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UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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*Ex parte* FRANK BENKWITZ, CHRISTOPHE DANIEL MIHALCEA, and  
ALICE MARIE HAVILL

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Appeal 2018-000679  
Application 14/360,645  
Technology Center 1600

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Before ULRIKE W. JENKS, RACHEL H. TOWNSEND, and  
DAVID COTTA, *Administrative Patent Judges*.

JENKS, *Administrative Patent Judge*.

DECISION ON APPEAL

Pursuant to 35 U.S.C. § 134(a), Appellant<sup>1</sup> appeals from Examiner's decision to reject the claims for obviousness and on the grounds of nonstatutory obviousness-type double patenting. We have jurisdiction under 35 U.S.C. § 6(b).

We REVERSE.

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<sup>1</sup> We use the word Appellant to refer to "applicant" as defined in 37 C.F.R. § 1.42(a). Appellant identifies the real party in interest as LanzaTech New Zealand Limited. Appeal Br. 2.

## STATEMENT OF THE CASE

Claims 1–6, 11, 13, 14, and 16–20 are on appeal,<sup>2</sup> and can be found in the Claims Appendix of the Appeal Brief. Claim 1 is representative of the claims on appeal, and reads as follows:

1. A method for improving carbon capture in a microbial fermentation of a substrate comprising CO, the method comprising;
  - a) in a bioreactor comprising a culture of at least one microorganism, fermenting a gaseous substrate comprising CO to produce a fermentation broth comprising at least one product;
  - b) *removing at least a portion of the fermentation broth via a bleed stream*, from the bioreactor;
  - c) passing at least a portion of the fermentation broth from the bioreactor to a separator to produce a permeate stream;
  - d) removing at least a portion of the at least one product from the bleed stream and/or permeate stream to provide a product depleted stream;
  - e) passing the product depleted stream to a clarifying module wherein at least a portion of the at least one component of the product depleted stream selected from the group consisting of *biomass*, proteins, organic components, or inorganic components is removed from the product depleted stream to provide a treated stream; and
  - f) passing at least a portion of the treated stream to the bioreactor.

Appeal Br. 13 (Claims Appendix) (emphasis added).

Examiner required Appellant to elect species in an Election/Restriction requirement mailed September 21, 2015. Appellant, in the response mailed December 16, 2015, elected without traverse

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<sup>2</sup> We have considered, and herein refer to, the Specification of May 26, 2014 (“Spec.”); Final Office Action of August 17, 2016 (“Final Act.”); Appeal Brief of April 19, 2017 (“Appeal Br.”); Examiner’s Answer of August 23, 2017 (“Ans.”); and Reply Brief of October 23, 2017 (“Reply Br.”).

*Clostridium autoethanogenum* as the microorganism, CO the gas, distillation as the method of removing a product, and an anaerobic digestion module as the clarifying module, specifically a biomass removal model. We limit discussion and consideration to the elected species, and take no position respecting the patentability of the broader generic claims, including the remaining, non-elected species. *See Ex parte Ohsaka*, 2 USPQ2d 1460, 1461 (Bd. Pat. App. Int. 1987).

Appellant requests review of following rejections made by Examiner:

- A. Claims 1–6 and 16–19 on the ground of nonstatutory obviousness-type double patenting over claims 1–8 of Simpson '824<sup>3</sup> in view of Simpson '157.<sup>4</sup>
- B. Claims 1–6 and 16–19 on the ground of nonstatutory obviousness-type double patenting over claims 1–4, 6–11, and 16 of Simpson '509<sup>5</sup> in view of Simpson '157.
- C. Claims 1–6, 11, 13, 14, and 16–20 under 35 U.S.C. § 103(a) as unpatentable over Simpson '157 as evidenced by Biomass-Wikipedia<sup>6</sup> and Biomaterial-Wikipedia.<sup>7</sup>

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<sup>3</sup> Simpson et al., US 7,972,824 B2, issued July 5, 2011 (“Simpson '824”).

<sup>4</sup> Simpson et al., WO 2007/117157 A1, published October 18, 2007 (“Simpson '157”).

<sup>5</sup> Simpson et al., US 8,293,509 B2, issued October 23, 2012 (“Simpson '509”).

<sup>6</sup> <http://web.archive.org/web/20111103210835/http://en.wikipedia.org/wiki/Biomass>, archived November 3, 2011; last accessed July 21, 2016 (“Biomass-Wikipedia”).

<sup>7</sup> <http://web.archive.org/web/20111211005116/http://en.wikipedia.org/wiki/Biomaterial>, archived December 11, 2011, accessed July 21, 2016 (“Biomaterial-Wikipedia”).

- D. Claims 1–6, 11, 13, 14, and 16–20 under 35 U.S.C. § 103(a) as unpatentable over Simpson ’509 as evidenced by Biomass-Wikipedia and Biomaterial-Wikipedia.
- E. Claims 1–6, 11, 13, 14, and 16–20 under 35 U.S.C. § 103(a) as unpatentable over Simpson ’824 as evidenced by Biomass-Wikipedia and Biomaterial-Wikipedia.
- F. Claims 1–9, 11, 13, 14, and 16–20 under 35 U.S.C. § 103(a) as unpatentable over Simpson ’157 in view of Klasson,<sup>8</sup> and Ashcroft<sup>9</sup> as evidenced by Biomass-Wikipedia and Biomaterial-Wikipedia.
- G. Claims 1–9, 11, 13, 14, and 16–20 under 35 U.S.C. § 103(a) as unpatentable over Simpson ’509 in view of Klasson, and Ashcroft as evidenced by Biomass-Wikipedia and Biomaterial-Wikipedia.
- H. Claims 1–9, 11, 13, 14, and 16–20 under 35 U.S.C. § 103(a) as unpatentable over Simpson ’509 in view of Klasson, and Ashcroft as evidenced by Biomass-Wikipedia and Biomaterial-Wikipedia.

I. *Claim Interpretation - Biomass*

Examiner reasons that acetate is biomass because it can be used as an energy source for microbes in the production of ethanol, or other products. *See* Ans. 5, 10, 17, 22, 26. Examiner further notes that “the instant specification uses the term ‘biomass’ in contexts that do not appear to refer

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<sup>8</sup> Klasson et al., *Bioconversion of synthesis gas into liquid or gaseous fuels*, 14 ENZYME MICROB. TECHNOL. 602–608 (1992) (“Klasson”).

<sup>9</sup> Ashcroft et al., *Partial oxidation of methane to synthesis gas using carbon dioxide*, 352 NATURE 225–226 (1991) (“Ashcroft”).

to microbial cells, such as ‘non-food biomass waste generated by the forestry industry’ in paragraph [000145].” Advisory Act. 2.

The Examiner further turns to the definition of “biomass” and “biomaterial” in Wikipedia. Ans. 5. According to Wikipedia, “Biomass, as a renewable energy source, is biological material from living, or recently living organisms.” *Id.* (citing Biomass-Wikipedia). “A biomaterial[, on the other hand,] is any matter, surface, or construct that interacts with biological systems.” *Id.* (citing Biomaterial-Wikipedia 1). Based on these disclosures from Wikipedia, Examiner concludes that acetate, an organic molecule, is biomass. Ans. 5, 10, 17, 22, 26.

Appellant argues that claims are to be given their broadest reasonable interpretation in light of the Specification. Appeal Br. 5 (citing MPEP 2111 (“the interpretation must be in view of the specification **as it would be interpreted by one of ordinary skill in the art** (emphasis added)”).

Appellant argues that acetate is disclosed in the Specification as a fermentation product and cannot be given a meaning contrary to how it is used in the Specification. *See id.* at 5–6. Appellant argues that:

“Acetate” is defined separately as a product (See paragraphs [0008], [00020], [00044], etc.). Acetate is specifically defined at paragraph [00094] as meaning free acetic acid and acetate salt. It is clear that the specification defines biomass as being microbial biomass or microbial cells, i.e. the culture of carboxydophilic microorganisms and acetate is the product of the culture or the biomass. The product of a living microorganism cannot be the same as the microorganism and therefore one of ordinary skill in the art would not interpret biomass as acetate. Throughout the specification “acetate” is defined separately and differently from “biomass”.

*Id.* Additionally, Appellant argues that the better definition of the term biomass is the term used in ecology. *Id.* at 6 (citing Biomass (ecology)-

Wikipedia 1<sup>10</sup> (“Biomass, in ecology, is the mass of living biological organisms in a given area or ecosystem at a given time. Biomass can refer to *species biomass*, which is the mass of one or more species, or to community biomass, which is the mass of all species in the community. It can include microorganisms, plants or animals.”).

Upon review of the record, we find that Appellant has the better position. “Claims are not to be read in a vacuum[;] while it is true they are to be given the broadest reasonable interpretation during prosecution, their terms still have to be given the meaning called for by the specification of which they form a part.” *In re Royka*, 490 F.2d 981, 984 (CCPA 1974). Therefore, we first turn to the Specification to determine how the term “biomass” is used in the Specification. The issue is whether the preponderance of evidence of record supports Examiner’s interpretation that acetate, an organic compound, is reasonably interpreted as biomass as understood in light of the Specification.

While the Specification specifically defines a number of terms (*see* Spec. ¶¶ 80–100), the Specification does not provide a specific definition for the term “biomass.” It does indicate biomass and acetate are different fermentation components as we discuss below.

It is true that the Specification identifies acetic acid and biomass as organic compounds (Spec. ¶ 99) but the two are never equated. Rather, they are differentiated. In particular, the Specification explains that “[a] large number of anaerobic organisms including carboxidotrophic, photosynthetic,

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<sup>10</sup> Biomass (ecology), [http://web.archive.org/web/20111104074830/http://en.wikipedia.org/wiki/Biomass\(ecology\)](http://web.archive.org/web/20111104074830/http://en.wikipedia.org/wiki/Biomass(ecology)), last accessed April 19, 2017 (“Biomass (ecology)-Wikipedia”).

methanogenic and acetogenic organisms have been shown to metabolize CO to various end products, namely CO<sub>2</sub>, H<sub>2</sub>, methane, n-butanol, acetate[,] and ethanol. While using CO as the sole carbon source all such organisms produce at least two of these end products.” Spec. ¶ 8. “[E]thanol production by micro-organisms by fermentation of gases is always associated with co-production of acetate and/or acetic acid. . . .

Acetate/acetic acid is converted to methane by micro-organisms and therefore has the potential to contribute to Green House Gas emissions.” Spec. ¶ 10.

The Specification further explains that acetic acid<sup>11</sup> can be metabolized in aerobic digestion by yeast and/or bacteria to biomass and CO<sub>2</sub> or by anaerobic digestion where methane, CO<sub>2</sub> and biomass are produced. Spec. ¶¶ 111–112.

Thus, although acetate / acetic acid is an organic compound just as biomass is, we do not agree with Examiner’s interpretation that acetate in the context of the Specification and claims is equivalent to biomass. Instead, we agree with Appellant that the most reasonable interpretation in light of the Specification is that acetate is a separate entity from biomass even though both contain components having a carbon backbone.

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<sup>11</sup> Acetate is the salt of acetic acid. The Specification defines “[t]he term ‘acetate’ [to] include[]s both acetate salt alone and a mixture of molecular or free acetic acid and acetate salt, such as the mixture of acetate salt and free acetic acid present in a fermentation broth as may be described herein.” Spec. ¶ 94.

*II. (A) Nonstatutory Obviousness-Type Double Patenting over Simpson '824*

Examiner finds that claims 1–6 and 16–19 of the present application are not patentably distinct over claims 1–8 of Simpson '824 as evidenced by Simpson '157. Ans. 4. The Simpson '824 patent, titled “Microbial Fermentation of Gaseous Substrates to Produce Alcohols” issued on July 5, 2011, from U.S. Patent Application No. 12/296,300 filed April 17, 2009, and claims priority to PCT/NZ2007/000072 under 35 U.S.C. § 371 (c)(1), (2), and (4), which PCT application published as WO2007/117157 (i.e., “Simpson '157”). Simpson '824, code (10), (30), (45), (54), (86), (87).

Examiner acknowledges that “the claims of '824 [patent] do not recite passing a portion of the fermentation broth to a separator to produce a permeate stream or removing a portion of the ethanol from the permeate stream by distillation to provide a product depleted stream prior to converting the acetate to carbon dioxide and hydrogen.” Ans. 5. Examiner relies on 'Simpson '157 for this teaching. Specifically, Examiner finds that

the acetate added to the second bioreactor [in Simpson '157] can be interpreted as a “product depleted stream” because the product ethanol is removed from the fermentation broth prior to the removal of the acetate, that the second bioreactor in which acetate is converted can be interpreted as an ‘anaerobic digestion module’ and a “biomass removal module”, and that acetate can be interpreted as the “biomass” that is removed from the product depleted stream.

Ans. 7. Examiner acknowledges that the specification may not be used to support a double patenting rejection, but contends that “Simpson ['157] is a different document from '824, Simpson ['157] cannot be considered to be the specification of '824, even if Simpson and the specification of '824 have the same text.” Ans. 42.

Appellant contends that Simpson '157 is not a proper secondary reference to Simpson '824. "Simpson ['157] cannot be used as reference since it is the same reference as the '824 patent, i.e. Simpson and the '824 patent have the same priority document." Appeal Br. 7.

On this record, we find that Appellant has the better position. It is correct that Simpson '157 is not prior art to the claims in Simpson '824. Appeal Br. 7. Examiner does not appear to dispute that Simpson '157 has the same disclosure as Simpson '824. Instead, Examiner's position is that Simpson '157 is prior art to the present claims at issue. *See* Ans. 41–42 ("The Examiner has not used the specification of the '824 patent. Rather, the Examiner has used Simpson ['157], which is an international patent application.").

Appellant contends that the use of Simpson '157 "appears to be an easy way to circumvent the admonition by the courts that the specification of a patent cannot be used to make out an obviousness type double patenting rejection. Applicants still assert that this cannot be done." Appeal Br. 7. We agree. Our reviewing court has stated: "precedent makes clear that the *disclosure* of a patent cited in support of a double patenting rejection cannot be used as though it were prior art." *General Foods Corp. v. Studiengesellschaft Kohle mbH*, 972 F.2d 1272, 1281 (1992). Here, Examiner relies on the Simpson '157 disclosure for teaching a second bioreactor that digests acetate to form a product depleted stream (i.e. an anaerobic digestion module). Ans. 7. Relying on the Simpson '157 disclosure for the teaching of an anaerobic digestion module, as Examiner has done here, is essentially relying on the teachings in the '824 patent specification as prior art to the claimed invention on appeal because the

Simpson '157 disclosure is the specification of the '824 patent, i.e., they both stem from the same priority document. We conclude that applying the teachings of the Simpson '157 publication in this way goes beyond the permissible use of the '824 patent disclosure in an obviousness-type double patenting rejection. *See* MPEP 804.II.B.2.(a).

Even if the Simpson '157 disclosure could be properly considered, which it cannot because it is the Simpson '824 disclosure, the nonstatutory obviousness-type double patenting over Simpson '824 in light of Simpson '157 still fails because as discussed above (*see I. Claim Interpretation - Biomass*), the Examiner's rejection is premised on an erroneous interpretation of "biomass." How this error leads to an incorrect conclusion regarding obviousness in the obviousness-type double patenting rejection is more fully discussed in section IV below.

Accordingly, we reverse the nonstatutory obviousness-type double patenting over of Simpson '824 in view of Simpson '157.

### *III. (B) Nonstatutory Obviousness-Type Double Patenting over Simpson '509 in light of Simpson '157*

Examiner's nonstatutory obviousness-type double patenting rejection is premised on the interpretation that acetate is biomass. Ans. 10 ("the acetate produced by the fermentation process of '509 can be interpreted as 'biomass.'"). For the reasons discussed above (*see I. Claim Interpretation - Biomass*), we do not agree with Examiner's interpretation that acetate, a product of the CO fermentation, is reasonably considered biomass in light of the Specification. Because Examiner's nonstatutory obviousness-type

double patenting is premised on the erroneous interpretation of “biomass,” the we reverse this rejection.

*IV. (C)–(H) Obviousness*

Each of the of the obviousness rejections (*C–H*) relying on Simpson ’157, Simpson ’509, or Simpson ’824, either alone or in combination with Klasson and Ashcroft, is premised on the interpretation that acetate is biomass. For the reasons discussed above (*see I. Claim Interpretation - Biomass*), we do not agree with Examiner’s interpretation that acetate, a product of the CO fermentation, is reasonably considered biomass in light of the Specification. Because each of Examiner’s obviousness rejections is premised on the erroneous interpretation of “biomass,” we agree with Appellant’s (*see Appeal Br. 8–11*) that Examiner has not made out prima facie case of obviousness based on the cited references.

The preponderance of evidence on this record fails to support Examiner’s conclusion that either Simpson ’157, Simpson ’509, or Simpson ’824 teaches Appellant’s claimed invention.

Additionally, Appellant contends that Simpson ’157 “only describes a permeate stream. The broth fraction from the bioreactor is the bleed stream while that from the separator is the permeate stream.” *Appeal Br. 8; see also Reply Br.* (“Simpson teaches only a permeate stream . . . from which cells have been removed.”). Appellant makes the same arguments with respect to Simpson ’824. *See Appeal Br. 10.*

Figure 2 of Simpson ’157, reproduced below, illustrates the process of obtaining a fermentation product.

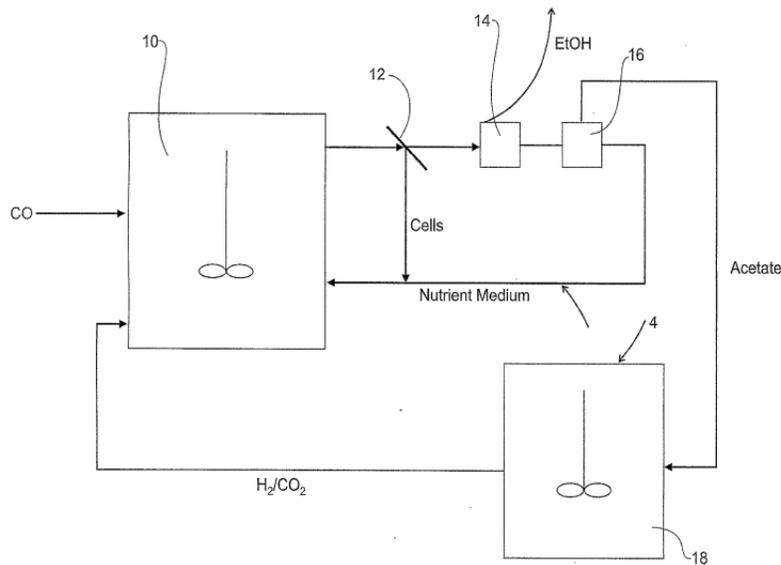


Figure 2 shows a first bioreactor 10, a filtration unit 12 that removes bacterial cells, a processing station 14 that removes ethanol by distillation, a processing station 16 that removes acetate with activated charcoal, a bioreactor 18 that receives acetate and liquid nutrient medium 4, and a H<sub>2</sub> and CO<sub>2</sub> product stream from the second bioreactor 18 that is fed back into the first bioreactor 10. Simpson '157, 21:9–22.

The Specification defines a “[b]leed stream – [as] the portion of the fermentation broth removed from a bioreactor *that is not passed to a separator.*” Spec. ¶ 85 (emphasis added). The Specification further defines a “[s]eparator- [as] a module that is adapted to receive fermentation broth from a bioreactor and pass the broth through a filter to yield a retentate and a permeate. The filter may be a membrane, e.g. cross-flow membrane or a hollow fibre [sic] membrane.” *Id.* ¶ 92.

We are not persuaded by Examiner’s interpretation that “the broth removed from the bioreactor [in Simpson '157] and filtered to create a permeate can be interpreted as both the ‘bleed stream’ of step (b) and as the ‘portion of the fermentation broth’ passed ‘from the bioreactor to a separator

to produce a permeate stream' of step (c).” Final Action 17. In other words, the Examiner is interpreting the part of the broth before it passes through the filter as the bleed stream. The Specification, however, is clear that the bleed stream is fermentation broth diverted from the bioreactor in a flow that does not pass to a separator, i.e. a module that is adapted to receive fermentation broth. Here, Examiner has not identified a fermentation broth flow in Simpson '157 that does not pass to a filtration module. For this additional reason, we agree with Appellant that Examiner has not established that Simpson '157 and Simpson '824 contain a bleed stream as recited in the claims.

DECISION SUMMARY

<b>Claims Rejected</b>	<b>35 U.S.C. §</b>	<b>Reference(s)/Basis</b>	<b>Affirmed</b>	<b>Reversed</b>
1-6, 16-19		Obviousness-type double-patenting over Simpson '824 in view of Simpson '157		1-6, 16-19
1-6, 16-19		Obviousness-type double-patenting over Simpson '509 in view of Simpson '157		1-6, 16-19
1-6, 11, 13, 14, 16-20	103	Simpson '157		1-6, 11, 13, 14, 16-20
1-6, 11, 13, 14, 16-20	103	Simpson '509		1-6, 11, 13, 14, 16-20
1-6, 11, 13, 14, 16-20	103	Simpson '824		1-6, 11, 13, 14, 16-20
1-9, 11, 13, 14, 16-20	103	Simpson '157, Klasson, Ashcroft		1-9, 11, 13, 14, 16-20
1-9, 11, 13, 14, 16-20	103	Simpson '509, Klasson, Ashcroft		1-9, 11, 13, 14, 16-20

Appeal 2018-000679  
Application 14/360,645

<b>Claims Rejected</b>	<b>35 U.S.C. §</b>	<b>Reference(s)/Basis</b>	<b>Affirmed</b>	<b>Reversed</b>
1-9, 11, 13, 14, 16-20	103	Simpson '824, Klasson, Ashcroft		1-9, 11, 13, 14, 16-20
<b>Overall Outcome</b>				<b>1-9, 11, 13, 14, 16-20</b>

REVERSED