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HARNESS, DICKEY & PIERCE, P.L.C.
P.O. BOX 8910
RESTON, VA 20195

EXAMINER	
JAIN, SALIL	

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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte JOON SEON JEONG, HYUN SEOK KIM, DA HYE PARK, DONG JIN HAM, and HYO RANG KANG

Appeal 2018-002957
Application 14/039,104
Technology Center 1700

Before ADRIENE LEPIANE HANLON, CATHERINE Q. TIMM, and N. WHITNEY WILSON, *Administrative Patent Judges*.

TIMM, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF THE CASE

Pursuant to 35 U.S.C. § 134(a), Appellant[1] appeals from the Examiner's decision to reject claims 1–13, 15–17, 27, and 28. We have jurisdiction under 35 U.S.C. § 6(b).

We REVERSE.

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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 Samsung Electronics Co., Ltd. Appeal Br. 2.

CLAIMED SUBJECT MATTER

The claims are directed to a capacitive deionization apparatus (*see, e.g.*, claim 1) and a method of treating fluid using the same (*see, e.g.*, claim 27). Claim 1, reproduced below, is illustrative of the apparatus:

> 1. A capacitive deionization apparatus comprising:
>
> at least one pair of porous electrodes including an electrode material, the electrode material having a surface area that facilitates electrostatic adsorption of feed ions; and
>
> a spacer structure disposed between the at least one pair of porous electrodes, the spacer structure including an electrically-insulating material and an ion exchange polymer coating on a surface of the electrically-insulating material, the ion exchange polymer coating including an ion exchange group, the spacer structure defining a path for flowing a fluid therethrough, and the path extending along a surface of the spacer structure,
>
> wherein the ion exchange polymer coating is different from the electrically-insulating material,
>
> wherein the electrically-insulating material includes a polyester, a polyolefin, a polyamide, an aromatic vinyl polymer, cellulose, a cellulose derivative, a polyetherether ketone, a polyimide, a polyvinylchloride, or a combination thereof, and
>
> wherein the spacer structure has an open mesh including a mesh opening.

Appeal Br. 21 (claims appendix).

REJECTIONS

The Examiner maintains the following rejections:

A. The rejection of claims 1–13 and 15–17[2] under 35 U.S.C. § 112(a) or § 112 ¶ 1 (pre-AIA) as failing to comply with the written description requirement;

B. The rejection of claims 1, 4, 8–11, 15–17, and 27 under pre-AIA 35 U.S.C. § 103(a) as obvious over Andelman '768[3] in view of Banerjee[4] and Reinhoudt[5];

C. The rejection of claims 2, 3, 5–7 and 28 under pre-AIA 35 U.S.C. § 103(a) as obvious over Andelman '768 in view of Banerjee and Reinhoudt and further in view of Andelman '782[6];

D. The rejection of claim 12 under pre-AIA 35 U.S.C. § 103(a) as obvious over Andelman '768 in view of Banerjee and Reinhoudt and further in view of Andelman '913[7]; and

E. The rejection of claim 13 under pre-AIA 35 U.S.C. § 103(a) as obvious over Andelman '768 in view of Banerjee and Reinhoudt and further in view of Srinivasan[8].

[2] Although the Examiner lists claim 14 as rejected, we omit it because the rejection of this claim is moot given it has been canceled.
[3] Andelman, US 5,415,768, issued May 16, 1995.
[4] Banerjee, US 5,447,636, issued Sept. 5, 1995.
[5] Reinhoudt et al., US 2013/0075260 A1, published March 28, 2013.
[6] Andelman et al., US 2002/0167782 A1, published Nov. 14, 2002. The Examiner refers to this document as "Walker."
[7] Andelman, US 2004/0012913 A1, published Jan/ 22, 2004.
[8] Srinivasan et al., US 2003/0173222 A1, published Sept. 18, 2003.

OPINION

Rejection A

Claim 1 is directed to a capacitive deionization apparatus that includes a spacer structure disposed between a pair of porous electrodes with "the spacer structure defining a path for flowing a fluid therethrough, and the path extending along a surface of the spacer structure."

The Examiner rejects claims 1–13 and 15–17 under 35 U.S.C. § 112(a) or § 112 ¶ 1 (pre-AIA) because "while there is written description support for the limitation 'the spacer structure defining a path for flowing a fluid therethrough,' there appears to be no written description support for the limitation 'the path extending along a surface of the spacer structure.'" Final 3.

Appellant contends that Figure 1(A) and paragraphs 49, 52, 61, 76, and 77 of the Specification provide written descriptive support. Appeal Br. 8.

The issue is: Has Appellant identified a reversible error in the Examiner's finding of lack of written descriptive support for the language "the path extending along a surface of the spacer structure?"

Appellant has identified such an error.

We reproduce Figure 1(A) below:

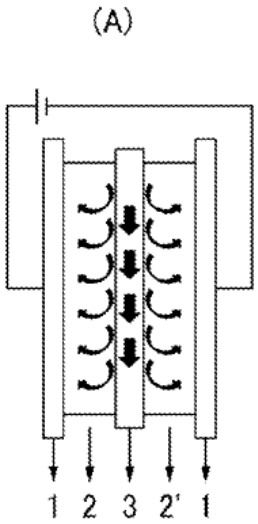

Figure 1(A) is a schematic view of an examplary capacitive deionization apparatus

According to the Specification, a capacitive deionization apparatus "is a device that applies a voltage to porous electrodes having nano-sized pores to provide them with a polarity." Spec. ¶ 4. When a medium containing dissolved ions, such as hard water, flows between the two electrodes, the ions absorb onto the electrodes. *Id.* Appellant's capacitive deionization apparatus includes a spacer structure that provides a path for flowing fluid between the pair of porous electrodes. Spec. ¶¶ 8, 11, and 32. This path is also referred to as a flow channel. Spec. ¶ 39.

The Specification describes the spacer as formed of materials having open areas for the fluid to flow. *See* Spec. ¶ 40 ("[T]he spacer structure may be an open mesh, non-woven fabric, woven fabric, or foam shape." The thickness and open area of the spacer depends on the flow rate and solution resistance.); Spec. ¶ 41 ("[T]he ion exchange group may be on the exterior

surfaces as well as the interior surfaces that define the pores/open areas within the spacer structure.").

Figure 1(A) depicts spacer structure 3 between porous electrodes 2 and 2' "to provide a flow path." Spec. ¶ 47. Although the Specification does not explicitly state it, Figure 1(A) reasonably conveys that the flow path is the path depicted by the downward arrows in the figure.

Claim 1 requires a spacer structure including an electrically-insulating material coated with an ion exchange polymer. The spacer has an open mesh structure with a mesh opening. In other words, there are open areas for flow of the fluid to be treated.

The Specification reasonably conveys that Appellant had possession of a spacer defining a path for flowing a fluid therethrough with the path "extending along a surface of the spacer structure." The path extends in the direction of the arrows of Figure 1(A) along the surfaces of the ion-exchange-polymer-coated mesh that define the mesh openings.

We do not sustain the Examiner's rejection of claims 1–13 and 15–17 as lacking written descriptive support.

Rejections B–E

The Examiner rejects claims 1, 4, 8–11, 15–17, and 27 under pre-AIA 35 U.S.C. § 103(a) as obvious over Andelman '768 in view of Banerjee and Reinhoudt and adds further references to reject dependent claims 2, 3, 5–7, 12, 13, and 28.

The question arising for all the rejections is: Has Appellant identified a reversible error in the Examiner's finding of a reason or suggestion in Banerjee and Reinhoudt to create a spacer structure of electrically-insulating

material coated with an ion exchange coating such that the spacer structure has an open mesh structure including a mesh opening and such that the spacer structure defines a path for flowing a fluid therethrough that extends along a surface of the open mesh structure?

Appellant has identified such an error.

As found by the Examiner, Andelman '768 discloses a capacitive deionization apparatus (flow-through capacitor 10) including spacers (layers 12 and 18) between a pair of electrodes (16, 17 and 21, 22) as required by claim 1. Final 4–5; Andelman '768 Fig. 1 and col. 8, l. 48–col. 9, l. 10.

Andelman '768 suggests forming the spacer from a number of materials including a porous woven or nonwoven fibrous material of, for example, polymeric fibers (e.g., polyolefins, polyamide, like nylon, or polyester) or from a microporous, polymeric membrane of ionically conductive materials, such as fluorocarbon, polyamide membranes, like Nafion®. Andelman '768 col. 4, l. 65–col. 5, l. 6. But Andelman '768 does not disclose coating polymeric fibers with an ion exchange polymer such as Nafion polymer to create an open mesh spacer. Thus, the Examiner turns to Banerjee and Reinhoudt. Final 5–7.

We agree with Appellant that Banerjee and Reinhoudt do not suggest forming the spacer of Andelman '768 as an insulating material coated with an ion exchange polymer coating to create an open mesh structure.

Banerjee teaches forming a composite membrane that is "substantially non-porous to bulk flow of fluids but permits ions, especially cations, to transport across the composite structure." Banerjee col. 4, ll. 5–12. Banerjee does not wish the fluid to flow in a path through the membrane, only the ions. But Andelman '768 requires the spacer material be fluid

porous in a way that allows fluid to flow to the open end of the inner hollow tube. Andelman '768 col. 9, ll. 18–24. Thus, the ordinary artisan would not have adopted the composite membrane of Banerjee for use in Andelman '768 as it would not perform the intended use required by Andelman '768 of allowing fluid to flow in the manner required by Andelman '768.

The Examiner relied upon Reinhoudt for its teaching of using a netting structure, which the Examiner finds is an open mesh including a mesh opening. Final 7 (citing Reinhoudt ¶ 73). Reinhoudt's netting structure with pillars 91 and framework 93, however, is not disclosed as an electrically-insulating material coated with ion exchange polymer. Reinhoudt ¶ 73.

Thus, as applied by the Examiner, neither Banerjee nor Reinhoudt, alone or together, provide the required suggestion for forming the spacer of Andelman '768 as an electrically-insulating material coated with an ion exchange polymer with a spacer structure that has an open mesh including a mesh opening and having a path for flowing a fluid therethrough as required by claim 1.

None of the references cited by the Examiner to reject dependent claims cures the deficiency. Thus, we do not sustain any of the obviousness rejections.

DECISION

Claims Rejected	Basis	Affirmed	Reversed
1–13, 15–17	§ 112(a)		1–13, 15–17

Claims Rejected	Basis	Affirmed	Reversed
1, 4, 8–11, 15–17, 27	§ 103(a) Andelman ’768, Banerjee, Reinhoudt		1, 4, 8–11, 15–17, 27
2, 3, 5–7, 28	§ 103(a) Andelman ’768, Banerjee, Reinhoudt, Andelman ’782		2, 3, 5–7, 28
12	§ 103(a) Andelman ’768, Banerjee, Reinhoudt, Andelman ’913		12
13	§ 103(a) Andelman ’768, Banerjee, Reinhoudt, Srinivasan		13
Overall Outcome			1–13, 15–17, 27, 28

REVERSED