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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte NOZOMU IKUNO

Appeal 2019-005751
Application 14/906,419
Technology Center 1700

Before MAHSHID D. SAADAT, DONNA M. PRAISS, and
BRIAN D. RANGE, *Administrative Patent Judges*.

SAADAT, *Administrative Patent Judge*.

DECISION ON APPEAL

Pursuant to 35 U.S.C. § 134(a), Appellant¹ appeals from the Examiner's decision to reject claims 1–3 and 5–7, which are all the claims pending in this application.² We have jurisdiction under 35 U.S.C. § 6(b).

We AFFIRM.

¹ We use the word “Appellant” to refer to “applicant” as defined in 37 C.F.R. § 1.42(a). Appellant identifies the real party in interest as Kurita Water Industries LTD. Appeal Br. 2.

² Claim 4 has been canceled.

STATEMENT OF THE CASE

Introduction

Appellant's disclosure is directed to a method and apparatus "for removing boron from raw water in order to produce ultrapure water." Spec.

¶ 22. Claim 1 is illustrative of the invention and reads as follows:

1. A method for treating water containing boron, comprising:

passing water containing boron in a concentration of 10 to 100 $\mu\text{g/L}$ through a high-pressure reverse osmosis membrane device, thereby obtaining a boron-reduced water containing boron in a concentration of 0.5 – 8 $\mu\text{g/L}$;

passing the boron-reduced water subsequently through a regenerative ion-exchange device, thereby obtaining a boron-removed water containing boron in a concentration of $< 1 \text{ ng/L}$; and

passing the boron-removed water through a nonregenerative ion-exchange device,

wherein the water fed to the high-pressure reverse osmosis membrane device has a pH of 5 to 8,

the high-pressure reverse osmosis membrane device has a pure water permeate flux of 0.6 to 1.3 $\text{m}^3/\text{m}^2/\text{day}$ under an effective pressure of 2.0 MPa at 25°C, and

the high-pressure reverse osmosis membrane device has a NaCl rejection of 99.5% or more where the NaCl rejection is a rejection determined at 25°C under an effective pressure of 2.7 MPa using an aqueous NaCl solution having a NaCl concentration of 32000 mg/L.

The Examiner's Rejections

Claims 1 and 2 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Arba et al. (US 6,398,965 B1; issued June 4, 2002) and E. H. Ezechi et al. (*Boron in Produced Water: Challenges and Improvements*:

A Comprehensive Review, 12 J. Applied Sciences 402–415, 2012). *See* Final Act. 3–4.

Claim 3 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Arba, Ezechi, and Tanabe et al. (US 5,833,846; issued Nov. 10, 1998). *See* Final Act. 4–5.

Claims 5–7 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Arba. *See* Final Act. 5–6.

ANALYSIS

We disagree with Appellant’s arguments, and agree with and adopt the Examiner’s findings and conclusions in (i) the action from which this appeal is taken (Final Act. 3–6) and (ii) the Answer (Ans. 7–11) to the extent they are consistent with our analysis below.

Claims 1 and 2

The Examiner finds Arba discloses (1) A method of treating water containing boron, comprising; (2) passing water through a high-pressure reverse osmosis membrane; (3) passing water through regenerative ion-exchange device (electroionization); (4) passing water through a nonregenerative ion-exchange device (polisher unit that functions as a mixed bed deionization). Final Act. 3 (citing Arba Figs. 2B, 70–74; col. 4, ll. 18–20; col. 8, ll. 15–30, 53–64; col. 9, ll. 13–21; col. 10, ll. 27–30). The Examiner finds Arba does not teach or suggest NaCl rejection percentage of the membrane but asserts “the manner in which the membrane will perform under these testing conditions is a function of the membrane which is directly related to the properties of the membrane” because “[w]hen the structure recited in the reference is substantially identical to that of the

claims, claimed properties or functions are presumed to be inherent.” Final Act. 3–4 (citing *In re Schreiber*, 128 F.3d 1473, 1478 (Fed. Cir. 1997) and Manual of Patent Examining Procedure “MPEP” § 2112.01, I.). The Examiner further relies on Ezechi as disclosing reverse osmosis, regenerative ion-exchange, and the recited boron concentrations. Final Act. 4 (citing Ezechi pp. 3/19, 4/19, 11/19). According to the Examiner, one of ordinary skill in the art would have modified Arba with the reverse osmosis and regenerative ion-exchange with similar method and apparatus of treating water disclosed by Ezechi’s integrated system. Final Act. 4.

pH Argument

Appellant contends the Examiner erred because the pH level in the reverse osmosis (RO) unit “is maintained to be higher than 7.” Appeal Br. 7. With respect to Ezechi, Appellant argues the reference discloses that the pH of water supplied to the RO membrane is about 10.5, which is higher than the recited range. *Id.*

The Examiner responds by stating “Arba et al. teach in the abstract that pH of feed water to the water treatment unit is maintained above about 7 or below about 7 (abstract; col. 3, lines 54-67; col. 4, lines 52-57) to target specific basic or acidic components” and concludes that the disclosed PH “is about 7 which is included in the 5-8 pH range.” Ans. 8. The Examiner further explains that Ezechi was not relied upon as disclosing the recited pH range, but for its teachings of the reverse osmosis, regenerative ion-exchange, and the boron concentration. Ans. 9.

We agree with the Examiner that Arba discloses a first treating unit wherein the pH of the feedstream is below about 7 and above about 7 in a second treating unit. Arba Abstract; col. 3, ll. 54–68. Contrary to

Appellant's challenge to Arba and as further stated above by the Examiner, a pH of above 7 is within the recited pH range of 5–8. *See* Appeal Br. 7; Reply Br. 4. Based on the cited portions of the reference, the Examiner has shown that Arba maintains the pH between “below about 7” and “above about 7” and in a specific example between about 7 and 8. *See* Arba col. 13, ll. 5–8.

High Pressure Reverse Osmosis (RO) Argument

Appellant further contends the Examiner erred because “the RO membrane used in Example 1 of Arba is categorized in a low pressure RO membrane based on the operation pressure, contrary to the present application.” *Id.* Appellant relies on the exhibits submitted with the Appeal Brief. For example, Appellant's “Arba's Example 1” exhibit is a product specification for 4820HR cartridge, produced by Fluid Systems, Inc., of Arba's RO system which is mentioned in column 14, lines 33–40. Appellant further asserts Arba's RO membrane has an operating pressure of 1.55–3.1 kPa, “which falls in the low-pressure type RO on Table 1 on EXHIBIT (5),” whereas the RO membranes discussed in exhibits 1–4 and 9 are high pressure membranes, similar to the claimed RO membrane. Appeal Br. 9

The Examiner responds by pointing out “The RO membranes of EXHIBITS (1), (2), (3), (4) have the equivalent pressure as the present application.” Ans. 9. The Examiner further explains that Arba's membrane is a high-pressure RO membrane because its operating pressure is similar to the value disclosed by Appellant as a high-pressure RO membrane. Ans. 9–10. According to the Examiner, absent a specific definition for “high-pressure reverse osmosis membrane device,” the relative pressure can

indicate whether the RO membrane is a high-pressure membrane or not.

Ans. 10.

We agree with the Examiner that the filed exhibits describe an RO membrane having an operating pressure similar to that of Appellant's disclosed membrane, which Appellant identifies as a high-pressure RO membrane. We also agree with the Examiner that Appellant's Specification includes no precise definition or description for a high-pressure RO membrane. In that regard, we also rely on Appellant's recited pressure of 2.0 MPa and the description of such membrane in the Appeal Brief stating "[t]he effective pressure of the reverse osmosis membrane device is set at 2.0 MPa." Claim 1; Appeal Br. 6 (citing Spec. ¶ 20).

The exhibits identified by Appellant indicate the typical operating range of the membrane is 225–450 psi with a maximum operating pressure of 600 psi. That is, Arba uses a membrane having an operating range of about 1.6–3.1 MPa and a maximum operating pressure of about 4.5 MPa.³ As a result, the operating range of the membrane disclosed in Arba encompasses the value disclosed by Appellant for a high-pressure membrane. It is well settled that the disclosure of a range in the prior art which substantially overlaps a claimed range is generally sufficient in and of itself to render the claimed range prima facie obvious. *See In re Woodruff*, 919 F.2d 1575, 1578 (Fed. Cir. 1990); *In re Wertheim*, 541 F.2d 257, 262 (CCPA 1976); *In re Malagari*, 499 F.2d 1297, 1302 (CCPA 1974). Even without complete overlap of the claimed range and the prior art range, a minor difference shows a prima facie case of obviousness. *Haynes Int'l v. Jessop Steel Co.*, 8 F.3d 1573, 1577 n.3 (Fed. Cir. 1993).

³ The conversion is based on 1 MPa = 145 psi.

With respect to Appellant's discussion of EXHIBIT (5), we note that Appellant's Specification is the source of defining the claim terms, such as high-pressure RO membrane. The definitions provided in Appellant's EXHIBIT (5) notwithstanding, as discussed above, Appellant's Specification describes the claimed high-pressure RO membrane as one operating under an effective pressure of 2.0 MPa. Spec. ¶ 26; *see also* Appeal Br. 6.

Boron Concentration Argument

Appellant contends the Examiner erred because Ezechi fails to disclose the recited Boron concentration. Appeal Br. 10. The Examiner relied on page 2/19 of Ezechi as disclosing methods of water treatment for removing high concentration of Boron, which is described at Boron concentration of about "26-28 ppm." Final Act. 4. The Examiner further responds by explaining Ezechi provides a process for treating water with elevated Boron levels, which in combination with Arba's teachings, would achieve the recited levels. *See* Ans. 9.

We are unpersuaded of Examiner error. Appellant has not identified error in the Examiner's specific findings that providing water treatment for Boron-containing water that includes the recited high-pressure RO membrane and the specific pH levels would produce similar results as Appellant's disclosed water treatment, including "obtaining a boron-reduced water containing boron in a concentration of 0.5 – 8 µg/L." Claim 1. That is, consistent with Appellant's Specification, passing water through an arrangement similar to the recited RO membrane would achieve the claimed purpose or the specific boron concentration.

Accordingly, we sustain the Examiner's obviousness rejection of independent claim 1 and dependent claim 2.

Remaining Claims

Appellant argues the patentability of claims 3 and 5–7 based on the same arguments raised with respect to claim 1 rejection. *See* Appeal Br. 10. We, therefore, sustain the Examiner’s obviousness rejections of those claims.

DECISION SUMMARY

In summary:

Claims Rejected	35 U.S.C. §	Reference(s)/Basis	Affirmed	Reversed
1, 2	103	Arba, Ezechi	1, 2	
3	103	Arba, Ezechi, Tanabe	3	
5–7	103	Arba	5–7	
Overall Outcome			1–3, 5–7	

FINALITY AND RESPONSE

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