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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* ADAM RICHARD BROTHERTON and MARK JOHN TORRESANI

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Appeal 2015-000773  
Application 12/793,240  
Technology Center 3700

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Before JILL D. HILL, LISA M. GUIJT, and GORDON D. KINDER,  
*Administrative Patent Judges.*

GUIJT, *Administrative Patent Judge.*

DECISION ON APPEAL

STATEMENT OF THE CASE

Appellants<sup>1</sup> seek our review under 35 U.S.C. § 134 of the Examiner's decision<sup>2</sup> rejecting claims 1–42. We have jurisdiction under 35 U.S.C. § 6(b).

We AFFIRM-IN-PART.

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<sup>1</sup> Appellants identify the real parties in interest as Cornerstone Environmental Group, LLC and Unison Solutions, Inc. App. Br. 2.

<sup>2</sup> Appeal is taken from the Final Office Action dated January 27, 2014 (“Final Act.”).

CLAIMED SUBJECT MATTER

Claims 1, 16, 23, and 28 are the independent claims on appeal. Claim 1, reproduced below, is illustrative of the claims on appeal.

1. A system for producing fuel from a gas stream of biogenic origin, the system comprising:

a gas inlet configured to convey a gas stream from a feed source to the system;

a hydrogen sulfide removal stage operably connected downstream of the gas inlet, the hydrogen sulfide removal stage including a first vessel configured to receive a first media that removes hydrogen sulfide entrained in a gas stream;

a filtration stage operably connected downstream of the hydrogen sulfide removal stage and configured to remove particulates and free moisture entrained in the gas stream;

a primary compression stage operably connected downstream of the gas inlet and configured to elevate a pressure of the gas stream, the primary compression stage comprising a compressor, an oil/gas separator to extract oil from the gas stream, an oil filter, and an oil cooler;

a moisture removal stage operably connected downstream of the gas inlet and configured to condense and separate remaining moisture from the gas stream, the moisture removal stage comprising a first heat exchanger, a second heat exchanger, and a chiller;

a siloxane removal stage operably connected downstream of the gas inlet, the siloxane removal stage including a second vessel configured to receive a second media which removes at least some siloxanes from the gas stream;

a carbon dioxide removal stage operably connected downstream of the gas inlet and including a single-stage

membrane configured to separate carbon dioxide from the gas stream by a permeability characteristic of the gas stream; and

a secondary compression stage operably connected downstream of the primary compression stage and configured to elevate a pressure of the gas stream to a level suitable for distribution to CNG-compatible vehicles.

#### REJECTION

Claims 1–42 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Palumbo (US 2007/0095205 A1; pub. May 3, 2007), Borray (US 5,727,903; iss. Mar. 17, 1998), and Notaro (US 6,251,164 B1; iss. June 26, 2001).

#### ANALYSIS

*Independent claim 1 and dependent claims 2–15*

Regarding independent claim 1, the Examiner finds, *inter alia*, that Palumbo discloses the system as claimed, except for a filtration stage operably connected *downstream of the hydrogen sulfide removal stage* and configured to remove particulates and free moisture entrained in the gas stream. Final Act. 3–4. The Examiner relies on Borray for disclosing a filtration stage comprising knockout drum 18 that “removes water droplets and particulates from the incoming landfill gas stream” (Ans. 15 (citing Borray 4:30–34)) and is “operably connected downstream of the gas inlet and immediately upstream of a blower” (Final Act. 4 (citing Borray 4:31–38, Fig. 2 (step 54)). The Examiner further relies on Boray for teaching that “such a stage will ‘protect the blower’ (primary stage compressor) ‘from corrosion and erratic operation from moisture and solid buildup on the blower blades[.]’” *Id.* at 4 (citing Borray 4:31–38, Fig. 2 (step 54)). The Examiner reasons that it would have been obvious “to configure the system of Palumbo with such a filtration stage immediately upstream of the compressor (and thus

downstream of the hydrogen sulfide removal stage), in order to protect the compressor as taught by Borray.” Final Act. 4.

First, Appellants argue that Borray’s “knockout drum 18 is not a filtration stage downstream of a hydrogen sulfide removal stage,” but rather “at the inlet to a gas collection blower . . . intended to remove particulates from an incoming landfill gas stream.” App. Br. 9; *see also* Reply Br. 2. However, as stated *supra*, the Examiner does not rely on Borray for disclosing a hydrogen sulfide removal stage. Appellants’ argument does not address the Examiner’s rejection, which modifies Palumbo’s system for processing landfill gas by incorporating a filtration stage (i.e., a knockout drum as taught Borray) downstream of Palumbo’s hydrogen sulfide removal stage 101 and upstream of Palumbo’s compressor 102 to protect the compressor. Thus, Appellants’ argument does not apprise us of error in the Examiner’s findings or reasoning.

Second, Appellants argue that “[t]he Examiner has not provided sufficient reason why one of skill in the art would modify the system of [Palumbo],<sup>3</sup> since Borray specifically requires its knockout drum to receive gas directly from the incoming landfill itself, not from a filtration component or other component within the system of Borray.” App. Br. 9–10. We disagree. Borray discloses that “[t]he knockout drum is to protect the blower from corrosion and erratic operation from moisture and solid buildup on the blower blades.” Borray 4:36–38. Additionally, Borray discloses that

[t]he apparatus **10** comprises a pretreatment system **14** which includes a gas collection blower **16** for extracting the raw landfill gas stream **12** from the landfill **2**, a knockout drum **18** and a drying device or means **20**. The pretreatment system **14** is utilized to protect a purification

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<sup>3</sup> Although Appellants’ Appeal Brief states “system of *Borray*,” we understand this to be an typographical error, in view of the Examiner’s proposed modification to the “system of Palumbo.” App. Br. 9 (emphasis added); Final Act. 4.

compression system **24** through the elimination of particulates and the reduction of moisture.

Borray 6:5–8. Palumbo discloses that gas flows through hydrogen sulfide removal system 101 to compressors 102. Palumbo ¶ 29. Thus, the Examiner has articulated adequate reasoning based on rational underpinnings to explain why a person having ordinary skill in the art would have been led to position a filtration stage (or knockout drum) directly upstream of Palumbo’s compressor (and therefore, downstream of Palumbo’s hydrogen sulfide removal system) to protect Palumbo’s compressor from corrosion and erratic operation due to moisture and solid buildup on the compression system through the elimination of particulates and the reduction of moisture, as taught by Borray.

Third, Appellants argue that “[a] combination of Borray with Palumbo would require a filtration stage upstream of the hydrogen sulfide removal system 101 in Palumbo, not downstream.” *Id.* at 10. We disagree for the reasons stated *supra*, in that Borray teaches positioning a filtration stage to protect a compression system, and therefore, the Examiner’s proposal to configure Palumbo’s system to include a filtration stage directly upstream of Palumbo’s compressor is adequately supported by factual findings from Borray.

Fourth, Appellants argue that “the knockout drum 18 of Borray is not equivalent to the claimed filtration stage,” because “knockout drum 18 is a large vessel that slows gases down and allows liquid to drop out of the gas stream,” whereas the claimed “filtration stage (e.g., one that includes a filter housing and mesh filter . . .) . . . receives gas that has already passed through a first media.” App. Br. 10; Reply Br. 2. Appellants’ argument is not persuasive because Appellants are arguing limitations that are not recited in the claims. Claim 1 requires, in relevant part, “a filtration stage . . . configured to remove particulates

and free moisture entrained in the gas stream,” and as correctly determined by the Examiner, Borray teaches that knockout drum 18 “removes water droplets and particulates from the . . . gas stream.” Borray 4:31–33; Ans. 15.

Accordingly, we sustain the Examiner’s rejection of independent claim 1. Appellants chose not to present separate arguments for the patentability of claims 2–15 depending from claim 1, and therefore, we also sustain the Examiner’s rejection of claims 2–15. App. Br. 10.

*Independent claim 16 and dependent claims 17–22*

Regarding independent claim 16, the Examiner finds, *inter alia*, that Palumbo discloses the system as claimed, and in particular, “reducing a hydrogen sulfide content of the gas stream by passing the gas stream through a first media adapted to remove at least some hydrogen sulfide in the gas,” because Palumbo discloses a hydrogen sulfide removal stage 101 containing an iron oxide sponge. Final Act. 7 (citing Palumbo ¶ 29). The Examiner further finds that Palumbo fails to disclose “reducing a quantity of particulates and free moisture entrained in the gas stream by passing the gas stream that exits the first media through a filtration stage,” as claimed, and relies on Borray for this claim limitation, as applied to claim 1 *supra*. *Id.* at 8.

First, Appellants argue that Borray’s “knockout drum 18 is at the inlet to a gas collection blower, and is intended to remove particulates from an incoming landfill gas stream,” and also that “[t]here is no first media from which a gas stream exits before it enters the knockout drum 18.” App. Br. 11. However, for the reasons stated *supra*, we are not apprised of error in the Examiner’s reasoning that one skilled in the art would be led to configure Palumbo’s system to include a filtration stage directly upstream of Palumbo’s compressor to protect the compressor as taught by Borray. The Examiner’s proposed modification would

result in gas exiting Palumbo's hydrogen sulfide removal stage 101, which includes an iron stage as first media, before entering the filtration stage (or knockout drum 18).

Second, Appellants argue that "the knockout drum of Borray is not equivalent to the claimed filtration stage," because Borray's "knockout drum 18 is a large vessel that slows gases down and allows liquid to drop out of the gas stream," whereas the claimed filtration stage "includes a filter housing and mesh filter . . . that receives gas that has already passed through a first media." App. Br. 11 (citing Spec. ¶ 16). We are not persuaded by Appellants' argument, which as stated *supra*, argues limitations that are not recited in claim 16. *See* App. Br. 19 (Claims App.) (Claim 16 recites, in relevant part, "reducing a quantity of particulates and free moisture entrained in the gas stream by passing the gas stream that exits the first media through a filtration stage.")

Accordingly, we sustain the Examiner's rejection of independent claim 16. Appellants chose not to present separate arguments for the patentability of claims 17–22 depending from claim 16, and therefore, we also sustain the Examiner's rejection of claims 17–22. App. Br. 11.

#### *Claims 23–37*

Regarding independent claim 23, the Examiner finds, *inter alia*, that

Palumbo discloses a plurality of uses for the carbon dioxide removal stage permeate gas stream including being blended with gas discharged from the siloxane removal stage, or being directly used as regenerative gas, and then, . . . being sent to a flare . . . or generator set . . . , albeit not necessarily directly. Further Palumbo teaches disposing of waste gases in a flare or in an on-site electrical generator set, interchangeably at a plurality of processing stages.

Final Act. 13 (citing Palumbo ¶¶ 29, 30, Figs. 1, 2). The Examiner reasons that it would have been obvious "to utilize otherwise wasted permeate in an electrical

generator set or direct use component at any stage as desired, as such potential utilization is generally taught by Palumbo.” *Id.*

Appellants argue, *inter alia*, that “the Examiner provides no foundation or support as to why the system of Palumbo would in any way be modified to include the specific structure and permeate lines claimed in claim 23.” App. Br. 12.

Appellants submit that “the permeate stream 9 in Palumbo is specifically intended to be recycled.” *Id.* (citing Palumbo ¶ 29, Fig. 2 (permeate stream 9)). Appellants further submit that “there is no indication in Palumbo that permeate is directed to the generator set 113,” and that “[r]ather, a product gas stream 8 (from the PSA vessel 108 that separates nitrogen) is directed to the generator set 113.” *Id.*

A preponderance of evidence does not support the Examiner’s finding.

Paragraph 29 of Palumbo discloses that

[t]he reject stream of gas, called permeate, is rich in carbon dioxide and of very low pressure, and is either recycled back to the inlet of the compressors (102) [(stream 9 as depicted in Figure 2)] or used as the regenerative gas for the PSA’s . . . and then sent to the thermal oxidizer or enclosed flare as stream 10.

Paragraph 29 also discloses that

[s]tream 2 then enters pressure swing adsorbent (PSA) vessels (104) for removal of water and nearly all non methane organic compounds (NMOC’s) and volatile organic compounds (VOC’s) utilizing adsorbents specifically selected for this purpose. When regenerated, the PSA’s utilize either ambient air or the CO2 rich permeate stream . . . and this gas stream 10 containing the collected VOC’s and NMOC’s is sent to an enclosed flare or thermal oxidizer (110).

Paragraph 30 of Palumbo discloses that

[t]he PSA’s used for nitrogen rejection (108) are regenerated by pulling a vacuum on the adsorbent beds. This gas, stream 8, contains approximately 35% methane and may be either flared in the thermal oxidizer (110) or utilized such as in on-site generation units (113),

usually reciprocating engines to assist in powering the process equipment.

Thus, Palumbo discloses that stream 8 (from nitrogen rejection stage 108 and containing methane), *not* stream 9 (from process membranes 106 and containing CO<sub>2</sub> rich permeate), may be utilized in on-site generation units 113. Further, the Examiner's position that at least some permeate indirectly becomes part of stream 9 for use in on-site generation units 113 is also not supported by Palumbo, which discloses that stream 9 is recycled back to the inlet of the compressors 103, which is upstream of membranes 106 that remove CO<sub>2</sub> and create the permeate stream. In other words, the permeate is not blended with a stream downstream of membranes 106, such that the permeate reaches on-site generation units 113. We agree with Appellants that the Examiner also fails to adequately support the conclusion that it would have been obvious to send permeate directly to an electrical generator set or a direct-use component<sup>4</sup>, because Palumbo teaches that it is known to use waste streams (i.e., stream 9) in on-site generation units.

Accordingly, we do not sustain the Examiner's rejection of independent claim 23 and claims 24–37 depending therefrom.

*Independent claim 38 and dependent claims 39–42*

Similar to independent claim 23, independent claim 38 recites, in relevant part

directing the permeate gas stream . . . either directly to at least one of an electrical generator set and a direct-use component, or to a junction

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<sup>4</sup> The Specification discloses that “the methane percentage at this point may be high enough to fuel a stationary prime mover driving an electric generator or burned in a boiler or furnace (i.e., ‘direct use’).” Spec. ¶ 25. Thus, re-use in the system by recycling stream 9 into compressors 103 does not meet the definition of “direct use.”

where the permeate gas stream is blended with gas discharged from the siloxane removal stage and then sent directly into the at least one of an electrical generator set and a direct-use component.

App. Br. 24 (Claims App.). The Examiner relies on the same findings as relied upon in the rejection of claim 23 to reject claim 38. Final Act. 13.

Accordingly, for the same reasons stated *supra*, we also do not sustain the Examiner's rejection of independent claim 38 and claims 39–42.

#### DECISION

The Examiner's rejection of claims 1–22 under 35 U.S.C. § 103(a) is affirmed.

The Examiner's rejection of claims 23–42 under 35 U.S.C. § 103(a) is reversed.

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-IN-PART