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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte ETIENNE JOURDIER, CAROLINE AYMARD, and FADHEL BEN CHAABANE

Appeal 2018-002917
Application 14/654,063
Technology Center 1600

Before RICHARD M. LEBOVITZ, JEFFREY N. FREDMAN, and MICHAEL A. VALEK, *Administrative Patent Judges*.

VALEK, *Administrative Patent Judge.*

DECISION ON APPEAL

Appellant[1] submits this appeal under 35 U.S.C. § 134(a) involving claims to a method for producing oligosaccharides from lignocellulosic biomass. We have jurisdiction under 35 U.S.C. § 6(b).

We REVERSE.

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[1] We use the word "Appellant" to refer to "applicant" as defined in 37 C.F.R. § 1.42. Appellant identifies IFP Energies Nouvelles, Agro Industries Recherche et Development, and Institut National de la Recherche Agronomique as the real parties in interest.

STATEMENT OF THE CASE

According to the Specification,

> [t]he inventors have observed that it is possible to promote the formation of oligosaccharides starting from a hydrolysate containing glucose and cellulases by incubation when the water content of the liquid fraction of the hydrolysate is less than or equal to 65% by weight with respect to the total weight of the liquid fraction of the hydrolysate.

Spec. 4:18–21. The Specification explains that the effluent produced by this process may then be "used as an inducing solution in a unit for the production of cellulases." *Id.* at 6:21–22.

Claims 1–9 and 18–21 are on appeal and can be found in the Claims Appendix of the Appeal Brief. Claim 1 is representative of the claims on appeal. It reads as follows:

> 1. A process for the production of oligosaccharides from lignocellulosic biomass, comprising at least the following steps:
>
> (a) pre-treating the biomass in a pre-treatment reactor in order to provide an effluent containing a pre-treated substrate;
>
> (b) carrying out an enzymatic hydrolysis of the pre-treated substrate contained in the effluent obtained from step a) in a reactor, in the presence of cellulases, in a manner such that a hydrolysate containing glucose, cellulases and water is produced;
>
> (c) removing at least a portion of the hydrolysate obtained from step b) comprising a liquid fraction;
>
> (d) reducing the water content of said at least a portion of the hydrolysate removed in step c) in a manner such that the liquid fraction of the resulting hydrolysate has a water content of less than 65% by weight of water with respect to the total weight of the liquid fraction of the at least a portion of the hydrolysate removed in step c);
>
> (e) incubating the resulting hydrolysate with reduced water content obtained from step d) at a temperature in the

> range 40°C to 70°C for a time necessary to produce an effluent enriched in oligosaccharides.

Appeal. Br. 16.

Appellant seeks review of the following rejections:

I. Claims 1–3, 5, and 18–21 under 35 U.S.C. § 103 as obvious over Dunson;[2]

II. Claim 4 under 35 U.S.C. § 103 as obvious over Dunson and Knutsen;[3]

III. Claims 6–8 under 35 U.S.C. § 103 as obvious over Dunson and Lloyd;[4] and

IV. Claim 9 under 35 U.S.C. § 103 as obvious over Dunson and Vaheri.[5]

Appeal Br. 3–4. All of these rejections are premised on the same reference, Dunson, for the limitations of claim 1. Examiner relies on Knutsen, Lloyd, and Vaheri solely for limitations added by dependent claims 4, 6–8, and 9. *See* Ans. 9–13. Appellant contends the arguments concerning the first rejection "apply equally to support reversal" of the other rejections and does not present any additional arguments concerning rejections II–IV. *See*

[2] US 7,781,191 B2, issued Aug. 24, 2010 ("Dunson").
[3] Jeffrey S. Knutsen et al., *Cellulase Retention and Sugar Removal by Membrane Ultrafiltration During Lignocellulosic Biomass Hydrolysis*, Appl. Biochem. and Biotech., Vol. 113–116, 585–599 (2004) ("Knutsen").
[4] Todd A. Lloyd et al., *Combined Sugar Yields for Dilute Sulfuric Acid Pretreatment of Corn Stover Followed by Enzymatic Hydrolysis of the Remaining Solids*, Bioresource Tech., Vol. 96, 1967–1977 (2005) ("Lloyd").
[5] Marja Vaheri et al., *Transglycosylation Products of Cellulase System of Trichoderma Reesei*, Biotechnol. Lett., Vol. 1, 41–46 (1979) ("Vaheri").

Appeal Br. 13–15. Accordingly, we consider the rejections together in our analysis.

The issue is: Does the preponderance of evidence of record support Examiner's conclusion that the cited prior art renders obvious the claimed process?

Analysis

Examiner finds that Dunson:

> teaches a method for the production of oligosaccharides, comprising . . . 1) pre-treatment of lignocellulosic biomass with ammonia and steam thus forming a pre-treated substrate (Example 1), 2) carrying out an enzymatic hydrolysis of said pretreated substrate at 50°C thus yielding glucose, cellulases, and water and a composition enriched in oligosaccharides (Example 2; the saccharification taught in this section implies glucose production, see Col. 13, line 63 through Col. 14, line 5), reading on steps (a) and (b) of claim 1, and reading in part on step (d) and (e) of claim 1.

Ans. 4–5. Examiner further determines Dunson "envisions obtaining the soluble/liquid fraction and concentrating said fraction prior to saccharification by evaporation . . . reading on step (c) of claim 1 and reading in part on step (d) of claim 1." *Id.* at 5.

Regarding steps (d) and (e) of claim 1, Examiner acknowledges Dunson "does not teach reducing the water content . . . [to] less than 65% by weight of water in said liquid fraction" and "does not teach a second step of enzymatic hydrolysis at the temperatures of 40-70°." *Id.* at 5–6. However, according to Examiner, step (e) is an obvious "repetition of steps previously recited within a claim," i.e., the enzymatic hydrolysis step (b), which is "not inventive because it merely requires employing the well-known maxim, 'if

at first you don't succeed, try, try again.'" *Id.* at 7 (quoting *Perfect Web Techs., Inc. v. InfoUSA Inc.*, 587 F.3d 1324, 1327 (Fed. Cir. 2009)). Moreover, in Examiner's view, the "less than 65% by weight of water" requirement of step (d) is the result of an obvious optimization of a result-effective variable (i.e., pH) because reducing "water concentration would indirectly affect the pH." *Id.*

Appellant contends that Examiner has not established a prima facie case of obviousness because Dunson fails to teach both steps (d) and (e) of claim 1. Appeal Br. 5. According to Appellant,

> Dunson has absolutely no teaching at all regarding the claimed step (e) of incubating the resulting reduced hydrolysate with reduced water content. Dunson certainly has no teaching or suggestion of such an incubating step conducted at a temperature in the range 40°C to 70°C for a time necessary to produce an effluent enriched in oligosaccharides.

Id. at 6 (quotations omitted). Regarding Examiner's determination that step (e) of claim 1 is merely the obvious repetition of Dunson's saccharification step, Appellant explains that:

> [t]he saccharification step in Dunson is a hydrolysis step to breakdown the biomass to smaller parts . . . . The incubation step (e) of claim 1, in contrast, prepares oligosaccharides by coupling together mono-saccharides (e.g., glucose) obtained in the previous hydrolysis step. The building up of oligosaccharides from mono-saccharides in the incubation step (e) of claim 1 is nothing like the saccharification step in Dunson for breaking down the biomass to smaller parts. Thus, repeating the **saccharification** step of Dunson does not result in or suggest the **incubation** step (e) of claim 1.

Reply Br. 3. With respect to Examiner's determination that the "less than 65% by weight of water" requirement of step (d) is an obvious optimization

of a result-effective variable, Appellant urges that the "objective of Dunson is distinct, thus, optimizing the level of water reduction to achieve the objectives of Dunson fails to support an optimization which results in the level of water reduction recited in the claims." Appeal Br. 8.

On this record, we are persuaded by Appellant's arguments and determine the preponderance of evidence does not support Examiner's rejections.

As an initial matter, Dunson does not teach step (e) of claim 1 and the record does not support Examiner's finding that step (e) is nevertheless obvious because it is the same as repeating Dunson's saccharification step. First, Examiner identifies no evidence to support the finding that it would be obvious to repeat Dunson's saccharification step. The Federal Circuit's determination that it would be "common sense" to repeat a step in *Perfect Web* was premised on the particular facts and evidence at issue in that case. *See Arendi S.A.R.L. v. Apple Inc.*, 832 F.3d 1355, 1362 (Fed. Cir. 2016) (distinguishing *Perfect Web*'s holding that "common sense" supplied "a limitation that was admittedly *missing* from the prior art" because the limitation there "was unusually simple and the technology particularly straightforward"). Examiner has not shown that the same "common sense" rationale would apply here to render obvious a claim step that is wholly absent in Dunson. Second, even if the record supported a finding that it would be obvious to repeat Dunson's saccharification step, the incubation step (e) of claim 1 is a different step that is performed according to different recited parameters (e.g., incubation of a "hydrolysate with reduced water content," and "for a time necessary to produce an effluent enriched in oligosaccharides") than the saccharification process taught in Dunson.

Moreover, the saccharification process that Examiner relies on in Dunson Example 2 describes the production of "glucose" and "xylose," i.e., monosaccharides. Dunson, col. 16, ll. 1–25 (Table 2). The Examiner did not provide adequate evidence that repeating this process would "produce an effluent enriched in oligosaccharides" as recited in Appellant's claim 1. Accordingly, Examiner's findings concerning step (e) are not supported by the preponderance of the evidence of record.

Examiner's finding concerning the "less than 65% by weight of water" requirement of step (d) is likewise unsupported. Dunson teaches that the "pH was controlled at 5.0 during saccharification" because "of the sensitivity of the enzymes [used in that process] to high pH environments." Dunson 16:2–5. Based on this teaching, Examiner finds that pH is a result-effective variable and because "water concentration would indirectly affect the pH, the water concentration is then reasonably read as a result-effective variable with respect to the pH." Ans. 7. The problem with Examiner's reasoning is that optimizing pH to preserve enzyme activity is a different result than enhancing oligosaccharide formation. Indeed, optimization of pH need not reduce water content at all. For example, Dunson teaches that the pH was controlled by the addition of acetic acid and use of a citrate buffer, not by removing water. Dunson 15:67–16:5. Accordingly, Examiner has not shown that reducing water content, much less below the "65%" threshold recited in step (d) of claim 1, would be an obvious result of optimizing pH to maintain enzyme activity.

For these reasons, we agree with Appellant that Examiner has not met the burden "of presenting a *prima facie* case of unpatentability" for claim 1. *See In re Oetiker*, 977 F.2d 1443, 1445 (Fed. Cir. 1992). We, therefore,

reverse as to claim 1. Because the rejections of dependent claims 2–9 and 18–21 are premised on the same underlying findings regarding claim 1, we reverse the rejections of those claims for the same reasons.

CONCLUSION

In summary:

Claims Rejected	35 U.S.C. §	Reference(s)/Basis	Affirmed	Reversed
1–3, 5, 18–21	103	Dunson		1–3, 5, 18–21
4	103	Dunson, Knutsen		4
6–8	103	Dunson, Lloyd		6–8
9	103	Dunson, Vaheri		9
Overall Outcome				1–9, 18–21

REVERSED