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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL
AND APPEAL BOARD

Ex parte IVAN D. CHAPMAN and
REENA L. DATTA

Appeal 2011-013599
Application 11/694,633
Technology Center 1700

Before ROMULO H. DELMENDO, MICHAEL P. COLAIANNI, and GRACE KARAFFA OBERMANN, *Administrative Patent Judges*.

COLAIANNI, *Administrative Patent Judge*.

DECISION ON APPEAL

Appellants appeal under 35 U.S.C. § 134 the final rejection of claims 1, 3-8, 10-13, 15-20, 22, and 23. We have jurisdiction over the appeal pursuant to 35 U.S.C. § 6(b).

We AFFIRM.

Appellants' invention is directed to a water vapor transfer (WVT) unit for humidifying an inlet flow to a fuel cell stack where flow channel plates within the WVT unit have a hydrophilic film so that membranes within the WVT are exposed to maximum possible water pressure so as to improve water transfer from a cathode exhaust stream to a cathode inlet air stream (Spec. para. [0001]).

Claim 1 is illustrative:

> 1. A water vapor transfer unit for humidifying an inlet stream being sent to a fuel cell stack, said unit comprising:
>
> a plurality of spaced apart membranes; and
>
> a plurality of plates positioned between the membranes, said plates being stamped metal plates that are configured to define flow channels where the flow channels facing one side of each membrane provide water vapor to the membranes and the flow channels facing an opposite side of each membrane collect water vapor from the membranes, and wherein the side of the plate that provides the water vapor includes a hydrophilic coating on the flow channels that causes the water vapor to form a film on the plate and transfer water vapor to the membrane more efficiently, wherein the hydrophilic coating is formed by a chromic acid etch that roughens the surface of the plates to form the coating.

Appellants appeal the following prior art rejections:

1. Claims 1, 3, 4, 11-13, 15, 16, and 23 are rejected under 35 U.S.C. § 103(a), as being unpatentable over Appellants' Admitted Prior Art in paragraph [0007] of the Specification (AAPA) in view of Blunk

(US 2006/0040148 A1 published Feb. 23, 2006), Iqbal (US 6,649,031 B1 issued Nov. 18, 2003), and Hartnack (US 2004/0258969 A1 published Dec. 23, 2004).

2. Claims 5, 6, 17, and 18 are rejected under 35 U.S.C. § 103(a) as being unpatentable over AAPA in view of Blunk, Iqbal, Hartnack, and Vyas (US 2006/0216571 A1 published Sept. 28, 2006).
3. Claims 7, 8, 19, and 20 are rejected under 35 U.S.C. § 103(a) as being unpatentable over AAPA in view of Blunk, Iqbal, Hartnack, and Fukui (JP 11-219713 published Aug. 10, 1999, as translated).
4. Claims 10 and 22 are rejected under 35 U.S.C. § 103(a) as being unpatentable over AAPA in view of Blunk, Iqbal, Hartnack and Meissner (EP 20030006610 published Nov. 26, 2003, as translated).

REJECTION (1)

Appellants argue the claims as a group with the primary focus on independent claims 1, 13, and 23 and dependent claims 4 and 16 (App. Br. 10-14). We select claims 1 and 4 as representative of the claim groupings.

ISSUE

1. Regarding claim 1, did the Examiner reversibly err in finding that one of ordinary skill in the art would have modified the AAPA water vapor transfer (WVT) structure to include a hydrophilic coating on the flow channels wherein the hydrophilic coating is formed by chromic acid etch that roughens the surface of the plates as Blunk, Iqbal and Hartnack teach is known to do in a fuel cell environment? We decide this issue in the negative.

2. Regarding claim 4, did the Examiner reversibly err in finding that the combined teachings of the AAPA, Blunk, Iqbal, and Hartnack would have suggested coating the hydrophilic coating on each side of the plate forming the flow channels? We decide this issue in the negative.

FINDINGS OF FACT & ANALYSIS

Issue (1): Claim 1

The Examiner's findings and conclusions may be located on pages 3-6 of the Answer. The Examiner finds that the AAPA teaches the WVT unit structure that includes flow channels defined by plates and a water transfer membrane positioned there between (Ans. 4). The Examiner finds that the AAPA does not teach that the flow channels are formed from stamped metal plates or a hydrophilic coating formed by chromic etch. *Id*. The Examiner relies on Iqbal to teach that it is known to stamp-form metal plates into flow channels for use in fuel cells and concludes that it would have been obvious to use stamped metal plates as the plates in the AAPA to ensure specific size flow field channels (*id.*). The Examiner finds that Blunk teaches chemically treating a composite bipolar plate by immersing in an acid bath to form a hydrophilic surface on the plate (*id.* at 5). The Examiner concludes that it would have been obvious to chemically treat the plates of the AAPA and Iqbal by immersion in an acid bath to create a hydrophilic surface on the AAPA plates. *Id*.

The Examiner relies on Hartnack to teach that it was known to use the same materials in both a fuel cell and a WVT unit (*id.*). The Examiner finds that Hartnack teaches that the benefit of using the same materials, shapes,

and sizes makes a humidification cell very simple, quick and inexpensive to produce. *Id*. The Examiner analogizes the structure of Hartnack's humidification cell with the structure of the WVT unit (*id.* at 12).

Appellants argue that because Iqbal and Blunk teach forming bipolar plates that are used in fuel cells not WVT plates, one of ordinary skill in the art would not have been able to fit the teachings of references together like "pieces of a puzzle" citing *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398 (2007) (App. Br. 12). Appellants contend that Hartnack's humidification unit is different and distinct from Appellants' WVT unit because Hartnack's humidification unit is part of the fuel cell stack whereas the WVT unit is separate from the fuel cell and humidifies a single inlet stream that is being sent to a fuel cell stack (*id.* at 13).

Appellants' arguments are not persuasive as they fail to address specifically the Examiner's stated reasoning for the combination (Ans. 4-5, 14-15; Reply Br. 1-3). The Examiner concludes that one of ordinary skill would have combined Iqbal's stamping process to form the AAPA's plates in order to ensure specific size flow field channels (Ans. 5). The Examiner concludes that one of ordinary skill would have used Blunk's chemical etching process to render the flow passages hydrophilic in order to provide better water management to the WVT unit (*id.* at 14-15). While Appellants contend that one of ordinary skill would not have been able to piece the teaching of the prior art together like a puzzle, the Examiner's specific reasons for the combination are not addressed by Appellants.

As the Examiner finds, the structure of the WVT unit is taught by the AAPA. The Examiner relies on teachings in the related fuel cell art to teach that stamping may be used to form flow channels from flat plates and that

chemically etching to make a flow channel surface hydrophilic is known to improve water management in flow channels. The Examiner's combination of prior art, in our view, is simply the predictable use of prior art forming and treating techniques (i.e., stamping and chemical etching) according to their established functions (i.e., forming flow channels and rendering a surface hydrophilic). *KSR*, 550 U.S. at 417.

Moreover, that the prior art does not explicitly teach putting a hydrophilic coating on a stamped plate in a WVT unit is not determinative. Rather, the court can take account of the inferences and creative steps one of ordinary skill would employ. *Id.* at 418. The combined teachings of the AAPA, Blunk, Iqbal, and Hartnack would have suggested to the ordinary artisan to place a hydrophilic coating where water management was necessary, such as where cathode exhaust or other water laden gas is present; such as the flow channels formed in the plate member of a WVT unit.

Appellants' arguments regarding Hartnack are premised on an argued distinction between Appellants' water vapor transfer (WVT) unit and a fuel cell (App. Br. 13). We understand the Examiner to rely on Hartnack to further provide a basis for using Iqbal's and Blunk's teachings regarding bipolar plates in fuel cells to modify the AAPA's WVT unit structure. Specifically, the Examiner finds that Hartnack teaches that the humidification unit and fuel cell may be made from similar materials, shapes and sizes to simplify construction of the humidification unit (Ans. 5). The Examiner finds that Hartnack's humidification device is analogous to a WVT unit (*id.* at 5, 12-14). Based on this similarity, the Examiner concludes that it would have been obvious to modify the AAPA's WVT unit

structure based upon the teachings regarding fuel cell bipolar plates in Iqbal and Blunk as noted *supra*.

Accordingly, even if the WVT unit is separate and distinct unit as argued by Appellants (App. Br. 13), the Examiner is not suggesting to modify the AAPA to have a stack of fuel cells and humidification cells as taught by Hartnack. Rather, we agree with the Examiner that there are similarities between Hartnack's humidification unit and the WVT unit. These similarities are discussed by the Examiner on pages 13-14 of the Answer. We agree with the Examiner that such similarities and teachings would have further suggested using the teachings of Iqbal and Blunk regarding forming and treating techniques for fuel cell bipolar plates to modify the AAPA's WVT unit structure.

On this record and for the above reasons, we affirm the Examiner's rejection of claim 1 over the AAPA in view of Iqbal, Blunk and Hartnack.

Issue (2): Claim 4

Claim 4 depends from claim 1 and recites: "wherein each plate includes a hydrophilic coating on both sides of the plate."

The Examiner finds that Blunk teaches immersing the bipolar plate into an acid bath (Ans. 6). Because the plate is immersed in the acid the Examiner finds that Blunk teaches that each side of the plate is surfaced with a hydrophilic coating (*id.*).

Appellants argue that Blunk does not teach a WVT unit plate and so cannot teach forming a hydrophilic coating on each side of a WVT plate (App. Br. 14).

Appellants' argument is unpersuasive as it fails to address the Examiner's rejection of claim 4 which depends from claim 1. As noted *supra*, the Examiner's rejection is based upon modifying the AAPA's WVT unit plates to have the features of Blunk and Iqbal. Specifically, the Examiner proposes to modify the AAPA's WVT plate to have Blunk's chromic acid etched hydrophilic surface. Therefore, the Examiner is not relying on Blunk alone to teach a WVT plate with a hydrophilic coating on each side. Rather, the combination of the AAPA's WVT unit plate and Blunk's teachings would have suggested forming a WVT plate with a chromic-acid etch surface on each side of the plate.

For these reasons, we affirm the Examiner's rejection of claim 4 over the AAPA in view of Iqbal, Blunk and Hartnack.

REJECTION (2)

Appellants' arguments focus on claims 5 and 17 (App. Br. 15, 18).

ISSUE

Did the Examiner reversibly err in finding that the combined teachings of the AAPA Blunk, Iqbal, Hartnack, and Vyas would have suggested placing a hydrophilic metal oxide coating on the plates of the AAPA as required by claims 5 and 17? We decide this issue in the negative.

FINDINGS OF FACT & ANALYSIS

The Examiner finds that the AAPA, Blunk, Iqbal and Hartnack fail to teach the hydrophilic coating is a metal oxide (Ans. 6, 9). The Examiner

relies on Vyas to teach forming metal oxides as hydrophilic coatings for fuel cells on bipolar plates (*id.*). The Examiner concludes that it would have been obvious to incorporate a hydrophilic coating on the AAPA plates as modified by Blunk, Iqbal, and Hartnack to obtain a hydrophilic coating (*id.* at 7, 9).

Appellants argue that the combination of prior art does not teach a WVT unit with stamped plates that are used to humidify an inlet stream before the inlet stream is sent to a fuel cell stack and thus cannot teach a WVT unit with plates containing a metal oxide hydrophilic coating (App. Br. 15, 18).

For reasons explained above with regard to claim 1, we find Appellants' arguments unpersuasive. Appellants' arguments that the combination of references fail to teach a WVT unit with stamped plates that have a metal oxide coating is premised on the same faulty argument made regarding claim 1.

On this record, we affirm the Examiner's rejection over the AAPA in view of Blunk, Iqbal, Hartnack, and Vyas.

REJECTION (3)

Appellants argue claims 7 and 19 (App. Br. 16, 18).

ISSUE

Did the Examiner reversibly err in finding that the combined teachings of the AAPA, Blunk, Iqbal, Hartnack and Fukui would have suggested

applying a carbide hydrophilic coating on a WVT plate as required by claims 7 and 19? We decide this issue in the negative.

FINDINGS OF FACT & ANALYSIS

The Examiner finds that the AAPA, Blunk, Iqbal and Hartnack teach the subject matter of claims 7 and 19, except for the use of a carbide as a hydrophilic coating (Ans. 7, 9-10). The Examiner finds that Fukui teaches using a hydrophilic coating on a separator for a fuel cell (*id.*). The Examiner concludes that it would have been obvious to form a carbide coating on the flowfield plate as suggested by the combined teachings of the AAPA, Iqbal, Blunk and Hartnack to attain good corrosion resistance, good conductivity, and low contact resistance even under a strong acid environment (*id.* at 7-8, 10). The Examiner finds that low contact resistance means that the material is hydrophilic (*id.* at 8, 10).

Appellants argue that because Fukui fails to teach a WVT unit plate with a hydrophilic coating, it cannot teach WVT unit plates with a hydrophilic coating (App. Br. 16, 19).

For the reasons discussed with regard to claim 1, Appellants' arguments are unpersuasive. We find that the combined teachings of the references would have suggested forming and treating a WVT unit plate for the reasons noted above.

Regarding claim 19, Appellants argue that the Examiner's finding that low contact resistance in Fukui can be interpreted as a hydrophilic material is conclusory (*id.* at 18-19).

The Examiner relies on paragraph 18 of Hammerschmidt (US 2007/0020503 A1 published Jan. 25, 2007) for the disclosure that

hydrophilic coating may impart low contact resistance to a surface (Ans. 19). Appellants do not contest or complain about this finding of the Examiner.

On this record, the preponderance of the evidence favors the Examiner's obviousness conclusion. We affirm the Examiner's § 103(a) rejection over the AAPA in view of Blunk, Iqbal, Hartnack, and Fukui.

REJECTION (4)

Appellants rely on arguments made regarding claim 1 (App. Br. 16-17, 19). Appellants argue that Meissner does not cure the argued deficiency of Blunk, Iqbal, and Hartnack. *Id*.

As noted above with regard to claim 1, we fail to find any deficiency in the combined teachings of the AAPA, Blunk, Iqbal and Hartnack. As Appellants do not specifically contest the Examiner's rejection of claims 10 and 22, we affirm the Examiner's rejection over the AAPA in view of Blunk, Iqbal, Hartnack and Meissner.

DECISION

The Examiner's decision is affirmed.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(1).

ORDER

AFFIRMED

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