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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte ESMAEEL NAEEMI, MANGESH BORE, DAVID G. O'CONNER, and ROBERT NELSON

Appeal 2015-006286
Application 12/610,322[1]
Technology Center 1700

Before: MARK NAGUMO, CHRISTOPHER C. KENNEDY, and AVELYN M. ROSS, *Administrative Patent Judges*.

ROSS, *Administrative Patent Judge*.

DECISION ON APPEAL[2]

Appellants appeal under 35 U.S.C. § 134(a) from a rejection of claims 12–15. We have jurisdiction under 35 U.S.C. § 6(b).

We REVERSE.

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[1] Appellants identify the real party in interest as Asemblon, Inc. Appeal Br. 1.

[2] In our Decision below we refer to the Specification filed November 1, 2009 (as amended June 19, 2013) (Spec.), the Final Office Action mailed February 12, 2014 (Final Act.), the Appeal Brief filed January 21, 2015 (Appeal Br.), the Examiner's Answer mailed April 2, 2015 (Ans.), and the Reply Brief filed June 8, 2015 (Reply Br.).

STATEMENT OF CASE

The claims are directed to a process for recovery of usable hydrogen from a dehydrogenation reaction. Spec. 1. Claim 12, reproduced below, is illustrative of the claimed subject matter:

> 12. A process for the delivery of hydrogen from an organic compound capable of reversible hydrogenation/dehydrogenation wherein the organic compound is initially in its hydrogenated form and subsequently catalytically dehydrogenated under dehydrogenation conditions in a reactor forming hydrogen and byproduct dehydrogenated organic compound, comprising:
>
> (a) introducing the organic compound capable of reversible hydrogenation/dehydrogenation in liquid form to a microchannel reactor incorporating a dehydrogenation catalyst;
>
> (b) vaporizing the organic compound in a vaporizer;
>
> (c) effecting dehydrogenation of the organic compound
>
> (d) recovering a reaction product comprised of a byproduct dehydrogenated organic compound and gaseous hydrogen; and
>
> (e) separating and recovering the reaction product comprised of the dehydrogenated organic compound and gaseous hydrogen into a gaseous hydrogen fraction and liquid phase byproduct dehydrogenated organic compound.

Claims Appendix at Appeal Br. 36.

REJECTIONS

The Examiner maintains the following rejections:

A. Claims 12 and 13 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Ratner[3] in view of Forquy[4] and Tonkovich.[5] Final Act. 2.

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[3] Ratner et al., US 7,186,396 B2, issued March 6, 2007 ("Ratner").
[4] Forquy et al., US 5,166,362, issued November 24, 1992 ("Forquy").
[5] Tonkovich et al., US 6,616,909 B1, issued September 9, 2003 ("Tonkovich").

B. Claims 14 and 15 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Ratner in view of Forquy and Tonkovich, and further in view of TeGotenhuis.[6] *Id.* at 5.

Appellants seek our review of the Examiner's rejections of claims 12–15 (Rejections A and B). As will be seen, we need discuss only claim 12, the sole independent claim, to resolve all issues on appeal.

OPINION

The Examiner rejects claim 12 as obvious in view of Ratner, Forquy and Tonkovich. Final Act. 2. The Examiner finds that "Ratner discloses a method for hydrogen storage and delivery (title), wherein hydrogen production compounds, such as organothiol compounds, are reacted with a reactive metal substrate to produce hydrogen gas (abstract)." *Id.* The Examiner also finds that Ratner teaches that one exemplary embodiment of the thiol compound is tetrahydrothiophene (THT), an unsubstituted cyclic thioether. *Id.* at 3. The Examiner finds that the method of Ratner results in hydrogen and spent compounds that can be rehydrogenated and reused for additional hydrogen production. *Id.* The Examiner acknowledges that Ratner does not teach that the organic compounds are subject to vaporization prior to dehydrogenation but finds that Forquy teaches dehydrogenation of THT by passing a *gaseous stream* over a catalyst. *Id.* The Examiner reasons that it would have been obvious to the person skilled in the art to utilize the gas feed of Forquy "as Forquy explicitly teaches that such a reaction will effectively dehydrogenate THT." *Id.* at 4. The Examiner

[6] TeGrotenhuis et al., US 2003/0180216 A1, published September 25, 2003 ("TeGrotenhuis").

further reasons that is would have been obvious "to utilize an additional apparatus to manipulate either the temperature and/or pressure of the THT of Ratner, as combined with Forquy, in order to achieve the gaseous state of said THT. Such an apparatus is considered to constitute a vaporizer." *Id.* And while neither Ratner nor Forquy "describe[] [the] detail[s] of the reactor itself[,] Tonkovich teaches general methods and apparatus for obtaining enhanced production rate of thermal chemical reactions (title), which utilize microchannel reactors (abstract)." *Id.*

Appellants present multiple arguments in opposition to the Examiner's rejections, including that neither Ratner nor Forquy teach a vaporizer and there is no teaching or suggestion "that Forquy's gas-phase processing and catalyst could be used in Ratner's disclosed apparatus [utilizing a liquid feed] . . . and no scientific reason for assuming or proposing any way to import any teaching of Forquy into Ratner's process and apparatus." Appeal Br. 17–18. Because we find these arguments persuasive, we need not address the remainder of Appellants' arguments.[7]

Setting forth a prima facie case of obviousness requires establishing that the applied prior art would have provided one of ordinary skill in the art with an apparent reason to modify the prior art to arrive at the claimed invention. *See KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 418 (2007). In the absence of a proper prima facie case of obviousness, an applicant who complies with the other statutory requirements is entitled to a patent. *In re*

[7] It is Appellants' burden to show by a preponderance of the evidence harmful error in the Examiner's rejection. Here, the nature and extent of Appellants' ad hominem attacks nearly obscure those arguments having technical merit. *See e.g.*, Appeal Br. 9, 18, 19, 20, 25, 28, and 33; Ans. 5 and 6.

Rouffet, 149 F.3d 1350, 1355 (Fed. Cir. 1998); *see also In re Oetiker,* 977 F.2d 1443, 1445 (Fed. Cir. 1992).

In this instance, we find first that the preponderance of the evidence supports Appellants' argument that neither Ratner nor Forquy expressly teaches use of a vaporizer. Moreover, we find that the Examiner has not articulated a reason why one of ordinary skill in the art would have been led to modify the reactor of Ratner to add a vaporizer that converts Ratner's liquid feed into a gaseous feed, like that of Forquy. The Examiner's rationale that a person skilled in the art would find such modification obvious because "Forquy explicitly teaches that such a reaction [in a gaseous state] will effectively dehydrogenate THT" (Final Act. 4), in essence reasons that because a gas feed works in one reactor (e.g., Forquy), it can be substituted for a liquid feed in another reactor (e.g., Ratner). Such reasoning falls short of providing a reason to utilize a gas feed and similarly fails to show why the skilled artisan would have reasonably expected success in the proposed modification of Ratner's reactor. *In re Vaeck*, 947 F.2d 488, 493 (Fed. Cir. 1991) ("Both the suggestion and the reasonable expectation of success must be founded in the prior art, not in the applicant's disclosure.").

The Examiner's additional findings regarding claims 13–15 do not address the deficiencies identified above. In view of the foregoing, we are constrained to reverse the rejections of each of the claims.

CONCLUSION

The Examiner reversibly erred in rejecting claims 12–15 as unpatentable over of Ratner, Forquy, and Tonkovich, and further in view of TeGrotenhuis, as applied to claims 14 and 15.

DECISION

For the above reasons, the Examiner's rejection of claims 12–15 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)(1).

REVERSED