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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte CHRISTOPHER MICHAEL JONES and LOUIS W. ELROD

Appeal 2019-000069
Application 15/074,315
Technology Center 1700

Before BEVERLY A. FRANKLIN, MARK NAGUMO, and
N. WHITNEY WILSON, *Administrative Patent Judges*.

WILSON, *Administrative Patent Judge*.

DECISION ON APPEAL

Appellant¹ appeals under 35 U.S.C. § 134(a) from the Examiner’s Oct. 3, 2017 decision finally rejecting claims 1–7, 11, 13, and 15–31 (“Final Act.”). We have jurisdiction over the appeal under 35 U.S.C. § 6(b).

We affirm-in-part.²

¹ We use the word “Appellant” to refer to “applicant” as defined in 37 C.F.R. § 1.42. Appellant identifies Halliburton Energy Services, Inc. as the real party in interest (Appeal Br. 3).

² The Board issued a decision in Appeal No. 2014-001831 on January 19, 2016 (“1831 Appeal Decision”). In that decision, we affirmed the Examiner’s rejections. The application at issue in the present appeal is the continuation of the application at issue in the ‘1831 Appeal, and the claims are very similar in many respects, but not identical, and the applied prior art is identical.

CLAIMED SUBJECT MATTER

Appellant's invention is directed to a method for determining geological formation measurements (Abstract). In particular, it is said that the formation rock properties — principally porosity and permeability — are measured by diffusion for application in the oilfield industry (Spec. ¶ 2). Independent claims 1 and 17 are representative of the claims on appeal and are reproduced below from the Claims Appendix of the Appeal Brief.

1. A method to determine formation measurements, the method comprising:
 - (1) collecting a plurality of formation samples from a subsurface formation that includes a formation fluid;
 - (2) analyzing a first formation sample of the plurality to determine a salinity of the first formation sample;
 - (3) adding a concentration fluid to a reservoir, wherein the concentration fluid is an isotopic species of a component of the formation fluid;
 - (4) sufficiently matching a salinity of the concentration fluid in the reservoir to the salinity of the first formation sample;
 - (5) placing a second formation sample of the plurality in the concentration fluid of the reservoir; and
 - (6) analyzing the concentration fluid in the reservoir as the second formation sample and fluid equilibrate sufficient to provide diffusion measurements of the second formation sample.

17. A method to determine formation measurements, the method comprising:
 - (1) collecting a formation sample from a subsurface formation that includes a formation fluid, wherein the formation sample comprises a plurality of cutting from the subsurface formation;

(2) adding a concentration fluid to a reservoir, wherein the concentration fluid is an isotopic species of a component of the formation fluid;

(3) placing the formation sample in the concentration fluid of the reservoir; and

(4) analyzing the concentration fluid as the formation sample and the concentration fluid equilibrate, sufficient to provide diffusion measurements of the formation sample.

[Step numbers added.]

REJECTIONS³

I. Claims 1–7, 11, 15–22, and 25–31 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Rees⁴ in view of Loon.⁵

II. Claims 13, 23, and 24 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Rees in view of Loon, and further in view of O'hira.⁶

³ The rejection of claims 1–7, 11, 13, and 15–31 under 35 U.S.C. § 112, second paragraph was withdrawn by the Examiner (Ans. 7). Accordingly, that rejection is not on appeal and will not be addressed by the Board.

⁴ Van Rees et al., *Evaluation of Laboratory Techniques for Measuring Diffusion Coefficients in Sediments*, 25 ENVIRON. SCI. TECHNOL. 1805–11 (1991).

⁵ L. R. Van Loon & A. Jakob, *Evidence for a Second Transport Porosity for the Diffusion of Tritiated Water (HTO) in a Sedimentary Rock (Opalinus Clay – OPA): Application of Through- and Out-Diffusion Techniques*, 61 TRANSPORT IN POROUS MEDIA 193–214 (2005).

⁶ O'hira et al., *Tritium Safety-Related Studies at TPL of JAERI*, 16 JOURNAL OF FUSION ENERGY 219–224 (1997).

DISCUSSION

Appellant argues the claims in three groups: (1) claims 1–7, 15, 16, and 25, (2) claims 17–24 and 26, and (3) claims 27–31. We will address each group in turn (Appeal Br. 2).

Claims 1–7, 15, 16, and 25. These claims are all subject to Rejection I. The Examiner’s findings supporting this rejection are set forth at pages 3–6 of the Final Action. The Examiner finds that Rees discloses a method which includes each of steps (1), (3), (5), and (6) from claim 1 (Final Act. 3, citing Rees, p. 1605, col. 1 ¶¶ 0, 1, and col. 2, ¶¶ 5, 6). The Examiner also finds that Rees does not explicitly teach step (4) (matching the salinity⁷ of the concentration fluid in the reservoir with the formation sample) (Final Act. 3).

The Examiner further finds that Rees teaches that a concentration gradient between the overlying water and the sediment pore-water can develop as a consequence of added contaminants to the overlying water, that Rees teaches that salinity differences influence diffusion, and that Loon teaches using synthetic OPA⁸ pore water to match the salinity of the fluid in a reservoir to the salinity of the formation sample before a diffusion measurement (Ans. 3–4, citing Rees, p. 1605, col. 1, ¶ 2, and Loon, p. 196, ¶ 2, and Table III). The Examiner determines that a person of skill in the art:

would have been motivated to analyze the [salinity] of a first sample of the plurality and sufficiently match the salinity to the fluid in the reservoir to the salinity of the formation sample without regard to a specific composition of the fluid (salinity only concerns the salt concentration), in order to reduce salinity

⁷ The Examiner finds that “salinity” is the concentration of salt in a solution (Ans. 3).

⁸ OPA is Opalinus clay, which is a compacted argillaceous rock containing mainly kaolinite, illite and illite/smectite clay minerals (Loon, p. 195).

difference caused diffusion between the sample and the reservoir and remove one variable from the diffusion measurements. An experimentalist would have been motivated to check, by experiment, the assumption of equilibrium between the substrate and the fluid in the reservoir. Verification of the validity of the assumption would indicate that the salinity of the fluid has been "sufficiently matched" to the salinity of the first formation.

(Final Act. 4).

Appellant disagrees with the Examiner's reasoning as set forth above (Appeal Br. 10). According to Appellant, the section of Loon relied upon by the Examiner indicates that "the composition of the artificial pore water is assumed to be in equilibrium with the Opalinus clay according to Table III" (*id.*). Appellant contends that the Examiner "is attempting to equate the artificial pore water with concentration fluid and the Opalinus clay with the first formation sample" (*id.*). Appellant argues that equilibrating between the pore water and the Opalinus clay does not result in equal salinity between the two, but only causes their respective salinities to change to a point where they would not change further over time (i.e., be in equilibrium) (*id.*).

In response, the Examiner finds that because salt diffuses from the high concentration side to the low concentration side (a finding that Appellant does not appear to contest), at equilibrium the salinity of pore water will match the salinity of the Opalinus clay (corresponding to the formation) (Ans. 8). While Appellant argues that equilibration does not require matching (Reply Br. 2-3), Appellant does not explain why the equilibrium described by Loon would not be "sufficiently matched" in salinity, as required by the claims.

Moreover, regardless of the teachings of Loon, as explained by the Examiner, a person of skill in the art

would have been motivated to analyze the [salinity] of a first sample of the plurality and sufficiently match the salinity to the fluid in the reservoir to the salinity of the formation sample without regard to a specific composition of the fluid (salinity only concerns the salt concentration), in order to reduce salinity difference caused diffusion between the sample and the reservoir and remove one variable from the diffusion measurements

(Final Act. 4). Appellant has not persuasively disputed this reasoning.

Accordingly, Appellant has not, by a preponderance of the evidence, shown reversible error in the Examiner’s determination that the limitation at issue would have been obvious. Therefore, we affirm the rejection of claims 1–7, 15, 16, and 25.

Claims 17–24 and 26. Appellant argues that the rejection of claim 17 suggests that the Examiner has correlated the following elements of claim 17 to the disclosures of Rees as follows:

Claim 17	Rees
formation fluid	lake water
concentration fluid	tritium tracer/water
second formation sample	sediment

(Appeal Br. 12). According to Appellant, “Rees is limited to [the] use of the fluid (the lake water) from which the sample (sediment) is retrieved in order to obtain its desired results,” while claim 17 requires adding a separate fluid that is an isotropic species of a component of the formation fluid (*id.*).

Although Appellant concedes that Rees’s lake water is “spiked with a tritium tracer,” Appellant argues that this spiking cannot correspond to the “concentration fluid” recited in claim 17 because “claim 17 specifically recites

that a different concentration fluid is added to the reservoir, wherein the concentration fluid is an isot[r]opic species of a component of the formation fluid” (Appeal Br. 12–13) (emphasis omitted).

Appellant’s argument is not persuasive. As explained by the Examiner (Ans. 9), Rees teaches adding tritium water (corresponding to the concentration fluid) to a reservoir. Tritium water is an isotropic species of a component (water) of the formation, meeting the claim terms. Appellant argues that claim 17 requires a concentration fluid which is different from the formation fluid, which is not taught by Rees (Reply Br. 3–4). This argument is also not persuasive. As explained by the Examiner, tritium water (corresponding to the claimed concentration fluid) is different from the formation fluid (water). Appellant has not directed our attention to, and our review has not yielded, a definition in the Specification of the terms “concentration fluid” or “component of the formation fluid” that would exclude any component of a fluid in the formation, including water.

Claims 27–31. Claims 27–31 each recite

maintaining a salinity of the second formation sample based on placement of a semi-permeable membrane in the reservoir between the concentration fluid and the second formation sample.

In rejecting these claims, the Examiner finds that Rees does not specifically teach placement of a semi-permeable membrane in the reservoir between the concentration fluid and the second formation sample, but that “placing a semi-permeable membrane between two diffusible spaces is conventional” such that “[n]o inventive step is invol[v]ed” (Final Act. 6). In the Answer, the Examiner expanded on the rationale, finding that:

Rees teaches placement of a semi-permeable membrane (glass microfiber paper) in the reservoir between the concentration fluid and the second formation sample (page 1605, col. 2, par 6). Rees-Loon teaches matching the salinity of the concentration fluid and the salinity of the second formation sample. Therefore, Rees-Loon teaches maintaining a salinity of the second formation sample based on placement of a semi-permeable membrane in the reservoir between the concentration fluid and the second formation sample, by matching the salinity at the fluid side of the membrane with the salinity of the formation side of the membrane.

(Ans. 9). However, as correctly noted by Appellant (Reply Br. 5–6), Rees explicitly states that the glass micro-fiber paper is of sufficiently small diameter so as not to inhibit the diffusion process between the overlying reservoir solution and the sediment column, and thus cannot satisfy the claim requirement that the semi-permeable membrane maintain a salinity of the second formation sample (i.e., prevent diffusion).

Accordingly, we reverse the rejection of claims 27–31.

CONCLUSION

In summary:

Claims Rejected	35 U.S.C. §	Reference(s)/Basis	Affirmed	Reversed
1–7, 11, 15–22, 25–31	103	Rees, Loon	1–7, 11, 15–22, 25, 26	27–31
13, 23, 24	103	Rees, Loon, O’hira	13, 23, 24	
Overall Outcome			1–7, 11, 13, 15–26	27–31

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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-IN-PART