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EXAMINER

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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte BRUCE LOGAN

Appeal 2015-004973
Application 12/765,192
Technology Center 1700

Before: CHRISTOPHER C. KENNEDY, JULIA HEANEY, and
AVELYN M. ROSS, *Administrative Patent Judges*.

ROSS, *Administrative Patent Judge*.

DECISION ON APPEAL¹

Appellant² appeals under 35 U.S.C. § 134(a) from a rejection of claims 1–10, 12–15, and 27–28. We have jurisdiction under 35 U.S.C. § 6(b).

We AFFIRM.

¹ In our Decision below we refer to the Specification filed April 22, 2010 (Spec.), the Final Office Action appealed from mailed February 28, 2014 (Final Act.), the Appeal Brief filed August 8, 2014 (Appeal Br.), the Examiner's Answer mailed January 28, 2015 (Ans.), and the Reply Brief filed March 30, 2015 (Reply Br.).

² Appellant identifies the real party in interest as The Penn State Research Foundation, the assignee of the instant application. Appeal Br. 1.

STATEMENT OF CASE

The claims are directed to desalination methods. Spec. ¶ 2. Specifically, the invention teaches a desalination process for wastewater treatment that includes generating an electronic potential between the anode and cathode using anodophilic bacteria. *Id.* at 4. Claim 1, reproduced below, is illustrative of the claimed subject matter:

1. A desalination process, comprising:
 - providing a system for desalination, comprising a reaction chamber having a wall defining an interior of the reaction chamber and an exterior of the reaction chamber; an anode at least partially contained within an anode compartment of the reaction chamber; a plurality of anodophilic bacteria disposed in the anode compartment; a cathode at least partially contained within a cathode compartment of the reaction chamber, wherein the cathode is an air cathode; a conductive conduit for electrons in electrical communication with the anode and the cathode; a saline material compartment disposed between the anode compartment and the cathode compartment; a first anion selective barrier disposed between the saline material compartment and the anode compartment such that anions moving from the saline material compartment traverse the first anion selective barrier to a compartment adjacent an anion selective barrier and cations are substantially prevented from moving from the saline material compartment to the compartment adjacent an anion selective barrier; and a first cation selective barrier disposed between the saline material compartment and the cathode compartment to a compartment adjacent a cation selective barrier such that cations moving from the saline material compartment traverse the first cation selective barrier and anions are substantially prevented from moving from the saline material compartment to the compartment adjacent a cation selective barrier;
 - introducing a material oxidizable by an oxidizing activity of the anodophilic bacteria;
 - incubating the material oxidizable by the anodophilic bacteria under oxidizing reactions conditions such that electrons

are produced and transferred to the anode, generating a potential between the anode and cathode; and
introducing a saline material into the saline material compartment.

Claims Appendix at Appeal Br. 7.

REJECTIONS

The Examiner made the following rejections:

- A. Claims 1–10, 12–13, 15, and 27–28 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Hamano³ in view of Logan.⁴ Final Act. 3.
- B. Claim 14 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Hamano in view of Logan and further in view of Beatty.⁵ *Id.* at 13.

Appellant seeks our review of Rejections A–B. Appellant presents argument directed to independent claim 1 and provides no additional argument as to claims 2–10, 12–15, and 27–28 separate from what is argued for claim 1. Appeal Br. 5–6. Therefore, we focus our discussion below on claim 1 (Rejection A) to resolve the issues on appeal.

OPINION

The Examiner rejects claim 1, among others, as unpatentable over Hamano in view of Logan. Final Act. 3. The Examiner finds that Hamano

³ Toshikatsu Hamano, US 5,376,250, issued December 27, 1994 (hereinafter “Hamano”).

⁴ Bruce Logan, US 8,277,984 B2, issued October 2, 2012 (hereinafter “Logan”).

⁵ John C. Beatty, III, US 4,105,534, issued August 8, 1978 (hereinafter “Beatty”).

teaches a desalination process with a system having each of the claim limitations except

a plurality of anodophilic bacteria disposed in the anode compartment, that the cathode is an air cathode, introducing a material oxidizable by an oxidizing activity of the anodophilic bacteria, and incubating the material oxidizable by the anodophilic bacteria under oxidizing reaction conditions such that electrons are produced and transferred to the anode and potential is generated between the anode and the cathode.

Id. at 6. The Examiner finds that Logan teaches a microbial fuel cell having a similar reaction chamber that includes anodophilic bacteria in the anode compartment as well as a gas cathode. *Id.* at 6–7. The Examiner further finds that Logan teaches

introducing a material oxidizable by an oxidizing activity of the anodophilic bacteria, and incubating the material oxidizable by the anodophilic bacteria under oxidizing reaction conditions such (see column 4, lines 64-67) [, as well as] . . . oxidizing reaction conditions are such that electrons are produced and transferred to the anode (see column 1, lines 42-47), generating a potential between the anode and the cathode (see column 9, lines 62-63).

Id. at 6. The Examiner concludes that the person of ordinary skill would have reason to “use the apparatus taught by Hamano to practice a process similar to the process taught by Logan for generating electric current by the oxidation of organic matter by anodophilic bacteria placed in the anode chamber” because it would have been recognized “that the advantage of the modification would be to achieve desalination with reduction or elimination of [an] external power requirement.” *Id.* 7–8.

Appellant presents several arguments in opposition to the Examiner’s conclusion of obviousness. First, Appellant contends that taking the teachings of Hamano as a whole, would lead one skilled in the art away from

the claimed invention. Appeal Br. 4. Specifically, Appellant notes that the teachings of Hamano require “introducing ‘water containing hardly soluble salts’ into two electrodialysis blocks, a first block including cation exchange membranes and monovalent anion selective membranes and a second block including anion exchange membranes and monovalent cation selective membranes.” *Id.* Therefore, according to Appellant, the fact that Hamano made changes to “conventional electrolysis methods and apparatus to overcome the disadvantages thereof must also be considered in an analysis of whether one of skill in the art would find it obvious to modify the Hamano et al. reference in view of the cited Logan reference.” *Id.*

We disagree with Appellant’s contention that Hamano teaches away from the combination. “A reference may be said to teach away when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant.” *In re Gurley*, 27 F.3d 551, 553 (Fed. Cir. 1994). The teachings of a reference that arguably teaches away from a claimed feature must be weighed alongside the teachings of a cited reference that teaches the propriety of employing that feature. *Para-Ordnance Mfg., Inc. v. SGS Imps. Int’l, Inc.*, 73 F.3d 1085, 1090 (Fed. Cir. 1995).

Here, Hamano discusses problems with conventional electrodialysis processes where “hardly soluble salts” are present in the saline material. Hamano, col. 1, ll. 10–25 and 45–60. Specifically, when “hardly soluble salts,” such as calcium sulfate, are present, these salts often precipitate out “on the surface and at the inside of the cation exchange members and the anion exchange membranes facing the concentrating cells of the

electrodialysis apparatus.” *Id.* at ll. 45–52. Consequently, the ion exchange membranes may be destroyed and the electronic resistance of the electrodialysis apparatus, as a whole, is reduced. *Id.* at ll. 52–59. However, and as the Examiner notes, while “Hamano solves the problem of precipitation of ‘hardly soluble salt’ Hamano does not preclude or teach away from treating water that does not have ‘hardly soluble salts.’” Ans. 19. Therefore, we find no reversible error in the Examiner’s findings and conclusions.

Second, Appellant notes that Hamano teaches a solution that “require[s] a use of two electrodialysis ‘blocks,’ each containing a specified combination of membranes, i.e. a first block including cation exchange membranes and monovalent anion selective membranes and a second block including anion exchange membranes and monovalent cation selective membranes.” Appeal Br. 4. Thus, Appellant argues, the combination of Hamano and Logan would not achieve the instant invention because Hamano “require[s] circulation of material to be desalinated through both of the two described electrodialysis ‘blocks’ in order to achieve their goal of preventing precipitation of a ‘hardly soluble salt’ onto the surface and on the inside of the ion exchange membranes.” *Id.* at 4–5.

On this record, Appellant has not apprised us of reversible error by the Examiner. As the Examiner aptly explains, “the method taught by Hamano would allow desalination of water, whether it contains ‘hardly soluble salts’ or not, and the apparatus taught by Hamano would also be capable of desalinating water that does not contain ‘hardly soluble salts.’” Ans. 19–20. Moreover, the Examiner finds that several embodiments of Hamano do not require two electrodialysis blocks. *Id.* at 20. Appellant does not dispute the

Examiner's finding, and we therefore adopt this finding as fact. *Cf. In re Kunzmann*, 326 F.2d 424, 425 n.3 (CCPA 1964) ("Since appellant has not shown this finding to be clearly erroneous, we accept it as fact.").

Third, Appellant presses that "Hamano et al. are abiotic and therefore do not include living organisms" and that "modification of an inorganic chemical process to include living organisms is neither simple not obvious." Appeal Br. 5; *see also* Reply Br. 1. As a result, one of skill in the art "would not find a suitable basis for expectation that combination with the Hamano et al. reference would work and it is only with hindsight that the present assertion of obviousness is made." Appeal Br. 5.

Without more, we find no reversible error. As the Examiner finds, "Logan clearly teaches how to modify a similar inorganic chemical process, i.e., the process to generate hydrogen, to include living organisms (see Logan, the whole document and column 9, line 58 to column 10, line 31)." Ans. 21. The Examiner also finds that the ion permeable barriers in Hamano are similar to the barriers of Logan and therefore concludes that "one of ordinary skill . . . would have had a reasonable expectation of success of the method of Hamano modified by introducing anodophilic bacteria in the anode chamber." *Id.* Appellant does not dispute these factual findings which we also accept as fact. *Kunzmann*, 326 F.2d at n.3. Thus, the Examiner's conclusion, based on these factual findings, adequately supports a conclusion of obviousness.

And lastly, Appellant argues that there exists no reasonable expectation of success in the combination of Hamano and Logan because Hamano contains a plurality of alternately arranged cation exchange

membranes and anion exchange membranes but Logan includes only one ion exchange membrane. Appeal Br. 5. Appellant argues that

one of skill in the art, understanding that the cited Logan reference describes and shows generation of protons at the anode and their passage to the cathode where they combine with electrons and oxygen to form water, would have no reasonable expectation that such a process would be possible in the apparatus and method of Hamano et al. since no means of passage of protons from the anode to cathode appears possible.

Appeal Br. 5. This is because an “impermeable barrier is present between the two electrodialysis “blocks” described and shown in Figure 1 of Hamano et al.” *Id.* And, Appellant urges that even if the barrier is not impermeable, the environment of Hamano will be changed and “one of skill in the art would have expected that exposure to the reaction conditions of Hamano would have significant consequences on living organisms, producing a non-physiological environment and decreasing or eliminating the metabolic functions of the bacteria critical for function of the system.” Reply Br. 2.

Appellant’s argument is not persuasive of reversible error. As the Examiner explains, a person skilled in the art would understand that the number of permeable membranes is immaterial “so long as there is a path for movement of the ions between the anode and the cathode of an electrolytic cell and the electrical circuit is completed.” Ans. 22. The Examiner also aptly finds that the “blocks” are not impermeable and that the partition “inherently must be an ion conducting partition in order for the electrodialysis apparatus of Fig. 1 to operate.” Ans. 23. Again, these findings are not challenged by Appellant and we therefore adopt them as fact. *Kunzmann*, 326 F.2d at n.3.

We are also unconvinced by Appellant's contention that the reaction conditions of Hamano "would have significant consequences on living organisms, producing a non-physiological environment and decreasing or eliminating the metabolic functions of the bacteria critical for function of the system." Reply Br. 2. Appellant provides no evidence supporting this assertion which is based instead on unsubstantiated attorney argument. Such attorney argument has low probative value. *See In re Geisler*, 116 F.3d 1465, 1470 (Fed. Cir. 1997). Attorney argument is not evidence. *In re Pearson*, 494 F.2d 1399, 1405 (CCPA 1974); *see also Estee Lauder Inc. v. L'Oreal, S.A.*, 129 F.3d 588, 595 (Fed. Cir. 1997) ("Counsel's argument cannot take the place of evidence lacking in the record."). Nor can such argument take the place of evidence lacking in the record. *Meitzner v. Mindick*, 549 F.2d 775, 782 (CCPA 1977).

Moreover, the use of a known element according to its established function to yield a predictable result—i.e., anodophilic bacteria to generate current—typically does not result in nonobvious subject matter. *See KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 416–21 (2007) ("The combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results."); *see also id.* at 416 ("[W]hen a patent claims a structure already known in the prior art that is altered by the mere substitution of one element for another known in the field, the combination must do more than yield a predictable result."). For reasons set forth above, Appellant's arguments do not persuade us otherwise in this case. Therefore, we affirm the Examiner's rejection.

CONCLUSION

The Examiner did not err in rejecting claims 1–10, 12–15, and 27–28.

DECISION

For the above reasons, the Examiner’s rejection of claims 1–10, 12–15, and 27–28 is affirmed.

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).

AFFIRMED