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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|-------------|----------------------|---------------------|------------------|
| 13/429,794 | 03/26/2012 | Wayne W. Simmons | 026757-0030P | 5848 |
| 34284 | 7590 | 11/30/2016 | EXAMINER | |
| Rutan & Tucker, LLP 611 ANTON BLVD SUITE 1400 COSTA MESA, CA 92626 | | | MERKLING, MATTHEW J | |
| | | | ART UNIT | PAPER NUMBER |
| | | | 1725 | |
| | | | NOTIFICATION DATE | DELIVERY MODE |
| | | | 11/30/2016 | ELECTRONIC |

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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte WAYNE W. SIMMONS,
SIDNEY P. WHITE, and CHRISTOPHER PERKINS

Appeal 2015-008285
Application 13/429,794
Technology Center 1700

Before KAREN M. HASTINGS, GEORGE C. BEST, and
N. WHITNEY WILSON, *Administrative Patent Judges*.

HASTINGS, *Administrative Patent Judge*.

DECISION ON APPEAL

Pursuant to 35 U.S.C. § 134(a), Appellants¹ appeal from the Examiner's decision finally rejecting claims 1–15. We have jurisdiction over the appeal under 35 U.S.C. § 6(b).

We AFFIRM-IN-PART.

Claim 1 is illustrative of the claimed subject matter (emphasis added to highlight key limitations):

1. *A multiple stage synthesis gas generation system, comprising:
a radiant high heat-flux reactor having one or more feed lines, an exit, one or more enclosed spaces, a cavity with an inner*

¹ The real party in interest is stated to be Sundrop Fuels, Inc. (Appeal Br. 3).

wall, two or more reactor tubes, one or more gas fired burners, and *a first control system that is part of one or more control systems*, wherein the one or more feed lines are configured to supply biomass particles to the radiant high heat-flux reactor, where the radiant high heat-flux reactor is configured to react the biomass particles in a biomass gasification reaction in the radiant high heat-flux reactor at greater than 950 degrees C, via primarily due to a radiant heat emitted from the radiant high heat-flux reactor, to produce reactant products including ash and syngas components of hydrogen and carbon monoxide coming out of the exit of the radiant high heat-flux reactor, where the radiant high heat-flux reactor has the one or more enclosed spaces in which the biomass particles undergo the biomass gasification reaction, the cavity with the inner wall encloses the two or more reactor tubes and a geometric configuration of the reactor tubes to the cavity wall shapes a distribution of incident radiation, where the two or more reactor tubes are configured to both i) form a seal to prevent gaseous exchange between the enclosed space and the cavity and ii) separate the particles of biomass being gasified in the enclosed space from an external heat source such that heat energy is exchanged by primarily absorption and re-radiation of radiant heat between the inner wall of the cavity and multiple reactor tubes to drive the biomass gasification reaction of the particles of biomass, and the one or more gas fired burners that couple to the high heat-flux reactor provide the external heat source separated from the one or more enclosed spaces where the biomass particles undergo the biomass gasification reaction in order to decompose the biomass particles in the biomass gasification reaction rather than combust or partially oxide the biomass particles to provide heat energy to sustain the biomass gasification reaction;

a hydrocarbon reforming reactor having one or more feed lines to supply a methane-based gas, an exit, and a second control system that is part of the one or more control systems, where the hydrocarbon reforming reactor is configured to receive the methane-based gas from the one or more feed lines, where the hydrocarbon reforming reactor is in parallel to and cooperates with the radiant high heat-flux reactor to produce a high quality syngas mixture for organic liquid product synthesis between the

resultant reactant products coming from the two reactors, wherein the hydrocarbon reforming reactor is configured to reform the methane-based gas, *wherein the hydrocarbon reforming reactor provides from the exit of the hydrocarbon reforming reactor 1) hydrogen gas, 2) a hydrogen-rich syngas composition, in which a ratio of hydrogen-to-carbon monoxide is higher than a ratio generally needed for organic liquid product synthesis, and 3) any combination of the two, to be mixed with a potentially carbon-monoxide-rich syngas composition from the exit of the radiant high heat-flux reactor, in which a ratio of carbon monoxide to hydrogen is higher than the ratio generally needed for organic liquid product synthesis, to provide a required hydrogen-to-carbon monoxide ratio for organic liquid product synthesis; and*

a common input into an organic liquid product-synthesis-reactor-train coupled downstream of the hydrocarbon reforming reactor and the radiant high heat-flux reactor that is configured to receive a first stream of the 1) hydrogen gas, 2) a hydrogen-rich syngas composition, and 3) any combination of the two from the exit of the hydrocarbon reforming reactor and a separate second stream of the carbon-monoxide-rich syngas composition from the exit of the radiant high heat-flux reactor, where the one or more control systems monitor a chemical composition feedback signal of the first stream and the second stream of the carbon-monoxide-rich syngas composition from one or more sensors to produce a high quality syngas mixture for organic liquid product synthesis to occur in the organic liquid product-synthesis-reactor-train.

The Examiner maintains the rejection² of claims 1–15 under 35 U.S.C. § 112, ¶ 2, as indefinite for failing to particularly point out and distinctly claim the subject matter of:

(a) “a second control system that is part of the one or more control systems” (Final Act. 2); and

(b) “wherein the hydrocarbon reforming reactor provides 1) hydrogen gas, 2) a hydrogen-rich syngas composition, in which a ratio of hydrogen-to-carbon monoxide is higher than a ratio generally needed for organic liquid product synthesis, **and/or** (depending on claims 1 or 2) 3) any combination of the two, to be mixed with a potentially carbon-monoxide-rich syngas composition . . .” (*id.* at 3 (original emphasis)).

Appellants make separate substantive arguments in support of patentability of independent claims 1 and 2 only (*id.* at 9; *see generally id.* at 18–23). Accordingly, our discussion will focus on the obviousness rejection of independent claims 1 and 2. Appellants group dependent claims 14 and 15 together (*id.* at 9), but do not make separate substantive arguments for these claims (*see generally id.* at 9–23). Accordingly, claims 1 and 3–15 stand or fall together. 37 C.F.R. § 41.37(c)(1)(iv).

² The Examiner has withdrawn the rejection of claims 1 and 3–13 under 35 U.S.C. § 103(a) as unpatentable over Fong et al. (US 5,496,859, issued Mar. 5, 1996) in view of Weimer et al. (US 2008/0086946 A1, published Apr. 17, 2008), Pearson (US 6,767,375 B1, issued July 27, 2004), and Bharathan (US 5,417,052, issued May 23, 1995) made in the Final Office Action (Ans. 2).

ANALYSIS

Rejection of subject matter limitation (a) under 35 U.S.C. § 112, ¶ 2

During prosecution, “the PTO applies to the verbiage of the proposed claims the broadest reasonable meaning of the words in their ordinary usage as they would be understood by one of ordinary skill in the art, taking into account whatever enlightenment by way of definitions or otherwise that may be afforded by the written description contained in the applicant’s specification.” *In re Morris*, 127 F.3d 1048, 1054 (Fed. Cir. 1997). Claims are definite if they “set out and circumscribe a particular area with a reasonable degree of precision and particularity. It is here where the definiteness of the language employed must be analyzed—not in a vacuum, but always in light of the teachings of the prior art and of the particular application disclosure as it would be interpreted by one possessing the ordinary level of skill in the pertinent art.” *In re Moore*, 439 F.2d 1232, 1235 (CCPA 1971).

The Examiner has rejected claims 1–15 under 35 U.S.C. § 112, ¶ 2 on the grounds that it is not clear in independent claim 1 how there can be one control system in the multiple stage synthesis gas generation system, if the claimed system also includes a second control system (Final Act. 2).³

Upon consideration of the Examiner’s findings, the evidence on this record and the arguments advanced by Appellants, the preponderance of evidence weighs in favor of a conclusion that the claims comply with the requirement to particularly point out and distinctly claim the subject matter.

³ Although the Examiner advises that a “simple name change of the control systems would help in clarifying this issue” (Ans. 3), the Examiner does not explicitly identify suitable language for amending the claim.

In particular, Appellants’ arguments are persuasive that the skilled artisan would clearly understand the meaning of claim 1 because these claims recite a multiple stage synthesis gas generation system comprised of other sub-systems such as: (i) a radiant high heat-flux reactor having a first control system and (ii) a hydrocarbon reforming reactor having a second control system (Appeal Br. 11). Claim 1 further recites that each of these control systems is part of the one or more control systems (*id.*). The Specification refers to a singular computerized control system, which may be multiple controls systems that interact with each other (*see, e.g.*, Spec. ¶ 78) (*see also* Appeal Br. 12–13).⁴ Thus, we find that a person of ordinary skill in the art would understand in light of the Specification that the claims, which recite the limitation “a second control system that is part of the one or more control systems,” recite how a singular (or more) control system(s) may include multiple individual sub-control systems that interact with each other.

Rejection of subject matter limitation (b) under 35 U.S.C. § 112, ¶ 2

A “Markush” claim reciting a list of alternatively useable species is permitted if the claim presents no uncertainty or ambiguity with respect to the question of scope or clarity of the claims. *See generally In re Harnisch*, 631 F.2d 716, 719–21 (CCPA 1980).

When materials recited in a claim are so related as to constitute a proper Markush group, they may be recited in the conventional manner, or alternatively. For example, if ‘wherein R is a material selected from the group consisting of A, B, C and D’ is a proper

⁴ The Specification further refers to one (or more) control system(s), which the gasifier reactor control system and the SMR control system may be part of (*see, e.g.*, Spec. ¶ 22) (*see also* Appeal Br. 13).

limitation then ‘wherein R is A, B, C or D’ shall also be considered proper.

Harnisch, 631 F.2d at 723.

The Examiner also rejected claims 1–15 under 35 U.S.C. § 112, ¶ 2 on the grounds that it is not clear what the composition of the gas stream is exiting from the hydrocarbon reformer reactor (Ans. 3; *see also* Final Act. 3). The Examiner’s de facto position is that, in either independent claim 1 or 2, the recitation of hydrogen in: 1) the hydrogen gas, 2) the hydrogen-rich syngas composition, and/or (depending on claims 1 or 2) 3) any combination of the two, is redundant because “hydrogen rich syngas inherently contains hydrogen” (Final Act. 3).⁵

Upon consideration of the Examiner’s findings, the evidence on this record and the arguments advanced by Appellants, the preponderance of evidence weighs in favor of a conclusion that claim 1 does not comply with the requirement to particularly point out and distinctly claim the subject matter. We, however, further determine that claim 2 does comply with this requirement. We address each claim in order below.

Appellants argue, *inter alia*, that the Examiner’s rejection should be reversed because: (i) “[c]laim 1 recites a Markush group of chemical members” (Appeal Br. 19) and (ii) “[t]he mere fact that a compound, such as hydrogen, may be embraced by more than one member of a Markush group is not a proper basis or concern under [35 U.S.C. § 112, ¶ 2] even though ‘hydrogen’ may be generic to ‘*synthesis gas*’” (*id.* at 21–22 (original emphasis)).

⁵ Although the Examiner advises that a “such clarity issues [in claim 2] can be remedied by a simple amendment” (Ans. 4), the Examiner does not identify suitable language for amending the claim.

Appellants' arguments are not persuasive that the skilled artisan would clearly understand claim 1 because the claim does not recite a list of alternatively useable species in proper "Markush" format. Claim 1 recites the limitation "wherein the hydrocarbon reforming reactor provides . . . 1) hydrogen gas, 2) a hydrogen-rich syngas composition . . . , and 3) any combination of the two" (emphasis added). As currently drafted, there is no language requiring that the emitted gases *are selected from the group consisting of* 1) hydrogen gas, 2) a hydrogen-rich syngas composition, and 3) any combination of the two. *Harnisch*, 631 F.2d at 723. Thus, we find that a person of ordinary skill in the art would not understand that the claims recite a list of alternatively useable gases, which exit from the hydrocarbon reforming reactor.

Accordingly, we affirm the rejection of claims 1 and 3–15 under 35 U.S.C. § 112, ¶ 2.

On the other hand, Appellants' arguments (Appeal Br. 23) are persuasive that the skilled artisan would clearly understand claim 2 because this claim recites, in proper "Markush" format, *see Harnisch*, 631 F.2d at 723, the limitation "wherein the hydrocarbon reforming reactor provides from the exit of the hydrocarbon reforming reactor 1) hydrogen gas, 2) a hydrogen-rich syngas composition, in which a ratio of hydrogen-to-carbon monoxide is higher than a ratio generally needed for organic liquid product synthesis, or 3) any combination of the two." The Specification refers to a proper hydrogen-to-carbon monoxide ratio necessary for high quality methanol synthesis of 2.3:1 to 3.0:1 (*see, e.g., Spec. ¶ 26*) (*see also* Appeal Br. 20). Appellants persuasively argue that "the hydrogen-rich *synthesis gas composition* already has a [distinguishing] feature present in the claim

language from the first member (hydrogen gas) of the Markush group” because the syngas has at least hydrogen and carbon monoxide (Appeal Br. 20–21 (original emphasis)). Thus, we find that a person of ordinary skill in the art would understand that claim 2 recites a list of alternatively useable gases, which exit from the hydrocarbon reforming reactor, in light of the Specification.

Accordingly, we reverse the rejection of claim 2 under 35 U.S.C. § 112, ¶ 2.

DECISION

The Examiner’s decision is affirmed-in-part.

TIME PERIOD

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(1).

ORDER

AFFIRMED-IN-PART