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Lawrence Livermore National Security, LLC LAWRENCE LIVERMORE NATIONAL LABORATORY PO BOX 808, L-703 LIVERMORE, CA 94551-0808			LEONG, JONATHAN G	
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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* MATTHEW SUSS, THEODORE F. BAUMANN,  
FRANCESCO FORNASIERO, MICHAEL STADERMANN, and  
JUAN G. SANTIAGO

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Appeal 2019-001339  
Application 14/024,540  
Technology Center 1700

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Before MICHELLE N. ANKENBRAND, *Acting Vice Chief Administrative Patent Judge*, DONNA M. PRAISS, and JEFFREY R. SNAY, *Administrative Patent Judges*.

PRAISS, *Administrative Patent Judge*.

DECISION ON APPEAL<sup>1</sup>

Appellant<sup>2</sup> appeals under 35 U.S.C. § 134(a) from the Examiner's decision rejecting claims 1–3 and 6–10. We have jurisdiction over the appeal under 35 U.S.C. § 6(b). We AFFIRM.

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<sup>1</sup> Our Decision refers to the Specification (“Spec.”) filed Sept. 11, 2013, the Examiner’s Final Office Action (“Final Act.”) dated July 23, 2018, Appellant’s Appeal Brief (“Appeal Br.”) filed Aug. 6, 2018, the Examiner’s Answer (“Ans.”) dated Oct. 26, 2018, and Appellant’s Reply Brief (“Reply Br.”) filed Nov. 29, 2018.

<sup>2</sup> We use the word “Appellant” to refer to “applicant” as defined in 37 C.F.R. § 1.42. Appellant identifies Lawrence Livermore National Security, LLC and the United States of America, as represented by the United States Department of Energy, as the real parties in interest. Appeal

## STATEMENT OF THE CASE

The invention “relates to energy harvesting and more particularly to energy harvesting with flow-through porous electrodes.” Spec. ¶ 2.

According to the Specification, conventional devices use flow-between electrodes, which results in diffusion-limited performance. *Id.* ¶ 3.

Conversely, the Specification discloses the use of flow-through electrodes that remove diffusion limitations and enable significant performance enhancements, such as a much higher power output than prior art flow-between systems. *Id.* ¶¶ 3, 6, 22.

Claim 1, reproduced below from the Claims Appendix to the Appeal Brief, is illustrative.

1. An energy harvesting apparatus utilizing a river that contains fresh water and a sea that contains salt water, comprising:

a river water intake, said river water intake located on the river wherein said river water intake intakes the fresh water contained in the river;

a sea water intake, said sea water intake located on the sea wherein said sea water intake intakes the salt water contained in the sea;

a first porous electrode having first pores wherein said first porous electrode is a first monolithic porous electrode;

a second porous electrode having second pores wherein said second porous electrode is a second monolithic porous electrode;

a non-conducting permeable separator between said first porous electrode and said second porous electrode;

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Br. 2. We note that inventor Juan G. Santiago executed an assignment to The Board of Trustees of the Leland Stanford Junior University. Assignment recorded Dec. 11, 2013, Reel 031671 / Frame 0458.

an electrical potential system for applying an electric potential difference between said first porous electrode, and said second porous electrode;

a fresh water line connected to said river water intake and connected to said first porous electrode having first pores;

a salt water line connected to said sea water intake on the sea and connected to said first porous electrode having first pores; and

an alternately connecting valve connected to said fresh water line and connected to said salt water line,

wherein said alternately connecting valve is operatively connected to said river water intake on the river by said fresh water line and provides the fresh water for flowing the fresh water from said river water intake through said first porous electrode having first pores, through said non-conducting permeable separator, and through said second porous electrode having second pores, and

wherein said alternately connecting valve is operatively connecting to said sea water intake on the sea by said salt water line and provides the salt water for flowing the salt water from said sea water intake through said first porous electrode having first pores, through said non-conducting permeable separator, and through said second porous electrode having second pores,

wherein the fresh water and the salt water flow through said first porous electrode having first pores, said second porous electrode having second pores, and said non-conducting permeable separator with said electrical potential system applying an electric potential difference between said first porous electrode, and said second porous electrode thereby harvesting energy from the fresh water and the salt water.

Independent claim 10 recites “[a]n energy harvesting apparatus utilizing a river that contains fresh water and a sea that contains salt water,” comprising, among other things, a river water intake, a sea water intake, a first porous electrode, a second porous electrode, a non-conducting

permeable separator, an electrical potential system, a fresh water line, a salt water line, and a valve. Each remaining claim on appeal depends from claim 1.

### ANALYSIS

We review the appealed rejection for error based upon the issues Appellant identifies, in light of the arguments and evidence produced thereon. *Ex parte Frye*, 94 USPQ2d 1072, 1075 (BPAI 2010) (precedential) (*cited with approval in In re Jung*, 637 F.3d 1356, 1365 (Fed. Cir. 2011) (“[I]t has long been the Board’s practice to require an applicant to identify the alleged error in the examiner’s rejections.”)). After considering the argued claims in light of the case law presented in this Appeal and each of Appellant’s arguments, we are not persuaded of reversible error in the Examiner’s rejection.

The Examiner rejects claims 1–3 and 6–10 under 35 U.S.C. § 103 as unpatentable over Suss<sup>3</sup> in view of Brogioli<sup>4</sup> and Appellant’s Admitted Prior Art<sup>5</sup> for the reasons provided on pages 3–8 of the Examiner’s Answer.

Appellant argues the claims together. Appeal Br. 7–28. Therefore, we confine our discussion to claim 1, which we select as representative. Claims 2, 3, and 6–10 stand or fall with claim 1. *See* 37 C.F.R. § 41.37(c)(1)(iv).

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<sup>3</sup> Matthew E. Suss et al., *Capacitive desalination with flow-through electrodes*, 5 Energy & Env’tl. Sci. 9511 (2012) (“Suss”).

<sup>4</sup> Dorian Brogioli, *Extracting Renewable Energy from a Salinity Difference Using a Capacitor*, 103 Physical Rev. Letters 058501 (2009) (“Brogioli”).

<sup>5</sup> The Examiner identifies Appellant’s Figure 1 and paragraphs 20 and 21 of the Specification as admitted prior art (“Appellant’s Admitted Prior Art”). Ans. 3.

The Examiner finds Suss discloses a first porous electrode, a second porous electrode, a non-conducting permeable separator, and an electrical potential system. Ans. 3–4. The Examiner finds Suss’s system flows water through the first porous electrode, through the separator, and through the second porous electrode. *Id.* at 4. The Examiner finds Suss does not disclose a river water intake, a sea water intake, a fresh water line, a salt water line, or an alternating connecting valve connected to the fresh water and salt water lines so, among other things, fresh water and salt water can flow through the first and second electrodes and separator, as claim 1 recites. *Id.* at 4–5.

The Examiner finds Brogioli discloses harvesting renewable energy from fresh water and salt water via a capacitor that is analogous to capacitive desalination devices. *Id.* at 5. According to the Examiner, Brogioli’s device includes an intake for fresh water, such as river water, an intake for salt water, such as sea water, a fresh water line connected to the fresh water intake, and a salt water line connected to the salt water intake. *Id.* The Examiner concludes it would have been obvious to modify Suss’s device to include a fresh water intake, a sea water intake, a fresh water line, and a sea water line so Suss’s device can harvest the renewable energy rivers and seas provide, as Brogioli teaches. *Id.* at 6. The Examiner notes that because Brogioli teaches river water as a fresh water source and sea water as a salt water source, it would have been obvious for one of ordinary skill in the art to obtain fresh water from a river and salt water from the sea by locating the respective intakes on a river and a sea. *Id.*

The Examiner finds Suss in view of Brogioli provides individual pumps for fresh water and sea water lines instead of an alternately

connecting valve, as claim 1 recites. *Id.* at 7. However, the Examiner finds Appellant's Admitted Prior Art, specifically Figure 1 and paragraphs 20 and 21 of the Specification, which describe Figure 1, demonstrates that such a valve was known. *Id.* The Examiner concludes it would have been obvious to one of ordinary skill in the art to use the alternately connecting valve instead of Brogioli's pumps as an alternative method for providing fresh water and salt water. *Id.*

The Examiner further finds the limitations "located on the river," "located on the sea," "for flowing the fresh water," "for flowing the salt water," regard intended uses (i.e., locations for intakes and uses for the valve) that Suss, as modified in view of Brogioli and Appellant's Admitted Prior Art, is capable of performing. *Id.* at 7–8.

Appellant contends the applied references do not teach or suggest the river water intake, fresh water line, sea water intake, or sea water line of claim 1 because Suss and Appellant's Admitted Prior Art do not disclose these limitations, Brogioli's Figure 3(a) shows only water reservoirs, and Brogioli in general does not teach or suggest these limitations. Appeal Br. 10–15, 20, 22–27; Reply Br. 3–4.

The test for obviousness is "whether the teachings of the prior art, taken as a whole, would have made obvious the claimed invention." *In re Gorman*, 933 F.2d 982, 986 (Fed. Cir. 1991). Here, the Examiner correctly finds that Brogioli discloses river water and sea water as sources and the reservoirs depicted in Brogioli's Figure 3(a) each include an intake, pump, and line (e.g., the tube leading from the intake opening within a reservoir to the pump for the reservoir). Ans. 9–10 (citing Brogioli Abstract, Figs. 1, 3(a)). Brogioli's Figure 1 identifies a low salinity water reservoir and a high

salinity water reservoir. Brogioli Fig. 1. Brogioli further explains that the different salt concentrations of the two water reservoirs represent salt and fresh water. *Id.* at 058501-1. Therefore, Brogioli, when considered as a whole, suggests using river water and sea water sources for a device which includes an intake and line for each water source type.

Appellant asserts the applied references do not teach or suggest the alternately connecting valve of claim 1 because “there is no question or argument that the Suss reference and the [Appellant’s Admitted Prior Art] AAA reference lack” this limitation, “[t]he Final Rejection does not have any portion that make[s] such an argument,” and Brogioli lacks the valve. Appeal Br. 16–17; Reply Br. 5–6. These arguments do not address the Examiner’s rejection. As noted above, the Examiner finds Appellant’s Admitted Prior Art discloses the alternately connecting valve of claim 1. Ans. 6. Appellant’s Figure 1, which is labeled “Prior Art,” includes valve 116 connected to fresh water source 112 and salt water source 114. The Specification explains prior art valve 116 switches between sources 112, 114 to provide alternating portions of fresh water and salt water to gap 108 between electrodes 102, 104. Spec. ¶ 20. The Examiner concludes it would have been obvious to use the alternately connecting valve instead of Brogioli’s pumps as an alternative method for providing fresh water and salt water. Ans. 7, 10–11. Such a rationale relies on the well-established principle that, for an improvement to be patentable, it must be more than the predictable use of prior art elements according to their established functions. *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 417 (2007).

Appellant also argues the applied references do not teach or suggest the electrical potential system of claim 1. Appeal Br. 17–18. Appellant’s

argument, however, merely recites the limitations of claim 1 regarding the electrical potential system with a generic denial that the applied references teach or suggest the limitations. *Id.* We and our reviewing court have long held that such “argument” does not merit separate consideration. *See, e.g., In re Lovin*, 652 F.3d 1349, 1357 (Fed. Cir. 2011) (“[W]e hold that the Board reasonably interpreted Rule 41.37 to require more substantive arguments in an appeal brief than a mere recitation of the claim elements and a naked assertion that the corresponding elements were not found in the prior art.”).

In addition, Appellant contends the proposed combination “would not produce an energy harvesting apparatus that could provide a commercially viable continuous and uninterrupted supply of energy” because Brogioli’s device “is strictly a laboratory experimental set up that could not possibly provide a commercially viable energy harvesting apparatus that would produce a continuous and uninterrupted supply of energy.” Appeal Br. 18–19. These arguments fail from the outset because they are not based on limitations set forth in the claims. *In re Self*, 671 F.2d 1344, 1348 (CCPA 1982). Claim 1 recites “[a]n energy harvesting apparatus” without limitation as to the amount of energy provided or whether the energy supplied is continuous. Moreover, Brogioli discloses the applicability of its device to exploit the flow of fresh water and salt water, like river water and sea water, based on the salinity difference as a completely renewable energy source. Brogioli 058501-1. Appellant has not provided persuasive evidence of a patentable difference in structure between the apparatus of claim 1 and that the prior art suggests.

Appellant argues there would not have been a reasonable expectation of success for Brogioli’s device to provide an energy supply based on

Brogioli's experimental laboratory set up. Appeal Br. 20. However, as the Examiner explains, Brogioli's device extracts renewable energy from the flows of fresh water and salt water. Ans. 12; Brogioli Abstract. Appellant's arguments are insufficient to demonstrate a lack of reasonable expectation that Brogioli's device would have succeeded in supplying energy.

Appellant argues there would not have been a reasonable expectation of success because the applied references "are differing systems with different interconnected components," noting the structures shown in drawings of each reference. Appeal Br. 19–20. Appellant contends that the Examiner has not provided valid reasons for combining the references because Suss is not directed to an energy harvesting apparatus, Appellant's Admitted Prior Art does not mention energy, and Brogioli is strictly an experimental laboratory set up that could not have reasonably provided an expectation of success for providing a supply of energy. Appeal Br. 21–22; Reply Br. 2–3.

These arguments are unpersuasive. The record supports the Examiner's finding (Ans. 6, 10, 12) that Brogioli teaches that its device is analogous in structure to capacitive desalination devices (e.g., Suss's device) and differs mainly in operation. Suss discloses a capacitive desalination device. Suss Title, 9511. Brogioli discloses a device for extracting renewable energy from water solutions of different salinity (e.g., river water and salt water). Brogioli Abstract. Brogioli states "[t]he device described in this Letter bears analogies also with the 'capacitive desalination' devices [13], in which electric energy is consumed, in order to remove salt ions from sea water" and "[a]ctually, the process reported here can be thought of as the reverse of capacitive desalination." *Id.* at 058501-2.

In other words, Brogioli not only teaches that its energy harvesting device and capacitive desalination devices (e.g., Suss's device) are analogous, but that the operation of capacitive desalination devices is essentially the reverse of harvesting energy from salt water and fresh water sources (i.e., the function of Brogioli's device). As a result, Brogioli's teachings would have provided a reasonable expectation of success that Suss's device as modified in view of Brogioli would have been capable of generating power. As noted above, the Examiner concludes it would have been obvious to modify Suss in view of Brogioli to provide an energy harvesting apparatus that extracts renewable energy from fresh water and sea water. Ans. 6, 12. Thus, the Examiner has "articulated reasoning with some rational underpinning" (i.e., Brogioli's teachings regarding the relationship between capacitive desalination devices and energy harvesting devices) to support the Examiner's legal conclusion of obviousness. *KSR*, 550 U.S. at 418.

In view of the above, Appellant's arguments do not identify a reversible error in the Examiner's § 103 rejection of claim 1 over Suss, Brogioli, and Appellant's Admitted Prior Art.

For these reasons and those the Examiner provides, we uphold the Examiner's rejection of claims 1–3 and 6–10 under 35 U.S.C. § 103 as obvious over Suss, Brogioli, and Appellant's Admitted Prior Art.

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).

CONCLUSION

In summary:

<b>Claims Rejected</b>	<b>35 U.S.C. §</b>	<b>Reference(s)/Basis</b>	<b>Affirmed</b>	<b>Reversed</b>
1-3, 6-10	103	Suss, Brogioli, Appellant's Admitted Prior Art	1-3, 6-10	

AFFIRMED