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| NOVOZYMES NORTH AMERICA, INC. US PATENT DEPARTMENT 77 PERRYS CHAPEL CHURCH ROAD PO BOX 576 FRANKLINTON, NC 27525-0576 | | | HOLLAND, PAUL J | |
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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte HAIYU REN, DONGMIN LI,
YUN WANG, CHUANJI FANG, and HONG ZHI HUANG

Appeal 2019-006448
Application 13/515,925
Technology Center 1600

Before FRANCISCO C. PRATS, ULRIKE W. JENKS, and
ELIZABETH A. LAVIER, *Administrative Patent Judges*.

PRATS, *Administrative Patent Judge*.

DECISION ON APPEAL

Pursuant to 35 U.S.C. § 134(a), Appellant¹ appeals from the
Examiner’s decision to reject claims 16–22 and 24–35. 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 states that the real party in interest is Novozymes
of Bagsvaerd, Denmark, and COFCO Corporation of Beijing, China.
Appeal Br. 3.

STATEMENT OF THE CASE

The sole rejection before us for review is the Examiner's rejection of claims 16–22 and 24–35 under 35 U.S.C. § 103(a) as being unpatentable over McFarland,² Vlasenko,³ and Festerson⁴ (Ans. 3–8).

Appellant's claim 16, the sole independent claim on appeal, is representative and reads as follows:

16. A process for producing a hydrolysate of a lignocellulosic material, said process comprising:

- a) subjecting the lignocellulosic material to a pretreatment at a temperature between 165°C and 175°C, wherein the pretreatment is carried out using an organic or inorganic acid selected from the group consisting of sulphuric acid, acetic acid, citric acid, tartaric acid, succinic acid, and mixtures thereof and the pretreatment is carried out using from 0.5 to 2.0 wt. % acid, and
- b) subjecting the pretreated lignocellulosic material to the action of hydrolytic enzymes to produce said hydrolysate, wherein the hydrolytic enzymes comprise cellulolytic enzymes and a xylanase, and wherein said xylanase is present in an amount of at least 10% of the total amount hydrolytic enzyme protein.

Appeal Br. 9.

DISCUSSION

The Examiner's Prima Facie Case

The Examiner found that McFarland describes a process of producing a hydrolysate of a lignocellulosic material as recited in Appellant's representative claim 16, the process having nearly all of the steps and

² WO 2008/151043 A1 (published Dec.11, 2008).

³ WO 2005/067531 A2 (published July 28, 2005).

⁴ WO 2005/059084 A1 (published June 30, 2005).

features recited in claim 16, including the acid pretreatment of claim 16's step (a), as well as the enzyme treatment of step (b). Ans. 3–4. The Examiner noted in particular McFarland's disclosure that in the enzymatic treatment step, it was useful to employ cellulolytic enzymes as recited in claim 16, as well as hemicellulases. *Id.* at 4.

The Examiner cited Vlasenko as evidence that the xylanase enzyme recited in representative claim 16 was known in the art to be a type of hemicellulase, and that xylanases were known in the art to be useful in processes, like McFarland's, in which cellulolytic enzymes were used to hydrolyze lignocellulosic material. Ans. 6.

The Examiner cited Festerson as evidence that adding at least 15% xylanase to a barley mash was useful for improving the filterability and extraction yield of the mash. Ans. 6.

Based on the references' collective teachings, the Examiner concluded that it would have been obvious to "combine the teachings of McFarland et al., Vlasenko et al., and Festerson et al. according to the teachings of Vlasenko et al. and Festerson et al. because McFarland et al. teach a process for producing a fermentation product from the hydrolytic activities of cellulases and hemicellulases." Ans. 7.

The Examiner reasoned in particular that a skilled artisan would have had motivation and a reasonable expectation of success in combining McFarland's cellulolytic enzyme with a xylanase as recited in representative claim 16 "because Vlasenko et al. acknowledge that xylanases are a type of hemicellulose, and Festerson et al. acknowledges that at least 15% xylanase decreases slurry viscosity and improves the extraction yield of the mash." Ans. 7. The Examiner further reasoned that it would have been obvious to

determine the suitable amounts of enzymes for use in McFarland's process through routine optimization. Ans. 7–8 (citing McFarland 61:13–18; also citing MPEP § 2144.05.II.A and *In re Aller*, 220 F.2d 454, 456 (CCPA 1955) (“[W]here the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation.”)).

Analysis

As stated in *In re Oetiker*, 977 F.2d 1443, 1445 (Fed. Cir. 1992):

[T]he examiner bears the initial burden . . . of presenting a *prima facie* case of unpatentability. . . .

After evidence or argument is submitted by the applicant in response, patentability is determined on the totality of the record, by a preponderance of evidence with due consideration to persuasiveness of argument.

Having carefully considered all of the arguments and evidence advanced by Appellant and the Examiner, Appellant does not persuade us that the preponderance of the evidence does not support the Examiner's conclusion that the process of Appellant's representative claim 16 would have been obvious. To the contrary, we agree with the Examiner's findings of fact regarding the cited references, as well as the Examiner's ultimate conclusion of obviousness based on the totality of the evidence, and adopt the Examiner's findings and conclusion of obviousness as our own. We address Appellant's arguments below.

Appellant contends that the Examiner erred because Festerson's use of at least 15% xylanase in a brewing process would not have motivated a skilled artisan to use that proportion of xylanase, encompassed by Appellant's representative claim 16, in the processes of hydrolyzing lignocellulose described in McFarland and Vlasenko:

Festerson does not (nor McFarland, nor Vlasenko, nor the instant specification) contain the term “fermentation mash.” Festerson does teach (and define) a “mash” as being an “aqueous starch slurry”, an element which is not taught by McFarland (nor Vlasenko).

Therefore, the Office has not provided a sufficient reason why the disclosures of McFarland and Festerson (and Vlasenko) should be combined. The cited references are devoid of any suggestion to combine the teachings and suggestions of McFarland and Festerson (and Vlasenko) as advanced by the Office, except from using Appellants’ disclosure as a template through hindsight reconstruction of Appellants’ claim.

Appeal Br. 6 (citing Final Act. 5).⁵

The Examiner responds that the basis for combining the references is based only on the references’ teachings. *See* Ans. 8–9. In particular, the Examiner reasoned:

One of ordinary skill in the art would recognize the similarities between the pretreated biomass slurry taught by McFarland et al. and the mash taught by Festerson et al. that can be used for the same purpose of producing consumable alcoholic beverages and would be motivated to use concentrations of xylanase above 10% based on the teachings of Festerson et al. because Festerson et al. acknowledges that at least 15% xylanase decreases slurry viscosity and improves the extraction yield of the mash. By decreasing the viscosity of the slurry, the efficiency and cost of the system is improved because the slurry is able to flow freely through the system allowing the sugars to be more accessible to the fermenting microorganisms.

Id. at 9.

We find that the Examiner has the better position. First, as noted above, in addition to citing Festerson as evidence that it would have been obvious to include at least 10% xylanase, as recited in representative claim

⁵ Final Action entered August 27, 2018.

16, among the hydrolytic enzymes used in McFarland's process, the Examiner also reasoned that the amount of xylanase recited in claim 16 would have been arrived at through routine optimization. *See* Final Act. 6 (citing *Aller*, 220 F. 2d at 456); Ans. 7–8 (same).

Appellant does not address the Examiner's optimization rationale. Nor does Appellant explain specifically why the Examiner erred in concluding that claim 16's process would have been obvious based on such reasoning.

It is undisputed that McFarland describes a process of hydrolyzing lignocellulosic material that includes an acid pretreatment step and a step of hydrolyzing the acid-treated material with enzymes having cellulolytic activity. *See* McFarland 7 (preferred hydrolyzed material contains lignocellulose); *id.* at 59 (preferred chemical pretreatment is acid); *id.* at 17 (cellulolytic enzyme composition preferably includes hemicellulases as additional enzymes).

It is also undisputed that Vlasenko teaches that, when using enzymes to hydrolyze lignocellulose in processes like McFarland's, xylanases as recited in Appellant's claim 16 (which are hemicellulases) are among the enzymes useful in combination with cellulolytic enzymes. Vlasenko 20.

Thus, based on the teachings of McFarland and Vlasenko, a skilled artisan would have had good reason to use cellulolytic enzymes in combination with xylanases, as recited in Appellant's claim 16, when hydrolyzing lignocellulose. And, as the Examiner found, determining optimal amounts of those enzymes depended on a number of variables in the hydrolysis process:

The optimum amounts of the enzymes and polypeptides having cellulolytic enhancing activity depend on several factors including, but not limited to, the mixture of component cellulolytic proteins, the cellulosic substrate, the concentration of cellulosic substrate, the pretreatment(s) of the cellulosic substrate, temperature, time, pH, and inclusion of fermenting organism (*e.g.*, yeast for Simultaneous Saccharification and Fermentation).

McFarland 61.

Thus, as evidenced by McFarland, the concentration of enzymes to be used in its process is a result-effective parameter. We therefore discern no error in the Examiner's determination that the amount of xylanase recited in Appellant's claim 16 (*i.e.*, at least 10% of the total enzyme composition) would have been obvious to a skilled artisan, particularly given Appellant's failure to advance persuasive argument or evidence suggesting that the claimed amount of xylanase yields an unexpected result. *See E.I. DuPont de Nemours & Company v. Synvina C.V.*, 904 F.3d 996, 1006 (Fed. Cir. 2018) (“[A] recognition in the prior art that a property is affected by the variable is sufficient to find the variable result-effective.”); *id.* at 1009 (“[T]he discovery of an optimum value of a variable in a known process is normally obvious.”); *see also Iron Grip Barbell Co. v. USA Sports, Inc.*, 392 F.3d 1317, 1322 (Fed. Cir. 2004) (“Where ‘the difference between the claimed invention and the prior art is some range or other variable within the claims . . . , the [applicant] must show that the particular range is critical, generally by showing that the claimed range achieves unexpected results.’”) (quoting *In re Woodruff*, 919 F.2d 1575, 1578 (Fed. Cir. 1990)).

We are also unpersuaded that the processes of McFarland and Festerson are unconnected, as Appellant avers. As noted above, McFarland discloses that the saccharide-containing slurry resulting from its

lignocellulose hydrolysis may ultimately be part of a fermentation process, like the brewing process in Festerson. *See* McFarland 61 (describing yeast fermentation of hydrolyzed lignocellulosic product); *id.* at 5 (objective of cellulolytic enzyme hydrolysis is viscosity reduction). As the Examiner found, Festerson teaches that xylanase reduces the viscosity and improves the filterability of a saccharide-containing slurry ultimately used in fermentation. *See* Festerson 4–5. Appellant does not persuade us, therefore, that the Examiner erred in determining that the amounts of xylanase described in Festerson would have been viewed as useful in the processes of McFarland.

In sum, for the reasons discussed, Appellant does not persuade us that the preponderance of the evidence fails to support the Examiner’s conclusion of obviousness as to Appellant’s representative claim 16. We therefore affirm the Examiner’s rejection of claim 16 over McFarland, Vlasenko, and Festerson. Because they were not argued separately, claims 17–22 and 24–35 fall with claim 16. *See* 37 C.F.R. § 41.37(c)(1)(iv).

CONCLUSION

In summary:

| Claims Rejected | 35 U.S.C. § | Reference(s)/ Basis | Affirmed | Reversed |
|------------------------|--------------------|--------------------------------------|-----------------|-----------------|
| 16–22, 24–35 | 103(a) | McFarland, Vlasenko, Festerson | 16–22, 24–35 | |

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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