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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte BRANKO N. POPOV and HANSUNG KIM

Appeal 2011-013454
Application 11/191,605
Technology Center 1700

Before TERRY J. OWENS, LINDA M. GAUDETTE, and
KAREN M. HASTINGS, *Administrative Patent Judges*.

OWENS, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF THE CASE

The Appellants appeal under 35 U.S.C. § 134(a) from the Examiner's rejection of claims 10 and 12-19. Claims 1-9, which are all of the other pending claims, stand withdrawn from consideration by the Examiner. We have jurisdiction under 35 U.S.C. § 6(b).

The Invention

The Appellants claim a method for making a polymer electrolyte membrane fuel cell. Claim 10 is illustrative:

10. A method of making a polymer electrolyte membrane fuel cell comprising the steps of:

contacting an uncatalyzed carbon electrode having a surface area with an electrodeposition solution containing ions of a catalytic metal, the uncatalyzed carbon electrode including a hydrophobic layer comprising carbon and a hydrophilic layer comprising carbon;

applying a pulse current to said electrodeposition solution to deposit said catalytic metal on said surface area of said carbon electrode thereby forming a catalyst layer; and

heat treating said catalyzed carbon electrode.

The References

Kim	US 2002/0034676 A1	Mar. 21, 2002
Cipollini	US 6,379,827 B1	Apr. 30, 2002

The Rejection

Claims 10 and 12-19 stand rejected under 35 U.S.C. § 103 over Kim in view of Cipollini.

OPINION

We reverse the rejection. We need to address only the sole independent claim, i.e., claim 10. That claim requires an “uncatalyzed carbon electrode including a hydrophobic layer comprising carbon and a hydrophilic layer comprising carbon”.

The Appellants’ description of the manufacture of their uncatalyzed carbon electrode begins with the following four sequential steps: 1) treating carbon black at 600 °C for 3 hours to remove organic matter, 2) thoroughly mixing the treated carbon black with polytetrafluoroethylene and isopropyl alcohol in a supersonic bath to make a paste, 3) rolling the paste onto a hydrophobic carbon cloth, and 4) annealing the hydrophobic carbon cloth/paste at 300 °C in air (Spec. 6:26-31). The Appellants then state that “[s]ubsequently, an organic solvent [e.g., glycerol (Spec. 5:30 – 6:1)] is added to the above mixture, which is then homogenized using ultrasound for 30 min. This ink is applied on the hydrophobic carbon layer prepared in the first step” (Spec. 6:31 – 7:3). The first step is the treatment of the carbon black at 600 °C for 3 hours. Thus, the organic solvent actually does not appear to be added subsequent to the annealing but, rather, appears to be mixed with the polytetrafluoroethylene and isopropyl alcohol in the supersonic bath (i.e., “homogenized using ultrasound for 30 min”) to form the paste which is rolled onto the hydrophobic carbon cloth.¹ The

¹ If so, it is not apparent why, in view of the Appellants’ disclosure that “[a]fter electrodeposition, the electrodes were heated at 300°C in air to remove the solvent contained in the hydrophilic carbon layer” (Spec. 7:14-15), the solvent is not removed by the annealing of the hydrophobic carbon cloth/paste at 300 °C in air (Spec. 6:29-31).

Appellants state that “[t]he resulting blank carbon electrode has a hydrophilic surface due to the addition of the organic solvent” (p. 7, ll. 3-4)

Kim treats a fuel cell electrode’s hydrophobic porous carbon substrate with an oxidizing agent to remove impurities from its surface and interior, electrodeposits a catalytic metal from an electrodeposition solution onto the treated substrate, and heat treats the catalyzed porous carbon substrate at 500-600 °K for 0.5-2 hours (¶¶ 0016, 0028-29, 0031, 0034).² “[T]he electrodeposition solution contains a hydrophobic solute so as to be infiltrated into the inner part of the porous carbon substrate” (¶ 0029).

Although Kim states that the solute is hydrophobic, Kim’s solute can be methanol (¶¶ 0029, 0031) which is hydrophilic. Kim’s hydrophobic solute performs the same function as the Appellants’ organic solvent which forms the hydrophilic layer, i.e., enabling control of the thickness of the catalytic layer by varying the extent to which the electrodeposition solution penetrates into the carbon substrate’s pores (Kim ¶ 0031; Spec. 8:16-24).

The Examiner states that “Kim et al. fail to teach that the electrode has a hydrophobic and hydrophilic layer” (Ans. 5). The Examiner argues that “Cipollini teaches an electrode for a fuel cell having a carbon containing hydrophobic layer and a carbon containing hydrophilic layer (column 5 lines 32-35; column 6 lines 1-5).” *Id.*

Cipollini discloses a fuel cell comprising, adjacent to each of the membrane electrode assembly (16)’s catalyst layers (anode catalyst layer 20, cathode catalyst layer 24), a support plate (anode support plate 21, cathode

² Kim’s heat treating at 500-600 °K appears to be comparable to the Appellants’ post-electrodeposition heating at 300 °C (573 °K) to remove the solvent contained in the hydrophilic carbon layer (Spec. 7:14-15).

support plate 25) having a porous hydrophobic carbon diffusion layer (anode diffusion layer 23, cathode diffusion layer 27) next to the catalyst layer and, next to the porous hydrophobic carbon diffusion layer, a porous hydrophilic carbon substrate (anode substrate 22, cathode substrate 26) (col. 4, ll. 26-38; col. 5, ll. 33-35; 58-62, 65-66; Fig. 1). The porous hydrophilic carbon substrates (22, 26), due to their small pore sizes and wettable character, flood rapidly with coolant to inert the fuel cell when it is being started up or shut down (col. 1, ll. 6-8, 22-25; col. 7, ll. 9-10; col. 9, ll. 3-12, 29-32, 37-40).

The Examiner argues that “[t]he skilled artisan would recognize that the electrode of Cipollini can be used in fuel cells, such as the fuel cell of Kim et al.” (Ans. 5) and that such a person “could have substituted the electrode of Kim et al. with the electrode of Cipollini and the results of the substitution would have been predictable.” *Id.*

A prima facie case of obviousness requires not only predictability or a reasonable expectation of success but also an apparent reason or suggestion to modify the prior art as proposed by the Examiner. *See KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 418 (2007); *In re Vaeck*, 947 F.2d 488, 493 (Fed. Cir. 1991). The Examiner has not established that Kim and Cipollini would have provided one of ordinary skill in the art with an apparent reason or suggestion to combine their disclosures to arrive at the Appellants’ uncatalyzed carbon electrode having hydrophobic and hydrophilic layers.

Accordingly, we reverse the Examiner’s rejection.

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Application 11/191,605

DECISION/ORDER

The rejection of claims 10 and 12-19 under 35 U.S.C. § 103 over Kim in view of Cipollini is reversed.

It is ordered that the Examiner's decision is reversed.

REVERSED

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