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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/942,863	11/09/2010	Jesse Smithyman	19585-0116	2540

29052 7590 11/30/2016

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ART UNIT	PAPER NUMBER
1729	

NOTIFICATION DATE	DELIVERY MODE
11/30/2016	ELECTRONIC

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte JESSE SMITHYMAN, ZHIYONG LIANG,
JIM P. ZHENG, BEN WANG, and CHUN ZHANG

Appeal 2015-004544
Application 12/942,863
Technology Center 1700

Before BRADLEY R. GARRIS, BEVERLY A. FRANKLIN, and DONNA M. PRAISS, *Administrative Patent Judges*.

PRAISS, *Administrative Patent Judge.*

DECISION ON APPEAL[1]

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[1] This decision makes reference to the Specification filed Nov. 9, 2010 ("Spec."), the Final Office Action mailed Feb. 3, 2014 ("Final Act."), the Appeal Brief filed Sep. 3, 2014 ("Br."), and the Examiner's Answer mailed Jan. 8, 2015 ("Ans.").

STATEMENT OF THE CASE

This is an appeal under 35 U.S.C. § 134 from the final rejection of claims 1–3, 5, and 10–14. We have jurisdiction under 35 U.S.C. § 6.

The subject matter of this appeal relates to composite materials including carbon nanotubes including one or more types of particles. Spec. 1:9–10. Claim 1 is illustrative (disputed elements italicized):

> 1. A method for making a composite material comprising:
>
> forming a first *suspension comprising (i) carbon nanotubes and (ii) first particles and/or fibers of interest*;
>
> filtering the first suspension to form a sheet which comprises a network of the carbon nanotubes wherein the first particles and/or fibers of interest are embedded in the network; and
>
> drying the sheet to form a free-standing sheet structure that is *free of polymeric binder*.

The Examiner maintains, and Appellants[2] appeal, the rejection of claims 1–3 and 10–14 under 35 U.S.C. § 103(a) as unpatentable over Kang[3] in view of Liu[4] and the rejection of claim 5 under 35 U.S.C. § 103(a) as unpatentable over Kang and Liu in further view of Park.[5] Appellants argue the subject matter of independent claim 1, and rely on those same arguments for dependent claims 2, 3, 5, and 10–14. Br. 13. In accordance with 37

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[2] Appellants identify the real party in interest as Florida State University Research Foundation. Br. 2.
[3] Kang et al., US 2007/0122712 A1, published May 31, 2007 ("Kang").
[4] Liu et al., US 2009/0098463 A1, published Apr. 16, 2009 ("Liu").
[5] Park et al., US 2009/0246613 A1, published Oct. 1, 2009 ("Park").

C.F.R. § 41.37(c)(1)(iv), and based upon the lack of arguments directed to the subsidiary rejection, claims 2, 3, 5, and 10–14 will stand or fall together with independent claim 1 from which they depend.

OPINION

The dispositive issues for the prior art rejection are:

1. Did the Examiner err in finding that Kang does not teach away from excluding a polymeric binder in its composite material comprising carbon nanotubes and particles?
2. Did the Examiner err in finding that Kang discloses the filtering step required by claim 1?

After review of the arguments and evidence presented by both Appellants and the Examiner, we affirm the stated rejections.

It is the Examiner's position that Kang in view of Liu suggests the subject matter of claims 1–3 and 10–14 for the reasons stated on pages 2–3 of the Answer.

In the Appeal Brief, Appellants argue that Kang cannot be modified by the teachings of Liu because "Kang discloses, unequivocally, that composite materials containing carbon nanotubes and particles must include a binder." Br. 5. Appellants argue that Kang teaches a three component composite material and "[t]he binder is not optional" because Kang states "[t]he negative active material **is** combined with a binder." *Id.* at 7 (emphasis added by Appellants) (quoting Kang ¶ 59). According to Appellants, this is a teaching away by Kang from combination with a binder-free, particle-free material such as that taught by Liu. *Id.*

Appellants contend Liu also does not suggest omitting a binder in Kang's method "because Liu discloses a method for making a pristine array

of carbon nanotubes that is 'essentially free' of any impurities, including particles and binders." *Id.* at 6. Appellants quote paragraph 30 of Liu for its particle-free teaching that "super-aligned array of carbon nanotubes formed under the above conditions [shown in Fig. 2] is **essentially free of impurities**, such as carbonaceous or residual catalyst **particles**." *Id.* at 8 (emphasis added by Appellants). Appellants also quote paragraph 42 of Liu for its binder-free teaching that "the carbon nanotube film is essentially free of binder and includes a large amount of micropores" and assert that "[s]ince the micropores are not affected by a binder," Liu achieves the benefit of "[t]he intercalation amount of lithium ions can be enhanced due to the special microporous film structure of the anode." *Id.* at 8 (quoting Liu ¶ 42). Appellants assert that Liu's "advantages are made possible by Liu's binder-free configuration, [and] the binder-free configuration, in turn, is made possible by the fact that Liu's films are particle-free." *Id.* Appellants argue that because active metal particles are indispensable to Kang, Kang teaches away from its combination with any particle-free configuration such as Liu and must include a binder. *Id.* Thus, Appellants contend that the rejection is improper for "selecting and combining elements from the prior art without considering what the references teach as a whole." *Id.* at 6.

Appellants also contend that the combination of Kang and Liu does not teach or suggest every element of claim 1 because "Kang discloses a filtering step that does not result in a sheet of material." *Id.* at 12.

The Examiner responds that "Kang teaches that a binder is used, not that the binder *must* be used." Ans. 4. The Examiner further responds that "even if it was suboptimal to exclude a binder, such a teaching is not enough to indicate that Kang teaches *against* the exclusion of a binder." *Id.* at 5.

Regarding Liu, the Examiner responds that "Liu is not being offered as teaching the activity material itself[,]" but, rather, for "the general proposition that binder interferes with lithium ion adsorption in the active material and should be removed so that adsorption is improved and adsorption sites are not blocked." *Id.* at 5–6. The Examiner finds that Liu's teaching of "[r]emoving a binder to improve adsorption would be applicable to any lithium adsorbing active material" (*id.* at 5) and that "in the context of Liu, the binder-free idea is separate from the particle-free idea" (*id.* at 6). Finally, the Examiner finds that "Kang teaches that the active material is filtered (par. 55) and that the final product is a sheet comprising the active material (par. 62, fig. 3)." *Id.* at 7. The Examiner further finds that claim 1 does not preclude further processing steps between the filtering and the forming of the sheet and points out that "Liu is not offered as teaching the filtering step." *Id.*

We are not convinced that the Examiner improperly combined the teachings of Kang and Liu for the reasons stated by the Examiner in the Final Action and Answer, including the Response to Arguments section. Ans. 2–7; Final Act. 3–5. We add the following primarily for emphasis.

Appellants' arguments are not persuasive for a number of reasons. First, Liu explicitly provides a reason to remove the binder from Kang's composite material. Liu ¶ 8 ("absorption ability of the carbon nanotubes is restricted by the binder mixed therewith."); Final Act. 3. Second, Appellants merely assert without support that Liu's "binder-free configuration, in turn, is made possible by the fact that Liu's films are particle-free." Br. 8. While Liu teaches a configuration that is both binder-free, particle-free, and includes a large amount of micropores, Liu does not teach that the binder-

free aspect is inexorably linked to being particle-free as well. Moreover, Liu describes the effects of the binder and particles differently; the binder inhibits adsorption while the particles reduce purity of the electrode material. Liu 8, 30; Ans. 6. Third, Kang does not teach that its composite "must include a binder" as asserted by Appellants. Br. 5. Rather, Kang discloses a rechargeable lithium battery embodiment where the negative active material is combined with a binder (Kang ¶ 59), and provides, as nonlimiting examples, polymeric binders (*id.* ¶ 61). Kang does not teach that the polymeric binder is critical to the functioning of the composite or otherwise teach away from its omission. A reference may be said to teach away when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant. *In re Gurley*, 27 F.3d 551, 553 (Fed. Cir. 1994). That Kang uses binders in its composite does not discourage the omission of a binder, particularly in view of another benefit attributed to excluding the binder. "The fact that the motivating benefit comes at the expense of another benefit, however, should not nullify its use as a basis to modify the disclosure of one reference with the teachings of another. Instead, the benefits, both lost and gained, should be weighed against one another." *Winner Int'l Royalty Corp. v. Wang*, 202 F.3d 1340, 1349 n. 8 (Fed. Cir. 2000). Nothing in the record before us shows that Kang's method is incapable of forming a negative active material in the absence of a polymeric binder such that the combination with Liu would frustrate the principle of operation of Kang. The Examiner's undisputed finding that Kang discloses that the surfactant in the suspension can act as a binder suggests that the binding function is not dependent solely

on a polymeric binder. See Ans. 2; Final Act. 3 (citing Kang ¶ 49). The Examiner also states in the Response to Arguments that "even if it was suboptimal to exclude a binder, such a teaching is not enough to indicate that Kang teaches *against* the exclusion of a binder." Ans. 5. Appellants have not filed a Reply Brief to address this point. Fourth, the Examiner's finding that Kang's method includes both filtering and forming a sheet is supported by the record. Kang ¶¶ 55, 62; Ans. 7. In addition, Appellants' claim is open ended, thus an additional step meets the claimed method.

For the foregoing reasons, we affirm all of the Examiner's rejections under 35 U.S.C. § 103(a).

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)(v).

AFFIRMED