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BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte PETER WILDE,
RUEDIGER SCHWEISS, STEFAN FORERO,
MELANIE HABERKORN, and TIM SCHUBERT

Appeal 2019-001861
Application 14/221,525
Technology Center 1700

Before MICHAEL P. COLAIANNI, GEORGE C. BEST, and
DEBRA L. DENNETT, *Administrative Patent Judges*.

BEST, *Administrative Patent Judge*.

DECISION ON APPEAL

The Examiner finally rejected claims 1–4, 6–12, and 14 of Application 14/221,525 under 35 U.S.C. § 103(a) as obvious. Final Act. 2 (March 29, 2018). Appellant¹ seeks reversal of the rejections pursuant to 35 U.S.C. § 134(a). We have jurisdiction under 35 U.S.C. § 6(b).

For the reasons set forth below, we *affirm*.

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 SGL Carbon SE and Future Carbon GmbH. Appeal Br. 1.

I. BACKGROUND

The '525 Application describes a method of producing a gas diffusion layer, which can be used in fuel cells, electrolytic cells, and batteries. Spec.

¶¶ 2, 3.

Claim 1 is representative of the '525 Application's claims and is reproduced below from the claims listing in the Claims Appendix to the Appeal Brief:

1. A process for forming a gas diffusion layer having a substrate of a carbon-containing material and a micro porous layer, which comprises the steps of:
 - i) *dispersing carbon black with a BET surface area of 20 to 100 m²/g, carbon nanotubes with a BET surface area of at least 200 m²/g and an average outer diameter of at most 25 nm and only water as a dispersion medium at a shearing rate of at least 1,000 rps and/or such that in a mixture produced of the carbon black, the carbon nanotubes and the dispersion medium, at least 90% of the carbon nanotubes have a mean agglomerate size of at most 25 μm, during the dispersing step a binding agent is not provided until after a shearing speed is obtained;*
 - ii) applying the mixture produced in step i) to at least a portion of at least one side of the substrate; and
 - iii) drying the mixture applied in step ii).

Appeal Br. (Claims App.) 13 (emphasis added).

II. REJECTIONS

On appeal, the Examiner maintains the following rejections:²

1. Claims 1–4, 6–11, and 14 are rejected under 35 U.S.C. § 103(a) as unpatentable over the combination of Gharibi,³ Heo,⁴ Konno,⁵ and Lee.⁶ Final Act. 2; Answer 3.
2. Claim 12 is rejected under 35 U.S.C. § 103(a) as unpatentable over the combination of Gharibi, Heo, Konno, Lee, and Haas.⁷ Final Act. 10; Answer 10.

III. DISCUSSION

Appellant argues for reversal of all of the rejections at issue based upon the limitations in independent claim 1. Appeal Br. 4–17. We, therefore, select claim 1 as representative of the claims subject to this ground of rejection and limit our discussion to this claim. 37 C.F.R. § 41.37(c)(1)(iv).

² Claims 13 and 15–20 are withdrawn from consideration by the Examiner pursuant to 37 C.F.R. § 1.142(b) as drawn to a non-elected invention. Final Act. 2. Claim 5 has been canceled. *Id.*

³ Hussein Gharibi et al., *The synergy between multi-wall carbon nanotubes and Vulcan XC72R in microporous layers*, 35 Int’l J. Hydrogen Energy 9241–51 (2010) (hereinafter “Gharibi”).

⁴ US 2010/0255402 A1, published Oct. 7, 2010.

⁵ US 2010/0092840 A1, published Apr. 15, 2010.

⁶ US 2009/0011308 A1, published Jan. 8, 2009.

⁷ WO 2005/124908 A2, published Dec. 29, 2005.

A. *Rejection of claims 1–4, 6–11, and 14 as unpatentable over the combination of Gharibi, Heo, Konno, and Lee.*

According to Appellant, the combination of Gharibi, Heo, Konno, and Lee does not describe or suggest the following elements of claim 1: (1) “carbon black with a BET surface area of 20 to 100 m²/g,” (2) “carbon nanotubes with a BET surface area of at least 200 m²/g and an average outer diameter of at most 25 nm,” (3) “at least 90% of the carbon nanotubes have a mean agglomerate size of at most 25 μm,” (4) “only water as a dispersion medium,” and (5) PTFE’s use in the sonification process. Appeal Br. 8–10.

First, Appellant argues that the Examiner’s relied-upon primary reference of Gharibi discloses the dispersion of “carbon particles like carbon black having a BET surface area of more than 100 m²/g.” *Id.* (emphasis added).

The Examiner, however, found that Konno’s gas diffusion layer for a fuel cell preferably uses carbon black with a surface area of 10 m²/g or more. Answer 5 (citing Konno ¶ 74).

Second, Appellant argues that, in the applied prior art, “nothing is said with respect to the average outer diameter being at most 25 nm of the carbon nanotubes.” Appeal Br. 10.

The Examiner, however, found Gharibi discloses that a gas diffusion layer for a fuel cell can be manufactured by dispersing carbon black and carbon nanotubes having diameters between 20–30 nm. Answer 3 (citing Gharibi 9242). The Examiner, furthermore, found that Heo discloses fuel cell catalysts comprising a carbon nanotubes having a surface area greater than 200 m²/g. Answer 5 (citing Heo Table 1; claim 5).

Thus, the Examiner has made findings that the applied prior art discloses overlapping ranges for the claimed properties of the carbon black

and carbon nanotube components. Answer 3, 5. This is sufficient to create a prima facie case of obviousness. *In re Peterson*, 315 F.3d 1325, 1329 (Fed. Cir. 2003) (a prima facie case of obviousness typically exists when the ranges of a claimed composition overlap the ranges disclosed in the prior art).

This prima facie case of obviousness can be overcome if Appellant shows either (i) that the prior art teaches away from the claimed invention or (ii) that there are new and unexpected results relative to the closest prior art. *Iron Grip Barbell Co. v. USA Sports, Inc.*, 392 F.3d 1317, 1322 (Fed. Cir. 2004) (citing *In re Geisler*, 116 F.3d 1465, 1471 (Fed. Cir. 1997); *In re Woodruff*, 919 F.2d 1575, 1578 (Fed. Cir. 1990)). An applicant must show that whatever property they are asserting is unexpected throughout the claimed range, but not outside that critical range. *See Peterson*, 315 F.3d at 1330.

Here, Appellant does not argue that any of the references relied upon by the Examiner teaches away from the claimed subject matter. Rather, Appellant asserts that the specific combination of ingredients with properties in the claimed ranges unexpectedly provides “a synergistic effect.” Appeal Br. 5; *see also id.* at 7 (contending that the Specification’s description of “an increase in both the electrical conductivity and the gas permeability is an unexpected result”).

Appellant’s argument, however, is not persuasive because for a showing of “unexpected results” to be probative evidence of non-obviousness, it falls upon the applicant to at least establish: (1) that there actually is a difference between the results obtained through the claimed invention and those of the prior art, *In re Klosak*, 455 F.2d 1077, 59 CCPA 862 (1972); and (2) that the difference actually obtained would not have

been expected by one skilled in the art at the time of invention,
Id.; *In re D'Ancicco*, 439 F.2d 1244, 58 CCPA 1057 (1971).

In re Freeman, 474 F.2d 1318, 1324 (CCPA 1973). In this instance, Appellant has not compared the claimed composition with the closest prior art method of Gharibi. Appellant, furthermore, does not point to any disclosure in the Specification that supports the assertion that these properties were unexpected. *See* Appeal Br. 7; Spec. ¶ 53. We, therefore, agree with the Examiner that Appellant has not made a persuasive showing of unexpected or synergistic results. *See* Answer 13, 16, 18.

Third, Appellant argues that, in the applied prior art, “nothing is said about the advantage of having a mean agglomerate size of at most 25 micrometer of the carbon nanotubes in the final mixture.” Appeal Br. 10.

For the reasons set forth above, the Examiner found that the prior art discloses carbon nanotubes having surface areas and average outer diameter ranges that overlap those recited in claim 1. We, therefore, agree with the Examiner that it would have been obvious to one of ordinary skill in the art at the time of the invention that the claimed dispersing step would have resulted in at least 90% of the carbon nanotubes having a mean agglomerate size of at most 25 μm . *See* Answer 15; *see also id.* at 5–6.

Fourth, Appellant argues that “Gharibi teaches . . . the use of a mixture of alcohols (2-propanol and glycerol) and water in order to disperse the carbon particles.” Appeal Br. 8 (citing Gharibi 9242). According to Appellant, “[n]o hint is given that water may be used as the only dispersion medium.” Appeal Br. 8.

Appellant’s arguments, however, ignore Lee’s specific disclosure that “[a] solvent[, which] may be *water*, n-propanol, isopropanol, or a mixed solvent thereof” may be used to disperse carbon powder for gas diffusion

layer manufacturing. *See* Lee ¶¶ 34, 35 (emphasis added); *see also In re Fritch*, 972 F.2d 1260, 1264–65 (Fed. Cir. 1992) (a reference stands for all of the specific teachings thereof as well as the inferences one of ordinary skill in the art would have reasonably been expected to draw therefrom). As the Examiner found, it would have been obvious to one of ordinary skill in the art at the time of the invention that Gharibi’s solvent “could have comprised any known solvent in the art, including only [Lee’s] ultrapure water, . . . with the motivation to simplify the process or reduce cost, as [Lee teaches that] water is a known substitute solvent for aqueous alcohol mixtures.” Answer 4–5 (citing Lee Example 1).

Appellant, therefore, has not persuaded us that the Examiner reversibly erred in finding that Lee describes the claimed use of water, by itself, as a dispersion medium.

Fifth, Appellant argues that Gharibi fails to teach “[t]he use of PTFE in the sonification process.” Appeal Br. 8. Specifically, Appellant argues that the PTFE amount is important for Gharibi’s microporous layer performance, whereas the Specification “recites that no PTFE is added to the mixture before the shearing process is performed.” *Id.* at 9.

The Examiner responds that, *inter alia*, Appellant’s argument is “irrelevant to the claims as written.” Answer 17. The Examiner further responds that “Lee . . . from the same field of invention, regarding production of a [gas diffusion layer] with carbon and binder, teaches adding the PTFE binder after dispersing and shearing the carbon components.” *Id.* at 17–18 (citing Lee Example 1).

We note that claim 1, when read in light of the Specification, requires that a PTFE binder is provided only *after* a shearing rate is obtained in step i), “but before . . . step ii) is carried out.” Spec. ¶ 19; *see also* Answer 4. In

other words, claim 1 does not require use of PTFE during sonification. Thus, Appellant's argument that Gharibi fails to teach using PTFE during the sonification process is irrelevant.

As the Examiner found, Lee teaches that the PTFE binder is added after the carbon components are dispersed and sheared. Answer 17–18 (citing Lee Example 1). Thereafter, Lee applies the carbon slurry onto a carbon substrate. *Compare* Lee ¶¶ 73, 74 *with* claim 1, steps “i)” and “ii).” We, therefore, are not persuaded that Appellant has established the existence of reversible error regarding the Examiner's finding that Lee describes or suggests the claimed step of providing a PTFE binder after a shearing rate is obtained.

In view of the foregoing, we determine that the Examiner did not reversibly err in rejecting claim 1 as unpatentable over the combination of Gharibi, Heo, Konno, and Lee. Accordingly, we also affirm the rejection of claims 2–4, 6–11, and 14, which depend from claim 1.

B. Rejection of claim 12 as unpatentable over the combination of Gharibi, Heo, Konno, Lee, and Haas.

Appellant argues that the rejection of claim 12 as unpatentable over the combination of Gharibi, Heo, Konno, Lee, and Haas should be reversed for the reasons set forth in arguing for reversal of the rejection over the combination of Gharibi, Heo, Konno, and Lee. *See* Appeal Br. 12 (“Claim[] . . . 12 stand[s] or fall[s] with claim 1.”).

For the reasons set forth above, we have affirmed the rejection of independent claim 1 as unpatentable over the combination of Gharibi, Heo, Konno, and Lee. We, therefore, also affirm the rejection of claim 12 as unpatentable over the combination of Gharibi, Heo, Konno, Lee, and Haas.

IV. CONCLUSION

In summary:

Claims Rejected	35 U.S.C. §	Reference(s)/Basis	Affirmed	Reversed
1-4, 6-11, 14	103(a)	Gharibi, Heo, Konno, Lee	1-4, 6-11, 14	
12	103(a)	Gharibi, Heo, Konno, Lee, Haas	12	
Overall Outcome			1-4, 6-12, 14	

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)(iv).

AFFIRMED