foam-stabilised slips, including: . . . Homogeneous *or functionally graduated* pore distributions are attainable.") (emphasis added)).)[6]

Appellants dispute the Examiner's finding that sintering inherently occurs in Oishi's method, contending "sintering would depend on the melting point of the materials to be sintered and a higher temperature would not inherently cause sintering but instead melting." (App. Br. 11.) The Examiner has provided a reasonable basis for finding sintering would occur. (*See* Ans. 14 ("One of ordinary skill would understand that [melting is] impossible, for if it were to melt, then the pores would collapse. And yet Oishi has very high void ratios (table 1).") .) Appellants have not met their burden to provide persuasive argument or evidence to refute this finding. *See In re Crish*, 393 F.3d 1253, 1259 (Fed. Cir. 2004) (quoting *In re Spada*, 911 F.2d 705, 708 n.3 (Fed. Cir. 1990) ("[W]hen the prior art evidence reasonably allows the PTO to conclude that a claimed feature is present in the prior art, the evidence 'compels such a conclusion if the applicant produces no evidence or argument to rebut it.'")).

Appellants dispute the Examiner's determination that it would have been obvious to optimize the viscosity of Oishi's ceramic slip to the range recited in claims 5 and 41, directing us to Specification page 5, lines 6-8, which read: "It has

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[6] We additionally note Appellants have not clearly explained why a slurry containing silicon carbide fibers would not meet the claim 1 requirement of "a substantially homogeneous mixture." The Specification does not provide a definition for "homogeneous mixture." (*See generally*, Spec.) According to Hawley's Condensed Chemical Dictionary (14th Edition, Copyright ©2002 by John Wiley & Sons, Inc.), "Homogeneity is a characteristic property of compounds and elements (collectively called substances) as opposed to mixtures. The term is often loosely used to describe a mixture or solution composed of two or more compounds or elements that are uniformly dispersed in each other. . . . [N]o solution or mixture can be homogeneous; the situation is more accurately described by the phrase 'uniformly dispersed.'"

been found that the viscosity of the slip is important for producing a stable foam, prior to burning out the binder." (App. Br. 15.) Appellants' argument is unpersuasive because the relied-upon statement in the Specification, alone, does not provide the requisite evidence of criticality in the claimed range. *See In re Peterson*, 315 F.3d 1325, 1330 (Fed. Cir. 2003).

We acknowledge, and have considered Appellants' traversal of the rejections based on Oishi in view of Wu, Rogers, Kim, or Möltgen (App. Br. 14-19). Appellants' arguments have been fully addressed by the Examiner in the Answer and are unpersuasive for the reasons stated therein. (*See* Ans. 16-17.) Likewise, we find the Examiner has fully addressed any arguments directed to limitations in claim 1, and claims dependent therefrom, which have not been explicitly discussed herein, and explained why such arguments are unpersuasive. (*See generally*, Ans. 11-16.)

We find a preponderance of the evidence favors the Examiner's conclusion of obviousness. Accordingly, we affirm the Examiner's decision to reject claims 1-22, 24, 26, 33-39, and 41.

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).

AFFIRMED

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