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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte MARK R. STOUFFER[1]

Appeal 2018-008382
Application 14/387,601
Technology Center 1700

Before MARK NAGUMO, MONTÉ T. SQUIRE, and SHELDON M. MCGEE, *Administrative Patent Judges*.

NAGUMO, *Administrative Patent Judge*.

DECISION ON APPEAL

3M ("Stouffer") timely appeals under 35 U.S.C. § 134(a) from the Final Rejection[2] of all pending claims 1–8 and 18–20. We have jurisdiction. 35 U.S.C. § 6. We reverse.

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[1] The applicant under 37 C.F.R. § 1.46 (Application Data Sheet, filed 24 September 2014), and hence the appellant under 35 U.S.C. § 134, is the real party in interest, identified as 3M Innovative Properties Company ("3M") (Appeal Brief, filed 4 May 2018 ("Br."), 1).

[2] Office Action mailed 18 January 2018 ("Final Rejection"; cited as "FR").

OPINION

A. Introduction[3]

The subject matter on appeal relates to liquid filtration systems comprising a powdered ion exchange resin immobilized by a polymeric binder. In a preferred embodiment described by the ′601 Specification, pulverized[4] particles of ion exchange resins are contacted with a polymeric binder comprising ultrahigh molecular weight polyethylene ("UHMWPE"). (*Id.* at 3 [0013].) The mixture is heated to form a heat-treated matrix, and the heat-treated matrix is compressed to form a radial flow (*id.* at [0018]) filtration block, which is placed in a housing to form the filtration system (*id.* at [0013]). In a more preferred embodiment, the average particle size diameter of the pulverized ion exchange resin is about 50 to about 250 μm. (*Id.* at 2 [0008].) Preferably, the UHMWPE binder is in the form of particles having "an irregular, convoluted surface" (*id.* at 6 [0032][5]), and an average particle size in the range of 10 to 120 μm. (*Id.* at 6 [0033].) The Specification suggests that "compression aids in forming point-to-point bonds between the pulverized resin and binder particles." (*Id.* at 4 [0020].)

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[3] Application 14/387,601, *Composite ion exchange media for liquid filtration systems,* filed 24 September 2014 as the national stage under 35 U.S.C. § 371 of PCT/US2013/029502, filed 7 March 2013, claiming the benefit of 61/620,618, filed 5 April 2012. We refer to the "′601 Specification," which we cite as "Spec."

[4] The Specification states that "[r]eference to 'pulverized' or 'pulverized form' means that a resin bead has been mechanically ground to a size and shape smaller than its original." (Spec. 5 [0023].)

[5] The Specification reports that such particles are described by Hughes et al., U.S. Patent No. 7,112,272 (*see* n.11, *infra*, for a complete citation).

According to the Specification, with radial flow of water through the block filter, the kinetics of calcium and magnesium reduction can be increased significantly, with significantly less pressure drop, and higher equilibrium concentration capacity for hardness reduction, as compared to conventional commercially available bead resins packed in a loose bed. (*Id.* at 3–4 [0018].) Such commercial ion exchange resin beads reportedly have an average diameter of 0.6–0.9 mm [600–900 μm]. (Spec. 1 [0004].) The Specification speculates that the smaller pulverized ion exchange particles provide "increase[d] access to ion exchange sites in the interior of particles." (*Id.* at 4 [0018].) Moreover, expected problems of increased pressure drop due to smaller ion exchange resin particles (*id.* at 2 [0005]) and swelling of those particles (*id.* at [0006]) are said to be avoided (*id.* at [0010]).

Sole independent claim 1 is representative and reads:

> A block comprising a filtration matrix comprising
>
> a polymeric binder that immobilizes a pulverized powder of an ion exchange resin;
>
> the polymeric binder and the pulverized powder of the ion exchange resin having point-to-point bonds in the block formed by a mold compression step of the filtration matrix;
>
> the polymeric binder present in an amount in the range of 10% to 40% by weight and
>
> the pulverized powder of the ion exchange resin present in an amount of 50% to 90% by weight;
>
> the pulverized powder of the ion exchange resin having an average particle size in the range of about 50 to about 250 micron;
>
> wherein the ion exchange resin comprises a cation exchange resin, an anion exchange resin, a chelating

exchange resin, a biologically-related ion exchange resin, or combinations thereof; and

wherein water passes radially through the block.

(Claims App., Br. 12; formatting added in conformity with 37 C.F.R. § 1.75(i) (2017) ("Where a claims sets for a plurality of elements or steps, each element or step of the claim should be separated by a line indentation.").)

The Examiner maintains the following grounds of rejection[6, 7]:

A. Claims 1–8 and 18–20 stand rejected under 35 U.S.C. § 112(2).

B. Claims 1, 4, 6–8, and 18 stand rejected under 35 U.S.C. § 103(a) in view of the combined teachings of Yao[8] and Iwamoto.[9]

B1. Claims 2, 3, and 19 stand rejected under 35 U.S.C. § 103(a) in view of the combined teachings of Yao, Iwamoto, and Stouffer '298.[10]

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[6] Examiner's Answer mailed 26 June 2018 ("Ans.").

[7] Because this application was filed before 16 March 2013, the effective date of the America Invents Act, we refer to the pre-AIA version of the statute.

[8] Li Yao et al., *Immobilized ion exchange materials and processes for making the same*, U.S. Patent Application Publication 2003/0062311 A1 (2003).

[9] Junjiro Iwamoto, *Apparatus for producing deionized water*, U.S. Patent No. 6,334,941 B1 (2002).

[10] Mark R. Stouffer and Eric C. Pemberton, *Filter medium and water filtration system including the same*, U.S. Patent Application Publication 2011/0042298 A1 (24 February 2011).

B2. Claim 5 stands rejected under 35 U.S.C. § 103(a) in view of the combined teachings of Yao, Iwamoto, and Hughes.[11]

B3. Claim 20 stands rejected under 35 U.S.C. § 103(a) in view of the combined teachings of Yao, Iwamoto, and Stouffer ′572.[12]

B. Discussion

The Board's findings of fact throughout this Opinion are supported by a preponderance of the evidence of record.

Rejection A: indefiniteness

The Examiner holds (FR 2) that claim 1 and all dependent claims are indefinite in the recitation, "the ion exchange resin comprises . . . a *biologically-related* ion exchange resin" (emphasis added), because "it is uncertain as to what scope of materials is implied by" that term. (Ans. 3.)

Stouffer responds that the term would have been recognized by persons having ordinary skill in the art, given the examples provided in the Specification, paragraph [0043], and as further evidenced by the consistent use of that term by Yao [*see* Yao at 3 [0041], col. 2, line 1, and lines 29–33 (identical to Spec. 8 [0043]) and lines 33–41 (tracked closely by the text of Spec. [0044] and [0045]).

Indefiniteness, as a subset of claim construction, is a question of law. The definiteness requirement of 35 U.S.C. § 112, second paragraph (now

[11] Douglass E. Hughes and Rich Buhler, *Liquid and gas porous plastic filter and methods of use*, U.S. Patent Application Publication 2004/0168972 A1 (2004) (issued as U.S. Patent No. 7,112,272 B2 on 26 September 2006).

[12] Mark R. Stouffer and Moses M. David, *Liquid filtration systems*, U.S. Patent Application Publication 2010/0243572 A1 (2010).

codified at 35 U.S.C. § 112(b)) requires that a claim "inform those skilled in the art about the scope of the invention with reasonable certainty. . . . while recognizing that absolute precision is unattainable." *Nautilus, Inc. v. Biosig Instruments, Inc.*, 572 US 898, 910 (2014). In the present case, particularly because the term "biologically-related ion exchange resin" appears to be a term of art known to practitioners, the Examiner must articulate why the meaning of that term would have been uncertain to the extent that a such a person would have been unable to determine whether a given ion exchange resin was or was not within the scope of the claim. For example, if a resin is a cationic, an anionic, or a chelating ion exchange resin, it is within the scope of the claim, even if it cannot be classified with certainty as a "biologically-related resin." Not having articulated such a circumstance, we hold that the term "biologically-related ion exchange resin," though broad, has not been shown to render the claim as a whole indefinite. *See, e.g.*, *In re Miller*, 441 F.2d 689, 693 (CCPA 1971) ("[b]readth of a claim is not to be equated with indefiniteness, as we have said many times.")

The rejection of claims 1–8 and 18–20 for indefiniteness on this basis is reversed.

Claims 7 and [8] read:

> The block of claim 1, wherein the filtration matrix is effective to provide
>
> an increased hardness reduction
>
> [lower pressure drop]
>
> as compared to a *comparative bed media* that comprises an ion exchange resin in bead form that is not immobilized by a binder.

(Claims App., Br. 13.)

The Examiner holds that the term "comparative bed media" renders claims 7 and 8 indefinite for the additional reason that "it is unclear as to what structure is implied." (FR 2, last para.)

Stouffer responds that the Examiner errs harmfully in not considering the entire claim, which requires that the comparative bed media comprise "an ion exchange resin in bead form that is not immobilized by a binder."

While the claims are broad—they do not, for example, specify the state of the polymer binder, or even require, at least expressly, that the polymer binder be in particulate form and be sintered with the pulverized ion exchange resin particles—breadth is not indefiniteness. *Miller*, 441 F.2d at 693. Again, the Examiner has not adequately explained why the claim as a whole is so uncertain that the routineer could not determine a "comparative bed media" to serve as a reference for a block according to claim 1. Nor has the Examiner articulated further issues that might give more weight to the present indefiniteness analysis.

Accordingly, we reverse the rejection of claims 7 and 8 for indefiniteness.

Rejections B, B1–B3: obviousness

The Examiner finds that "Yao et al[.] fail to specify the ion exchange as being a pulverized powder" (FR 4, ll. 2–3), but that "Iwamoto discloses making an analogous filtration matrix (see lines 29–31 and 47–51 of col. 4) using particles of an ion exchange resin that have been pulverized so as to have a particle size ranging from 50–2000 microns." (*Id.* at ll. 3–6.) The Examiner finds further that "particles at the lower end of the particle size ranges disclosed by Yao et al[.] and Iwamoto can be considered a powder"

(*Id.* at ll. 6–8, citing Yao [0048] and Iwamoto, col. 3, ll. 51–55.) The Examiner concludes that "[i]t would have been obvious to have substituted a pulverized powder of an ion exchange resin as disclosed by Iwamoto for the powder of an ion exchange resin as employed by Yao et al in order to provide *the predictable result of providing a powdered ion exchange resin as taught by Iwamoto*." (FR 4, ll. 8–11 (emphasis added).)

Review of the passages in Iwamoto cited by the Examiner indicates that the Examiner has not directed our attention to probative evidence supporting teachings by Iwamoto of pulverizing ion exchange resins. Rather, those passages at best appear to teach small particles, e.g., 50–300 μm, that might be considered powders. Nonetheless, Stouffer points out, with commendable candor, that Iwamoto mentions that ion exchange particles, if not synthesized so as to have an average particle size in the above mentioned range [50–2000 μm, or, more preferably, from 300 to 1000 μm], may be pulverized to provide the desired particle size. (Br. 6, last para., citing Iwamoto col. 3, ll. 65–67.) However, as Stouffer emphasizes (*id.*), Iwamoto teaches that of all the various forms the ion exchange particles may take, "a spherical shape is particularly preferable since it provides an excellent water permeability" (Iwamoto col. 4, ll. 1–5). Similarly, as Stouffer points out (Br. 6, 1st full para.), Yao teaches that substantially spherical polyolefin (binder) particles (made by underwater pelletizing (Yao [0051])) that have "smooth edges, tend to sinter evenly over a well defined temperature range to provide a final product with desirable mechanical properties." (Yao 5 [0053].)

While we hesitate to say that the combination proposed by the Examiner would "undermine the teachings of both Yao and Iwamoto"

(Br. 7, ll. 1–2), or produce a product "unsatisfactory for its intended purpose" (*id.* at ll. 3–4), Yao's express preference for "smooth, substantially spherical particles" (Yao 5 [0055]) is clear. *See also id.* at [0053] (explaining how spherical polyolefin particles "allows for the efficient packing of polyolefin and ion exchange particles, *which also tend to be spherical*." (emphasis added)). As Yao teaches, "[p]olyolefin particles made using cryogenic grinding are likewise preferably thermal fined to ensure smooth edges, and are then screened to ensure a proper average size," while particles made by underwater pelleting "typically provide[] smooth, substantially spherical particles" that do not need thermal fining and screening prior to use. (Yao 5 [0055].) In this context, the weight of the evidence is that the suggestion to use pulverized ion exchange particles is at best very weak.

Moreover, the Examiner has not addressed sufficiently the allegations of unexpected results reported in the Specification regarding the increased kinetics of calcium and magnesium reduction, the reduced pressure drop, and the higher equilibrium capacity for hardness reduction exhibited by the inventive monoliths compared to beds of loose resin material in bead form. (Spec. 3–4 [0018]; and the Examples at 9 [0048]–11 [0061].) As Stouffer points out (Reply 7, last para.), the Examiner has not explained the basis for the assumption that pulverized ion exchange resins—which Stouffer asserts would be non-spherical (*id.*)—would have been expected to serve as a satisfactory substitute for the smooth, substantially spherical particles preferred by Yao. Although, as noted *supra*, the claims are broad, and the experimental results limited, the Examiner has not come forward with

substantial evidence and analysis demonstrating any substantial reason to doubt the proffered data or explanations.

Weighing the weak case advanced in favor of prima facie obviousness against the evidence that the cited prior art had no positive reason to combine pulverized ion exchange resins with binder resins, and no reasonable expectation of providing any of the benefits disclosed by Stouffer, we conclude that Stouffer has demonstrated harmful error in the legal conclusion of obviousness of claim 1.

The Examiner makes no findings regarding the remaining references or the limitations of the dependent claims that cure the defects of the principal rejection.

We therefore reverse the rejections for obviousness.

C. Conclusion

In summary:

Claims Rejected	35 U.S.C. §	Reference(s)/Basis	Affirmed	Reversed
1–8, 18–20	112(2)			1–8, 18–20
1, 4, 6–8, 18	103(a)	Yao, Iwamoto		1, 4, 6–8, 18
2, 3, 19	103(a)	Yao, Iwamoto, Stouffer ′298		2, 3, 19
5	103(a)	Yao, Iwamoto, Hughes		5
20	103(a)	Yao, Iwamoto, Stouffer ′572		20
Overall Outcome				1–8, 18–20

REVERSED