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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte STUART D. HELLRING,
RANDY E. DAUGHENBAUGH, SHANTI SWARUP,
and ELLOR JAMES VAN BUSKIRK

Appeal 2018-007199
Application 14/242,162
Technology Center 1700

Before GEORGE C. BEST, DONNA M. PRAISS, and
MERRELL C. CASHION, JR., *Administrative Patent Judges*.

BEST, *Administrative Patent Judge*.

DECISION ON APPEAL

Pursuant to 35 U.S.C. § 134(a), Appellant¹ appeals from the Examiner's decision to reject claims 1, 2, 5, 6, 8, 10–19, 23, 25, 27–31, and 37–43 of Application 14/242,162. Final Act. (September 20, 2017). We have jurisdiction under 35 U.S.C. § 6.

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 PPG Industries Ohio, Inc., as the real party in interest. Appeal Br. 2.

BACKGROUND

The '162 Application describes compositions for manufacturing electrodes for use in an electrical storage device, such as a battery. Spec. ¶ 1. The compositions contain polyvinylidene fluoride (PVDF) polymers, a binder, water, and one or more electrode-forming materials. *Id.* The Specification explains that

[p]olyvinylidene fluoride, because of its excellent electrochemical resistance, has been found to be a useful binder for forming electrodes to be used in electrical storage devices. Typically, the polyvinylidene is dissolved in an organic solvent and the electrode material, that is the electrically active lithium compound and a carbonaceous material, is combined with the PVDF solution to form a slurry that is applied to a metal foil or mesh to form the electrode.

Id. ¶ 3.

A commonly used solvent for dissolving the PVDF is N-methyl-2-pyrrolidone (NMP). *Id.* ¶ 4. NMP, however, is toxic and creates health and environmental issues. *Id.* ¶ 5.

The Specification describes an alternative solvent for PVDF that may be used to produce high quality electrodes for batteries and other electrical storage devices. *Id.* ¶ 9. The alternative solvent system comprises an aqueous medium with a (meth)acrylic polymer dispersant. *Id.*

Claim 1 is representative of the '162 Application's claims and is reproduced below from the Claims Appendix of the Appeal Brief.

1. An electrode binder of a lithium ion secondary battery comprising an aqueous dispersion of:
 - (a) a polyvinylidene fluoride polymer and
 - (b) a (meth)acrylic polymer dispersant;

wherein the (meth)acrylic polymer dispersant is prepared from a mixture of monomers comprising one or more carboxylic acid group-containing (meth)acrylic monomers and one or more hydroxyl group-containing (meth)acrylic monomers, wherein carboxylic acid groups on the (meth)acrylic polymer dispersant are at least partially neutralized with a base and wherein

(i) the mixture of monomers contains a monomer that contains reactive groups that are reactive with the carboxylic acid and/or the hydroxyl groups or are reactive with themselves; and/or

(ii) the electrode binder further comprises a cross-linking agent reactive with carboxylic acid groups.

Appeal Br. 22.

REJECTIONS

On appeal, the Examiner maintains the following rejections:

1. Claims 1, 2, 8, and 10–12 are rejected under 35 U.S.C. § 103 as unpatentable over the combination of Mogi,² Maeda,³ Amin-Sanayei,⁴ and Swarup.⁵ Final Act. 2.

² WO 2012/039366 A1, published March 29, 2012. We cite EP 2621005 A1 as the English-language equivalent. We note that the Examiner and Appellant refer to this reference as Takeshi, which is the given name of the first-named inventor. We, however, will follow our normal practice of referring to references by the surname of the first-named inventor.

³ US 6,652,773 B2, issued November 25, 2003.

⁴ US 2010/0304270 A1, published December 2, 2010.

⁵ US 2003/0204013 A1, published October 30, 2003.

2. Claims 5 and 6 are rejected under 35 U.S.C. § 103 as unpatentable over the combination of Mogi, Maeda, Amin-Sanayei, Swarup, and Sekmakas.⁶ Final Act. 6.
3. Claims 13–16, 18, 19, 23, 25, and 27–29 are rejected under 35 U.S.C. § 103 as unpatentable over the combination of Mogi, Maeda, Amin-Sanayei, Swarup, and Sekmakas. Final Act. 7.
4. Claims 17 and 43 are rejected under 35 U.S.C. § 103 as unpatentable over the combination of Mogi, Maeda, Amin-Sanayei, Sekmakas, and Ruka.⁷ Final Act. 12.
5. Claims 30, 31, and 37–42 are rejected under 35 U.S.C. § 103 as unpatentable over the combination of Mogi, Maeda, Amin-Sanayei, and Sekmakas. Final Act. 13.

DISCUSSION

Rejection 1. The Examiner rejected claims 1, 2, 8, and 10–12 as unpatentable over the combination of Mogi, Maeda, Amin-Sanayei, and Swarup. Final Act. 2–6.

Appellant argues for reversal of this rejection with respect to two groups of claims: (1) claims 1, 2, and 10–12 and (2) claim 8. We address these two groups of claims below. Appeal Br. 6–14.

Claims 1, 2, and 10–12. We select claim 1 as representative of this group of claims and limit our discussion accordingly. 37 C.F.R. § 41.37(c)(1)(iv).

⁶ US 4,022,737, issued May 10, 1977.

⁷ US 6,248,468 B1, issued June 19, 2001.

In rejecting claim 1, the Examiner found that Mogi does not describe or suggest the claimed (meth)acrylic polymer dispersant. Final Act. 3. In particular, the Examiner found that Mogi's (meth)acrylic polymer is not prepared from a mixture of monomers that includes "one or more hydroxyl group-containing (meth)acrylic monomers" as recited in claim 1. *Id.* The Examiner further found that Mogi describes the use of alkyl ester (meth)acrylic acid monomers—e.g., propyl(meth)acrylate—in the preparation of its polymer. *Id.* (citing Mogi ¶ 33). According to the Examiner, these alkyl ester (meth)acrylic acid monomers are equivalent to the claimed hydroxyl group-containing monomers. *Id.* (citing Maeda 4:11–24; 6:60–64).

Appellant argues that the Examiner's finding of equivalence is erroneous. Appeal Br. 7–9. Appellant argues that Mogi requires that its polymer have particular properties: (1) a highest occupied molecular orbital ("HOMO") value calculated by a semi-empirical molecular orbital method of -10 eV or less; (2) a difference between the lowest unoccupied molecular orbital ("LUMO") value calculated by the semi-empirical molecular orbital method and its HOMO value (the "HOMO-LUMO gap") of at least 10.5 eV; and (3) a fluorine atom content of 2–30 mass %. *Id.* at 7–8. Appellant argues that hydroxypropyl methacrylate has a HOMO-LUMO gap of less than 10.5 eV. *Id.* at 8. According to Appellant, this fact means that a person having ordinary skill in the art would not regard hydroxypropyl methacrylate as equivalent to Mogi's alkyl ester monomers of (meth)acrylic acid because

[u]sing a hydroxyl functional monomer as suggested by the Examiner in amounts recommended by the reference will likely yield a polymer outside the HOMO/LUMO guideline taught by the [Mogi] reference. Therefore, one skilled in the art would not be led to use a hydroxyl

functional monomer due to the possibility of failure of compliance with the stringent HOMO and LUMO requirements outlined by the [Mogi] reference in order to meet the objects of the [Mogi] invention

Id. (emphasis omitted).

According to Appellant, a person of ordinary skill in the art at the time of the invention would have been very reluctant to make changes to the polymer composition described in Mogi because Mogi teaches that

a very specific polymer composition is required to attain the desired properties of the [Mogi] binder for electrodes. As noted in [Mogi] paragraph [0010], an electrochemical device obtained from the [Mogi] binder composition for electrodes can retain binding capacity and adhesion even in a high-temperature environment, and its self-discharge in a high-temperature environment is highly suppressed.

Id. at 9 (emphasis omitted).

Although Appellant's argument seems attractive, ultimately, it is not persuasive. This is because the argument is based upon factual assertions that are not supported in the record. In particular, Appellant's argument rests upon the energy levels of the HOMO and LUMO of hydroxypropyl methacrylic acid. *See id.* at 7–9. Appellant, however, does not provide a citation to the record to support the values set forth in the Appeal Brief. It is well-settled that arguments of counsel cannot take the place of factually supported objective evidence. *See, e.g., In re Huang*, 100 F.3d 135, 139–40 (Fed. Cir. 1996); *In re De Blauwe*, 736 F.2d 699, 705 (Fed. Cir. 1984).

Moreover, Appellant's argument is speculative. Appellant argues that using a hydroxyl functional monomer in the amounts recommended by Mogi “**will likely**” result in a polymer that does not meet Mogi's HOMO/LUMO criteria. Appeal Br. 8. Once again, this is attorney argument not supported by factual evidence. The argument, therefore, is unpersuasive. *See In re*

Geisler, 116 F.3d 1465, 1470 (Fed. Cir. 1997) (“An assertion of what seems to follow from common experience is just attorney argument and not the kind of factual evidence that is required to rebut a *prima facie* case of obviousness.”).

Appellant next argues that the Examiner erred by not adequately explaining the reason a person of ordinary skill in the art would have combined the teachings of Mogi and Amin-Sanayei. Appeal Br. 9 (discussing Final Act. 4). This argument is not persuasive. As the Examiner found, a person of ordinary skill in the art would have partially neutralized the acid groups in order to maintain the effectiveness of the polymers as thickeners. Final Act. 4 (citing Amin-Sanayei ¶¶ 58, 65); Answer 8–9.

Appellant also argues that claim 1 is drawn to an electrode binder of a lithium ion battery comprising two distinct components: (1) a polyvinylidene fluoride polymer and (2) a (meth)acrylic polymer dispersant. Appeal Br. 9–10. According to Appellant, Mogi describes a binder composition for electrodes which contains a single polymer component and an aqueous medium. *Id.* at 10–11. This argument is not persuasive for the reasons set forth by the Examiner at pages 9–13 of the Answer, which we adopt as our own.

For the reasons set forth above, we affirm the rejection of claims 1, 2, and 10–12.

Claim 8. Appellant presents an additional argument for reversal of the rejection of claim 8. *See* Appeal Br. 12–14.

For ease of reference, we reproduce claim 8 below.

8. The electrode binder of claim 1 in which *the mixture of monomers contains N-alkoxymethyl (meth)acrylamide and/or blocked isocyanatoethyl (meth)acrylate.*

Id. at 23 (emphasis added).

In rejecting claim 8, the Examiner found that Mogi describes the use of acrylamide such as N-methylolacrylamide as a monomer in the polymerization described in Mogi. *See* Final Act. 4. The Examiner also found that Swarup discloses that N-methylol(meth)acrylamide—which is a homolog of N-methylolacrylamide and has similar properties thereto—and N-alkoxymethyl(meth)acrylamides have similar properties and function equivalently as cross-linking monomers in the polymerization. *Id.* (citing Swarup ¶ 43). The Examiner further found that it would have been obvious to one of ordinary skill in the art at the time of the invention to have modified the combined [Mogi] by substituting N-alkoxymethyl(meth)acrylamide for N-methylolacrylamide because the substitution of a known equivalent for the same purpose is *prima facie* obvious. *Id.*

Appellant argues that the Examiner erred in concluding that the teachings of the prior art taken as a whole would have made obvious the subject matter of claim 8. Appeal Br. 12–14. In particular, Appellant argues that while Swarup describes N-methylol(meth)acrylamide and N-alkoxymethyl(meth)acrylamides as equivalent for preparing a latex emulsion for use in an automotive coating, this does not establish the equivalence of these monomers for use in preparing a binder composition for battery electrodes as described in Mogi. *Id.* at 13–14.

This argument is not persuasive. Although the end use of the polymers in Swarup and Mogi are different, the N-methylol(meth)acrylamide and N-alkoxymethyl(meth)acrylamides serve the same purpose in the polymerization reactions described in these references.

We, therefore, discern no error in the Examiner's finding that they are equivalent for the purposes of establishing a prima facie case of obviousness.

Appellant also argues that a person of ordinary skill in the art would not have made the substitution proposed by the Examiner because "one would want to avoid altering the HOMO and LUMO values which are critical to the [Mogi] binder performance." Appeal Br. 13.

This argument is not persuasive because it is not supported by any evidence of record. Appellant does not point to any data suggesting that the HOMO and LUMO values of the various compounds are such that they would give any concern to a person of ordinary skill in the art with respect to Mogi's description of the desired HOMO and LUMO values of the polymers used to create its electrode binder.

In view of the foregoing, we affirm the rejection of claim 8 as unpatentable over the combination of Mogi, Maeda, Amin-Sanayei, and Swarup.

Rejection 2. The Examiner rejected claims 5 and 6 under 35 U.S.C. § 103 as unpatentable over the combination of Mogi, Maeda, Amin-Sanayei, Swarup, and Sekmakas. Final Act. 6–7.

Appellant argues that Sekmakas does not cure the alleged deficiencies in the rejection of claim 1. Appeal Br. 14–15.

As discussed above, we have not been persuaded by Appellant that the rejection of claim 1 was erroneous. We, therefore, also affirm the rejection of claims 5 and 6.

Rejection 3. The Examiner rejected claims 13–16, 18, 19, 23, 25, and 27–29 as unpatentable over the combination of Mogi, Maeda, Amin-Sanayei, Swarup, and Sekmakas. Appeal Br. 7–12.

Appellant argues that the rejection of these claims should be reversed for the same reasons set forth with respect to the reversal of the rejection of claims 1, 2, 5, 6, 8, and 10–12.

As discussed above, we have not discerned reversible error in the rejection of those claims. Accordingly we also affirm the rejection of claims 13–16, 18, 19, 23, 25, and 27–29.

Rejection 4. The Examiner rejected claims 17 and 43 as unpatentable over the combination of Mogi, Maeda, Amin-Sanayei, Sekmakas, and Ruka. Final Act. 12–13.

Appellant argues that this rejection should be reversed for the same reasons advanced for reversal of the rejection of claims 1, 2, 5, 6, 8, and 10–12. Appeal Br. 18.

As discussed above, we do not discern reversible error in the rejection of claim 1. Accordingly we also affirm the rejection of claims 17 and 43.

Rejection 5. The Examiner rejected claims 30, 31, and 37–42 as unpatentable over the combination of Mogi, Maeda, Amin-Sanayei, and Sekmakas. Final Act. 13–15.

Appellant argues that this rejection should be reversed for the same reasons the rejection of claim 1 should have been reversed. Appeal Br. 20.

As discussed above, we do not discern reversible error in the rejection of claim 1. Accordingly we also affirm the rejection of claims 17 and 43.

CONCLUSION

In summary:

Claims Rejected	35 U.S.C. §	Basis	Affirmed	Reversed
1, 2, 8, 10–12	103	Mogi, Maeda, Amin-Sanayei, Swarup	1, 2, 8, 10–12	
5, 6	103	Mogi, Maeda, Amin-Sanayei, Swarup, Sekmakas	5, 6	

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Claims Rejected	35 U.S.C. §	Basis	Affirmed	Reversed
13-16, 18, 19, 23, 25, 27-29	103	Mogi, Maeda, Amin-Sanayei, Swarup, Sekmakas	13-16, 18, 19, 23, 25, 27-29	
17, 43	103	Mogi, Maeda, Amin-Sanayei, Sekmakas, Ruka	17, 43	
30, 31, 37-42	103	Mogi, Maeda, Amin-Sanayei, Sekmakas	30, 31, 37-42	
Overall Outcome			1, 2, 5, 6, 8, 10-19, 23, 25, 27-31, 37-43	

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

AFFIRMED