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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte MATTHEW J. BEUTEL and TIMOTHY J. FULLER

Appeal 2015-002032
Application 11/972,817
Technology Center 1700

Before ADRIENE LEPIANE HANLON, JEFFREY T. SMITH, and JEFFREY R. SNAY, *Administrative Patent Judges*.

SNAY, *Administrative Patent Judge*.

DECISION ON APPEAL[1]

Appellants[2] appeal under 35 U.S.C. § 134(a) from the Examiner's decision rejecting claims 1–3, 5–11, 13–15, 18–24, and 26–28, 41, and 42.[3] We have jurisdiction under 35 U.S.C. § 6(b).

We affirm-in-part.

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[1] We cite to the Specification ("Spec.") filed Jan. 11, 2008; Final Office Action ("Final Act.") mailed Jan. 28, 2014; Examiner's Answer ("Ans."); and Appellants' Appeal Brief ("App. Br.") and Reply Brief ("Reply Br.").
[2] Appellants identify General Motors LLC as the real party in interest. App. Br. 4.
[3] Claims 4, 16, 17, and 29–40 were withdrawn from consideration and are not before us.

BACKGROUND

The subject matter involved in this appeal relates to a method for forming a membrane electrode assembly, such as a proton exchange membrane fuel cell. Spec. 1. Claims 1 and 18 are illustrative and reproduced from the Claims Appendix of the Appeal Brief as follows:

> 1. A method comprising:
> providing a first catalyst coated gas diffusion media layer comprising a first catalyst coating over a gas diffusion media layer; depositing a wet first proton exchange membrane layer over the first catalyst coated gas diffusion media layer, the proton exchange membrane layer comprising an ionomer and a support comprising a sheet; and drying said first proton exchange membrane to form a dried first proton exchange membrane layer.
>
> 18. A method comprising:
> providing a first catalyst coated gas diffusion media layer and a second catalyst coated gas diffusion media layer;
> depositing a wet first proton exchange membrane layer over the first catalyst coated gas diffusion media layer and drying the first proton exchange membrane layer to form a first proton exchange membrane layer;
> depositing a wet second proton exchange membrane layer over the second catalyst coated gas diffusion media layer and drying the second proton exchange membrane layer to form a second proton exchange membrane layer; and
> hot pressing the first proton exchange membrane layer formed over the first catalyst coated gas diffusion media layer and the second proton exchange membrane layer formed over the second catalyst coated gas diffusion media layer together.

REJECTIONS

The Examiner maintained the following grounds of rejection:[4]

I. Claims 1, 2, 9–11, 13–15, and 41 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Kakutani,[5] Cavalca,[6] and Gascoyne.[7]

II. Claims 3 and 5–7 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Kakutani, Cavalca, Gascoyne, and Steinbach.[8]

III. Claims 8 and 42 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Kakutani, Cavalca, Gascoyne, and Yan.[9]

IV. Claims 18–21, 26, and 28 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Kakutani and Steinbach.

V. Claims 22–24 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Kakutani, Steinbach and Cavalca.

VI. Claim 27 stands rejected under 35 U.S.C. § 103(a) as unpatentable over Kakutani, Steinbach, and Yan.

DISCUSSION

Rejection I

With regard to Rejection I, Appellants argue the rejected claims as a group. App. Br. 19–35; Reply Br. 5–24. In accordance with 37 C.F.R. § 41.37(c)(1)(iv), we select claim 1 as representative and decide the propriety of Rejection I based on the representative claim alone.

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[4] Final Act. 2–15; Ans. 3–16.
[5] US 2005/0019649 A1, published Jan. 27, 2005 ("Kakutani").
[6] US 2004/0214064 A1, published Oct. 28, 2004 ("Cavalca").
[7] US 2005/0233067 A1, published Oct. 20, 2005 ("Gascoyne").
[8] US 2008/0143061 A1, published Jun. 19, 2008 ("Steinbach").
[9] US 2005/0164072 A1, published Jul. 28, 2005 ("Yan").

The Examiner found that Kakutani discloses a method comprising depositing a wet ion-exchange film over a catalyst-coated diffusion layer, Final Act. 4, followed by drying, *id.* at 7. These findings are supported by a preponderance of the evidence. Kakutani, at paragraph 27, provides:

> Accordingly, the present invention provides a fuel cell electrode manufacturing method including: a step of applying a solution for making a first electrode of positive and negative electrodes of a fuel cell to a sheet to form a first electrode layer; a step of, before this electrode layer has dried, applying a solution for making an ion exchange film to this first electrode layer to form an ion exchange film; a step of, before this ion exchange film has dried, applying a solution for making the second electrode to the ion exchange film to form a second electrode layer; and a step of hardening the first electrode layer, the second electrode layer and the ion exchange film by drying them.

The Examiner found that Kakutani does not include an ion-exchange film support sheet in the above-noted method, but discloses that use of such a sheet was known in the art. Final Act. 4 (citing Kakutani at ¶ 29). The Examiner further found that one of ordinary skill in the art would have had reason to include a sheet in Kakutani's ion-exchange film in light of Cavalca, which also discloses a method for forming a fuel cell and teaches that the ion-exchange film may advantageously be formed by impregnating the ion-exchange solution into a support sheet of expanded polytetrafluoroethylene. *Id.* at 4–5 (citing Cavalca at ¶ 166).

Appellants argue that Kakutani teaches away from use of a sheet in connection with forming the ion-exchange film. App. Br. 19–29. Particularly, Appellants contend that "Kakutani specifically teaches that in [the] prior art, a sheet was used for the ion exchange film, which lessened productivity and efficiency because the sheet needed to have handlability

and this made it difficult to make the electrode structure and resulting fuel cell thin and small." App. Br. 23. Appellants additionally contend that Kakutani teaches that use of a sheet "allowed for lessened efficiency through defective intimacy between the layers, which decreased performance." *Id.* In support of these contentions, Appellants point us to paragraphs 7–10 and 28 of Kakutani. *Id.* at 51.

We find Appellants' arguments unpersuasive of reversible error. Paragraph 28 of Kakutani makes no mention of a sheet. In their Reply Brief, Appellants additionally point to paragraph 29 of Kakutani. Reply Br. 13. There, Kakutani states that "when a sheet is used for the ion exchange film, it is necessary for the ion exchange film to be made somewhat thick, to keep the handlability of the sheet-form ion exchange film good." Kakutani at ¶ 29. However, claim 1 neither requires nor excludes an ion-exchange film based on thickness. Nor do Appellants present persuasive evidence or technical reasoning to show that one of ordinary skill would have viewed Kakutani's above-quoted statement as teaching away from the use of a support sheet where thickness of the device were not a concern.

Paragraphs 7–10 of Kakutani generally relate to a known method in which an ion exchange film "in the form of a sheet" was prepared before being positioned and compressed between already hardened electrode layers. In connection with that known process, Kakutani explains that because the various layers are already hardened before they are assembled and compressed, "there is a risk of areas of defective intimacy arising at the interfaces of the layers." *Id.* at ¶ 7. To address the noted risk of interfacial defects, Kakutani teaches that by applying the electrode and ion exchange layers in an undried state, mixing occurs at their interfaces. *Id.* at ¶ 28. *See*

also id. at ¶ 24 ("The present inventors discovered that the cause of areas of defective intimacy arising between the layers is that when a next solution is applied after a previously applied film has hardened, this solution does not permeate the previously applied film, and defective intimacy arises as a result."). Thus, while we agree with Appellants' characterization of Kakutani as teaching that providing electrode and ion-exchange layers in an undried state "provides advantages over the prior art method of combining solid layers (including a solid ion exchange membrane sheet)," App. Br. 38, we find no persuasive support in Kakutani for Appellants' contention that Kakutani teaches away from the use of an impregnated support sheet, such as that disclosed in Cavalca, e.g., where the impregnated support is applied in an undried state or where one were willing to forego the risk of interfacial defects in lieu of obtaining the advantages provided by the support material.

Appellants' additional arguments that the use of such a support sheet would destroy the purpose or change the principle of operation of Kakutani, or would constitute a regression rather than an improvement, are premised on the same contention that Kakutani teaches away from use of a sheet. App. Br. 30–35. These arguments are unpersuasive for the reasons set forth above.

Accordingly, we sustain Rejection I.

Rejections II and III

Appellants do not present any argument particularly addressing either Rejection II or III, other than an implicit reliance on the arguments addressed above in connection with Rejection I. Accordingly, we also sustain Rejections II and III.

Rejections IV–VI

Rejection IV addresses independent claim 18 along with claims depending therefrom. Claim 18 requires, inter alia, a step of hot pressing dried first and second proton exchange membrane layers. *See* App. Br. 61–62 (claim 18). In support of Rejection IV, the Examiner principally relied on Kakutani, and found that Kakutani "does not expressly disclose the steps of hot-pressing [recited in claim 18], the interposing and positioning of the subgasket [recited in claims 19, 20] and material of the subgasket [recited in claim 21]." Final Act. 11. Those features, the Examiner found, would have been obvious in light of Steinbach's teaching that it was known to hot press a gasket material between a proton exchange membrane layer and a catalyst coated gas diffusion layer. Final Act. 11.

Appellants argue that Kakutani's method involves applying each of the first and second electrode layers and the ion exchange layer "in an undried state." App. Br. 38. Appellants further argue that Kakutani teaches that only *after* these undried layers are deposited, they then are dried together, arguably "without a load being applied." *Id.* at 38, 52 (citing Kakutani at ¶ 31). The Examiner's reasoning in support of Rejection IV as applied to claim 26 is consistent with Appellants' characterization of the drying sequence in Kakutani. *See* Final Act. 11 ("With regard to claim 26, Kakutani discloses the steps wherein before a solution for making one of the positive or negative electrodes has dried, a solution for making the ion exchange film is applied to it . . . and then a solution for making the other electrode is applied *while the solution for making the ion exchange film is not yet dry*.") (Emphasis added). Thus, irrespective of whether a pressing

load is applied, we find that the Examiner erred in rejecting claim 18 based on a process in which the electrode and ion exchange layers are combined in an undried state, whereas claim 18 requires assembly of first and second ion exchange layers each in a dried state.

Because the Examiner's reasoning does not address this distinction between the applied prior art and claim 18, we do not sustain Rejection IV. Because neither of Rejections V and VI addresses this aspect of the rejected claims, these rejections also are not sustained.

DECISION

The Examiner's decision rejecting claims 1–3, 5–11, 13–15, 41, and 42 is affirmed.

The Examiner's decision rejecting claims 18–24 and 26–28 is reversed.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136.

AFFIRMED-IN-PART