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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte MICHAEL D. HEIBEL, JORGE V. CARVAJAL, NICOLA G. ARLIA, MELISSA M. WALTER, ROBERT W. FLAMMANG, MICHAEL A. JAMES, and DAVID M. SUMEGO

Appeal 2019-003326
Application 15/066,607
Technology Center 3600

Before MICHAEL L. HOELTER, ANNETTE R. REIMERS, and LISA M. GUIJT, *Administrative Patent Judges*.

GUIJT, *Administrative Patent Judge*.

DECISION ON APPEAL

Appellant[1] appeals under 35 U.S.C. § 134(a) from the Examiner's rejection of claims 1–17. Final Act. 1. We have jurisdiction under 35 U.S.C. § 6(b).

We AFFIRM.

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[1] We use the word "Appellant" to refer to "applicant" as defined in 37 C.F.R. § 1.42. Appellant identifies the real party in interest as Westinghouse Electric Company LLC. Appeal Br. 2.

STATEMENT OF THE CASE

Claim 1, reproduced below as the sole independent claim on appeal with disputed limitations italicized for emphasis, is exemplary of the subject matter on appeal.

> 1. A boron concentration monitor for measuring, in real time, the boron concentration of coolant within a piping servicing a primary loop of a nuclear reactor comprising:
>
> an acoustic transmitter acoustically coupled to or through the piping operable to transmit an acoustic signal substantially through an interior of the piping;
>
> an acoustic receiver supported at a location around a circumference of the piping that is spaced from the acoustic transmitter, for receiving the acoustic signal;
>
> a communication mechanism in electrical communication with the acoustic transmitter and the acoustic receiver and configured to convey the transmitted acoustic signal and the received acoustic signal to a remote location; and
>
> *an analyzer is structured to* be in communication with the remote location and is configured to receive the received acoustic signal and the transmitted acoustic signal from the communication mechanism and *compare the received acoustic signal and the transmitted acoustic signal and from the comparison determine the boron concentration* within the piping.

THE REJECTIONS

I. Claims 1, 2, 8, and 13–17 stand rejected under 35 U.S.C. § 103 as being unpatentable over Martin (US 6,480,793 B1; issued Nov. 12, 2002) and Mansell (US 5,533,074; issued July 2, 1996).

II. Claim 3 stands rejected under 35 U.S.C. § 103 as being unpatentable over Martin, Mansell, and Mohite-Patil.[2]

III. Claims 4, 7, and 9–12 stand rejected under 35 U.S.C. § 103 as being unpatentable over Martin, Mansell, and Seidel (US 8,767,903 B2; issued July 1, 2014).

IV. Claims 5 and 6 stand rejected under 35 U.S.C. § 103 as being unpatentable over Martin, Mansell, and Hyde (US 2010/0260305 A1; published Oct. 14, 2010).

ANALYSIS

Rejection I

In regard to claim 1, the Examiner finds that Martin discloses an acoustic transmitter acoustically operable to transmit an acoustic signal substantially through an interior of a piping, and an acoustic receiver supported at a location around a circumference of the piping that is spaced from the acoustic transmitter, for receiving the acoustic signal, as well as a communication mechanism, as claimed. Final Act. 5 (citing Martin, Fig. 2). The Examiner also finds that Martin discloses an analyzer structured to be in communication with a remote location and configured to receive and compare the acoustic signals, as claimed. *Id.* at 5–6 (citing Martin 6:7–8, Fig. 2).

The Examiner determines that although Martin discloses measuring the flow conditions (or parameters) in the coolant of a nuclear reactor using

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[2] Mohite-Patil et al., *Modeling of Acoustic Wave Absorption in Ocean*, 9 INTERNATIONAL JOURNAL OF COMPUTER APPLICATIONS 12:19–24, Nov. 2010.

acoustic differences in the various flow conditions, Martin does not disclose that the parameter being monitored is boron concentration. Final Act. 6; *see, e.g.*, Martin, Abstract. However, the Examiner notes that "Martin teaches that there are other known useful reactor parameters to measure." *Id.* at 6 (citation omitted). *See, e.g.*, Martin, Abstract. The Examiner also finds that "[t]here is nothing special about Appellant's analyzer that allows it to calculate boron concentration where Martins' cannot." Ans. 5–6 (citing Spec. ¶ 14).

The Examiner relies on Mansell for teaching that "boron concentration is a *useful reactor parameter* to measure with sensors," and specifically, that Mansell teaches "monitoring boron concentration (e.g., determining boron concentration in order to calculate coolant levels . . .)," because, "as explained in Mansell, . . . boron concentration . . . affect[s] coolant density." Final Act. 6–7 (citing Abstract, 4:46–48, 6:26–67). The Examiner also finds that it is well-known that "boron concentration is a useful and necessary reactor parameter to monitor." Ans. 4.

The Examiner reasons that "[t]he combination of the boron concentration of Mansell with the monitor of Martin would have produced a boron concentration monitor comprising a transmitter and a receiver connected to a processor for performing calculations," as claimed. Final Act. 7. The Examiner further reasons that the Examiner's proposed combination "simply substitutes the parameter of fluid level for the parameter of boron concentration." Ans. 5. The Examiner also finds that "Martin is capable of *being used* to determine lots of different useful reactor parameters, and because Mansell teaches that boron concentration is a useful reactor parameter to determine, the combination of these teachings would

have resulted in the use of a known apparatus in a manner consistent with its design."[3] Ans. 4. The Examiner further determines that the claimed invention "produces no unexpected results," and that "[i]n view of the prior art teachings of Martin, a person of ordinary skill would have predicted that combining Mansell's boron concentration with Martin's monitor would have produced [Appellant's] claimed invention of a boron concentration monitor." Final Act. 7.

Appellant argues that "neither Martin nor Mansell provide[s] any teaching or suggestion that acoustic signals could be used to determine boron concentration." Appeal Br. 7; Reply Br. 2. Appellant acknowledges the Examiner's finding that Martin is silent regarding the use of acoustic signals to determine boron concentration, and submits that Mansell "is directed to an algorithm for calculating coolant level from pressure readings plus temperature and boron concentration data." Appeal Br. 7–8 (citing Mansell 6:26–67). Appellant also submits that "[t]here is no teaching in Mansell regarding how the boron concentration is determined" and that "[t]here are many useful parameters in a nuclear reactor that are measured in many different ways." *Id.* at 8. Appellant further submits that although Martin teaches the use of acoustic signals to measure useful reactor parameters, and Mansell teaches that boron concentration is a useful reactor parameter, the Examiner's conclusion that it would be obvious to measure boron concentration using acoustic signals (i.e., that boron concentration is measurable using acoustic signals) lacks support. Reply Br. 3.

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[3] "The analyzer (processor 50) of Martin is *already* configured to compare acoustic signals and determine a reactor parameter." Ans. 5.

We agree with Appellant's argument that the Examiner's initial reasoning lacks rational support, because Mansell fails to disclose *sensing* boron concentration at all. In other words, a preponderance of the evidence fails to support a finding that Mansell discloses sensing boron concentration; instead, as argued by Appellant, Mansell acknowledges generally that "the weight of the coolant is a function of its temperature . . . and its chemical make-up," such that "[b]oth temperature and boron concentration . . . affect the coolant density." Mansell 4:46–48. Mansell suggests that *boron concentration data* is an *input* into a calculation, rather disclosing boron concentration as a *sensed* parameter (*id.* at 6:26–54). *See also id.* at 6:55–57 ("[t]he operator will be able to input various measurement points," such as "boron concentrations" to calculate coolant level via a microprocessor).[4]

Notwithstanding, we agree with the Examiner that Appellant has not sufficiently rebutted the Examiner's determination that Martin's acoustic detection system, which comprises "a pair of sensor assemblies positioned a distance from each other to detect variations in the acoustic patterns of coolant flow," would be *capable of* detecting boron concentration, *without* further *structural* modification, based on the transmission, receipt, and comparison of signals, once it is determined, through the teaching of Mansell, that boron is an important parameter to measure using Martin's acoustic detection system. Martin, Abstract; *see*, *e.g.*, Ans. 4 (finding that the claim limitation requiring the analyzer to be configured for determining

[4] *Cf.* Spec. ¶ 7 ("[t]here is currently no direct method employed to continuously measure the boron concentration in the reactor coolant system" and "[c]urrent measurements rely on samples drawn from taps," which may imply a method of sensing boron concentration in samples).

boron concentration is a use limitation). In other words, the Examiner finds Martin's acoustic detection system *is configured structurally* to determine boron concentration if desired and as claimed, and Appellant has not provided sufficient argument or technical evidence that the claimed analyzer is structurally distinguishable from the analyzer disclosed in Martin.

Critically, paragraph 14 of Appellant's Specification supports the Examiner's position by stating that, with reference to the claimed invention, "the acoustic transmitter and the acoustic receiver employ one or more vacuum micro-electronic devices," which are *known* devices,[5] and more importantly, Appellant admits in the Specification that "[a]n example of the parameters required to develop a correlation between the boron concentration in the reactor coolant system and the attenuation of the transmitted acoustic or ultrasonic energy is contained in [Mohite-Patil]," which was published in November 2010, as compared to the filing date of Appellant's Specification on March 10, 2016. Spec. ¶ 22; *see also id*. ¶ 23 (disclosing apparent conventional chemical analyses for determining boron concentration in a liquid); Mohite-Patel, p. 19 ("[t]he first term in above equation represents the sound absorption due to the Boric Acid," wherein parameters in the first term include water properties such as temperature, salinity and pH, constants, and relaxation frequencies of Boric Acid and the frequency of sound). Thus, the Specification supports the Examiner's

[5] The Specification discloses that claimed invention improves on the prior art "by using electronics, transmitters, and signal measurement devices that utilize vacuum micro-electronic device technology," for example, as "disclosed in US Patent 8,767,903, entitled 'Wireless In-Core Neutron Monitor.'" Spec. ¶ 10.

determination that Martin's analyzer is configured to determine boron concentration, i.e., transmit and receive acoustic signals, given the correct input and analyzation of parameters, which are known in the art.

> Finally, we do not find persuasive Appellant's argument that
>
> even if it were known to use acoustic signals to determine boron concentration, it would not have been obvious to one having ordinary skill in the art to modify the flow condition monitor of Martin to determine the boron concentration of the coolant as such a modification would change the principle of operation of Martin from monitoring flow condition of the coolant, the entire purpose of Martin, to monitoring a chemical characteristic of the coolant.

Appeal Br. 8–9. Rather, Martin expressly discloses that "[t]he flow condition monitor may also provide useful information in connection with the *chemical volume* control system." Martin 8:3–5 (emphasis added).

Thus, we sustain the Examiner's rejection of independent claim 1. Appellant chose not to present separate arguments for the dependent claims, and therefore, we also sustain the Examiner's rejection of claims 2, 8, and 13–17 for essentially the same reasons as stated *supra*. Appeal Br. 9.

Rejections II–IV

Appellant chose not to present separate arguments the dependent claims 3–7 and 9–12, and therefore, we also sustain the Examiner's rejections of claims 3–7 and 9–12 for essentially the same reasons as stated *supra*. Appeal Br. 9.

CONCLUSION

In summary:

Claims Rejected	35 U.S.C. §	Reference(s)/Basis	Affirmed	Reversed
1, 2, 8, 13–17	103	Martin, Mansell	1, 2, 8, 13–17	
3	103	Martin, Mansell, Mohite-Patil	3	
4, 7, 9–12	103	Martin, Mansell, Seidel	4, 7, 9–12	
5, 6	103	Martin, Mansell, Hyde	5, 6	
Overall Outcome			1–17	

TIME PERIOD FOR 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