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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte MOU PAUL, STEVEN D. JONS, JOSEPH D. KOOB,
XIAOHUA SAM QIU, STEVEN ROSENBERG, and ABHISHEK ROY

Appeal 2014-009668
Application 13/990,137
Technology Center 1700

Before MICHAEL P. COLAIANNI, WESLEY B. DERRICK, and
MONTÉ T. SQUIRE, *Administrative Patent Judges*.

SQUIRE, *Administrative Patent Judge*.

DECISION ON APPEAL¹

Appellants² appeal the Examiner's final rejection of claims 1–3 and 5–10. 35 U.S.C. § 134(a). We have jurisdiction under 35 U.S.C. § 6(b). An oral hearing was held on October 18, 2016.

We AFFIRM.

¹ In this decision, we refer to the Final Office Action appealed from, mailed June 26, 2014 (“Final Act.”), the Appeal Brief dated July 1, 2014 (“App. Br.”), the Examiner’s Answer to the Appeal Brief dated September 4, 2014 (“Ans.”), and the Reply Brief dated September 9, 2014 (“Reply Br.”).

² Appellants identify “The Dow Chemical Company and its affiliates, FilmTec Corporation and Global Technologies LLC” as the Real Party in Interest. App. Br. 2.

The Claimed Invention

Appellants' disclosure relates to a method for making a composite polyamide membrane comprising the steps of applying a polyfunctional amine monomer and acyl halide monomer to a surface of a porous support and interfacially polymerizing the monomers to form a thin film polyamide layer. Abstract; Spec. 1, 2. Claim 1 is representative of the claims on appeal and is reproduced below from the Claims Appendix to the Appeal Brief (App. Br. 10):

1. A method for making a composite polyamide membrane comprising a porous support and a thin film polyamide layer, wherein the method comprises the step of applying a polyfunctional amine monomer and polyfunctional acyl halide monomer to a surface of the porous support and interfacially polymerizing the monomers to form a thin film polyamide layer, wherein the method is characterized by including at least one of the following steps:

i) conducting the interfacial polymerization in the presence of a first subject monomer comprising an aromatic moiety substituted with a single carboxylic acid functional group or salt thereof and a single amine-reactive functional group selected from: acyl halide, anhydride, isocyanate and epoxy, and

ii) applying a first subject monomer comprising an aromatic moiety substituted with a single carboxylic acid functional group or salt thereof and a single amine-reactive functional group selected from: acyl halide, anhydride, isocyanate and epoxy, to the thin film polyamide layer.

The References

The Examiner relies on the following references in rejecting the claims on appeal:

Cadotte	US 4,277,344	July 7, 1981
Linder et al., (hereinafter "Linder")	US 4,767,645	Aug. 30, 1988

Hartman et al., (hereinafter “Hartman”)	US 5,180,802	Jan. 19, 1993
Murakami et al., (hereinafter “Murakami”)	US 6,406,626 B1	June 18, 2002

The Rejections

On appeal, the Examiner maintains the following rejections:

1. Claims 1–3 and 5–7 stand rejected under pre-AIA 35 U.S.C. § 103(a) as being unpatentable over Murakami in view of Hartman. Final Act. 3–5.
2. Claims 8 and 9 stand rejected under pre-AIA 35 U.S.C. § 103(a) as being unpatentable over Murakami in view of Cadotte. Final Act. 5–7.
3. Claim 10 stands rejected under pre-AIA 35 U.S.C. § 103(a) as being unpatentable over Murakami in view of Cadotte in further view of Linder. Final Act. 7.

OPINION

Having considered the respective positions advanced by the Examiner and Appellants in light of this appeal record, including Appellants’ argument at the oral hearing,³ we affirm the Examiner’s rejections for the reasons set forth in the Answer to the Appeal Brief and Final Office Action appealed from, which we adopt as our own. Nevertheless, we highlight and address specific findings and arguments for emphasis as follows.

³ An Appellant may only rely on, and we only consider, argument that has been relied upon in the Appeal Brief or Reply Brief. 37 C.F.R. § 41.47(e)(1).

Rejection 1

Claims 1, 3, and 5–7. In response to this rejection, Appellants do not present arguments for the separate patentability of claims 1, 3, and 5–7. We select claim 1 as representative of this group, and claims 3 and 5–7 stand or fall with claim 1. 37 C.F.R. § 41.37(c)(1)(iv).

The Examiner determines that the combination of Murakami and Hartman suggests a method for making a composite polyamide membrane satisfying all of the limitations of claim 1 and would have rendered claim 1 obvious. Final Act. 3, 4. The Examiner finds that Murakami discloses or suggests the majority of claim 1’s limitations, but that the reference “does not explicitly recite the claimed structure of the subject[] monomer.” *Id.* (citing Murakami, Abstract, col. 2, l. 62, col. 4, ll. 1–21, 30–33, col. 7, ll. 32–39, 52–59, col. 8, ll. 50–54). The Examiner, however, relies on Hartman for disclosing this limitation. *Id.* at 4. In particular, the Examiner finds that Hartman teaches “a method for manufacturing polyamide compositions comprising trimellitic anhydride as a substitute for the acid halide.” *Id.* (citations omitted) (citing Hartman, Abstract, col. 6, ll. 23–26). The Examiner finds further that the “trimellitic anhydride” Hartman discloses reads on the anhydride functional group recited in claim 1. *Id.*

Based on the above findings, the Examiner concludes that it would have been obvious to one of ordinary skill in the art at the time the invention was made “to practice the method of Murakami and substitute the polyfunctional acid anhydride halide with the polyfunctional acid anhydride trimellitic anhydride because Hartman teaches that these compositions are substitutable for the purpose of producing a polyamide.” Final Act. 4.

Appellants argue that the Examiner's rejection should be reversed because the claimed invention is directed to "a different polyamide structure that is neither disclosed nor suggested by the cited references." App. Br. 3. Appellants further argue that "Hartman represents non-analogous art." *Id.* at 5. In particular, Appellants argue that Hartman is "outside the field of semi-permeable membranes (*applicant's endeavor*)" and "fails to address improvements of either membrane flux or salt passage (*the problem addressed by applicant's invention*)." *Id.* Appellants also argue that the Examiner's rationale for combining Murakami and Hartman is "deficient" because it "fails to account for the context of Hartman's teaching and its inapplicability to interfacially polymerized membranes as described in Murakami" and does not "provide a proper motive or reasonable expectation of success" in combining the references' teachings. *Id.*

We are not persuaded by Appellants' arguments. In particular, we do not find Appellants' argument (App. Br. 3) that the claimed invention is directed to a different polyamide structure that is neither disclosed nor suggested by the cited references persuasive because it attacks the references individually rather than the collective teachings of the prior art as a whole. One cannot show non-obviousness by attacking references individually where the rejection is based on a combination of references. *See In re Keller*, 642 F.2d 413, 425 (CCPA 1981). Appellants' argument focuses primarily on what Appellants contend Murakami and Hartman each teach or suggest individually, and not the combined teachings of the references as a whole and what the combined teachings would have suggested to one of ordinary skill in the art.

Moreover, based on the record before us and the combined teachings of the cited references as a whole, the Examiner's finding that the combination of Murakami and Hartman suggests all of claim 1's limitations, including the claimed polyamide structure, is supported by a preponderance of the evidence and based on sound technical reasoning. Murakami, Abstract, col. 2, l. 62, col. 4, ll. 1–21, 30–33, col. 7, ll. 32–39, 52–59, col. 8, ll. 50–54; Hartman, Abstract, col. 6, ll. 23–26.

As the Examiner found (Final Act. 3, 4), Murakami teaches a method of forming a crosslinked polyamide ultra-thin membrane layer by the reaction between an aqueous solution containing a polyfunctional amine and an organic solvent solution containing polyfunctional acid halide together with polyfunctional acid anhydride halide, and that the polyfunctional acid anhydride is present during interfacial polycondensation. Murakami, Abstract, col. 2, l. 62, col. 4, ll. 1–21, 30–33, col. 7, ll. 32–39, 52–59, col. 8, ll. 50–54. As the Examiner further found (Final Act 4), Hartman teaches a method for manufacturing polyamide compositions comprising trimellitic anhydride as a substitute for the acid halide, reads on the anhydride functional group recited in claim 1. Hartman, Abstract, col. 6, ll. 23–26. Appellants' arguments expose no reversible error in the Examiner's analysis and factual findings in this regard.

On the record before us, we are also persuaded that the Examiner has provided a reasoned basis and identified sufficient evidence to evince why one of ordinary skill would have combined the teachings of Murakami and Hartman to arrive at Appellants' claimed invention. Final Act. 4 (explaining that one of ordinary skill would have been motivated to substitute the polyfunctional acid anhydride halide in Murakami's method with Hartman's

polyfunctional acid anhydride trimellitic anhydride because Hartman teaches that these compositions are substitutable for the purpose of producing a polyamide); *see also* Hartman, col. 6, ll. 23–26. Appellants do not direct us to sufficient evidence or provide a persuasive technical explanation as to why the Examiner’s articulated reasoning for combining the teachings of the prior art to arrive at the claimed invention lacks a rational underpinning or is otherwise based on some reversible error.

Appellants’ argument that Hartman represents non-analogous art is unpersuasive because it too narrowly characterizes the scope of Hartman’s disclosures, including the applicable field of endeavor and pertinence of the problems addressed to the problem in which the claimed invention is involved. *See In re Bigio*, 381 F.3d 1320, 1325 (Fed. Cir. 2004). As the Examiner points out (Final Act. 2, 3), the need or problem addressed by Hartman relates to selecting the components to form a polyamide, including “alkyl- or aryl-terminated polyamide compositions and polyamide rheological additives” and Hartman specifically discloses a method for forming a polyamide, which includes use of the claimed polyfunctional anhydride, “trimellitic anhydride.” Hartman, Abstract, col. 6, ll. 23–26, claim 1.

We disagree with Appellants’ arguments that the Examiner’s reasoning for combining Murakami and Hartman is “deficient” because it fails to account for the “context of Hartman’s teaching” and does not provide “a proper motive or reasonable expectation of success.” The Supreme Court has explained that any need or problem known in the art can provide a reason for combining the elements in the manner claimed and Appellants’ disagreement with the Examiner’s reason for combining the

references, without more, is insufficient to establish reversible error in this regard. *KSR Int'l Co. v. Teleflex, Inc.*, 550 U.S. 398, 420 (2007).

Moreover, as discussed above, we find that the Examiner's analysis and factual findings in this regard are supported by a preponderance of the evidence and based on sound technical reasoning. In particular, based on the record evidence, we agree with the Examiner's reasoning and findings provided at pages 3 and 4 of the Answer explaining why one of ordinary skill in the art would have had a reasonable expectation of success substituting Murakami's acid anhydride halide with Hartman's trimellitic anhydride. Murakami, col. 4, ll. 14–20, 30–33, col. 8, ll. 50–54; Hartman, Abstract, col. 6, ll. 23–26. Appellants' argument reveals no reversible error in the Examiner's analysis and factual findings in this regard.

We do not find Appellants' argument that “[u]nder Murakami's reaction conditions, Hartman's teaching of ‘equivalent’ monomers is invalid as carboxylic acid groups are substantially unreactive with amines” (App. Br. 5) persuasive because Appellants do not provide an adequate technical explanation or sufficient discussion in the appeal briefing to support it. Appellants' assertions that “[t]his point is particularly clarified in applicant's previously filed declaration and is further supported by excerpts of Murakami (see col. 5, line 61–63) and col. 8, lines 43–45 of US 4277344 (Cadotte)” (App. Br. 5; Reply Br. 3) and extensive attorney argument regarding the declaration at the oral hearing,⁴ without more, are insufficient

⁴ Appellants failed to explain or offer any reason why the extensive attorney argument made at the oral hearing regarding the declaration was not timely raised in either the Appeal Brief or the Reply Brief. We, therefore, decline to consider it at this juncture. 37 C.F.R. § 41.41(b)(2).

to persuade us of reversible error in the Examiner's findings in this regard. *In re De Blauwe*, 736 F.2d 699, 705 (Fed. Cir. 1984).

Claim 2. Appellants present a separate argument for the patentability of dependent claim 2. Claim 2 depends from claim 1 and adds the limitation "wherein the amine-reactive functional group of the first subject monomer present in steps i) or ii) is an acyl halide." App. Br. 10 (Claims App'x).

The Examiner finds that the combination of Murakami and Hartman suggests all of claim 2's limitations and would have rendered claim 2 obvious. Final Act. 3–5 (citing Murakami, Abstract, col. 1, ll. 44–51, col. 2, l. 62, col. 3, ll. 40–57, col. 4, ll. 1–21, 30–33, col, 7, ll. 32–39, 52–59, col. 8, ll. 50–54; Hartman, Abstract, col. 6, ll. 23–26). In particular, the Examiner finds that Murakami teaches that: (1) "the polyfunctional acid halide can be used alone"; (2) "[s]uch a polyfunctional acid halide is a benzene ring with two or more halocarbonyl groups (acyl halide) per molecule"; and that the (3) claimed "subject monomer may exclude the acid anhydride in favor of an acyl halide." *Id.* at 5 (citing Murakami, col. 1, ll. 44–51, col. 3, ll. 40–57).

Appellants argue that the Examiner's rejection of claim 2 should be reversed because: (1) "Murakami fails to describe equivalency between an anhydride group . . . and an acid halide group"; (2) "Murakami would seem to teach away from the Examiner's proposed substitution by expressly requiring two amine-reactive (acid halide) groups rather than one"; (3) "the Examiner has failed to provide any motivation for modifying Murakami's acid anhydride halide monomer in such a manner"; and (4) the "comparative examples provided in the subject application show an unexpected improvement in membrane salt passage when the subject monomers are used

as compared with similar monomers including two amine-reactive groups.”
App. Br. 7.

We are not persuaded by Appellants’ arguments regarding the patentability of claim 2 largely for the same reasons discussed above for claim 1. In particular, Appellants’ argument that Murakami fails to describe equivalency between an anhydride group and an acid halide group is unpersuasive because, as the Examiner correctly points out (Ans. 4), Murakami broadly teaches a number of functional groups attached to a benzene ring, including acid anhydride, acyl halide, and carboxyl functional groups, that react with a polyfunctional amine to form a polyamide, and which the Examiner finds are interchangeable in the context of forming a polyamide. Murakami, col. 3, ll. 40-67, col. 4, ll. 1-21, 30-33, col. 8, ll. 50-54. As found by the Examiner (Ans. 4), Murakami also specifically discloses a polyfunctional acid halide, which excludes acid anhydride in favor of acyl halide, successfully reacting with the polyfunctional amine to form a polyamide. Murakami, col. 4, ll. 14-21.

Appellants’ teaching away argument is unpersuasive because Appellants do not identify sufficient evidence to support it, and we will not read into the references a teaching away where no such language exists. *Cf. DyStar Textilfarben GmbH v. C.H. Patrick Co.*, 464 F.3d 1356, 1364 (Fed. Cir. 2006). In particular, Appellants’ assertion that Murakami would seem to teach away from the Examiner’s proposed substitution (App. Br. 7), without more, is insufficient to establish that the references teach away from the claimed invention or adequately rebut the Examiner’s analysis and findings in this regard. *In re De Blauwe*, 736 F.2d 699, 705 (Fed. Cir. 1984). We find that Appellants do not identify any teaching in Murakami or

in Hartman which discourages one of ordinary skill in the art from combining their teachings to arrive at the claimed invention as found by the Examiner. *In re Fulton*, 391 F.3d 1195, 1201 (finding that there is no teaching away where the prior art’s disclosure “does not criticize, discredit, or otherwise discourage the solution claimed”).

Appellants’ contention that comparative examples in the Specification show an unexpected improvement in membrane salt passage (App. Br. 7) is equally unpersuasive because Appellants do not identify sufficient evidence or provide an adequate technical explanation to support it, including any basis for the proposition that the results, improved or not, were unexpected, or that the comparative results provided are commensurate with the scope of the claims (*generally* App. Br.; Reply Br.). *De Blauwe*, 736 F.2d at 705; *see also In re Klosak*, 455 F.2d 1077, 1080 (CCPA 1972) (“the burden of showing unexpected results rests on he who asserts them”); *cf. also Ex parte Ishizaka*, No. 91-2539, 1992 WL 336794, at *4 (BPAI Apr. 30, 1992) (stressing that “appellants have the burden of explaining the . . . evidence of non-obviousness” upon which they rely).

Accordingly, we affirm the Examiner’s rejection of claims 1–3 and 5–7 under pre-AIA 35 U.S.C. § 103(a) as unpatentable over the combination of Murakami and Hartman.

Rejection 2

Appellants argue claims 8 and 9 as a group. We select claim 8 as representative and claim 9 stands or fall with claim 8. 37 C.F.R. § 41.37(c)(1)(iv). Claim 8 is similar to claim 1, but more narrowly limits the “first subject monomer” in reciting the steps:

i) conducting the interfacial polymerization in the presence of a first subject monomer selected from at least one of: 3-carboxybenzoyl chloride and 4-carboxybenzoyl chloride, and

ii) applying a first subject monomer selected from at least one of: 3-carboxybenzoyl chloride and 4-carboxybenzoyl chloride, to the thin film polyamide layer.

App. Br. 11 (Claims App'x).

The Examiner finds that the combination of Murakami and Cadotte suggests all of claim 8's limitations and would have rendered claim 8 obvious. Final Act. 5–7 (citing Murakami, Abstract, col. 2, l. 62, col. 4, ll. 1–21, 30–44, col. 5, ll. 57–66, col. 7, ll. 32–39, 52–59, col. 8, ll. 50–54; Cadotte, Abstract, col. 8, ll. 38–45). In particular, the Examiner finds that although Murakami “does not explicitly recite the claimed structure of the subject[] monomer,” it does disclose that “the polyfunctional acid anhydride is used together with the polyfunctional acid halide at particular ratios to form the polyamide membrane.” *Id.* at 6 (citing Murakami, col. 4, ll. 34–44). The Examiner further finds that Cadotte teaches “a method for forming a polyamide membrane from a polyamine and polyacyl halide wherein it is taught that carboxylic acid anhydride functional groups react slowly with amines and carboxylic acid functional groups also react slowly with amines.” *Id.* (citation omitted) (citing Cadotte, Abstract, col. 8, ll. 38–45).

Based on the Examiner's findings regarding Murakami's and Cadotte's combined teachings, the Examiner concludes that “it would have been obvious to one of ordinary skill in the art at the time the invention was made to substitute the slow reacting carboxylic acid anhydride functional group with a carboxylic acid functional group because Cadotte teaches that they are equivalents in terms of slowly reacting with amines.” Final Act. 6.

Appellants argue that this rejection should be reversed because “Cadotte teaches away from the use of either carboxylic acid anhydride or carboxylic acid functional groups” and because neither Cadotte nor Murakami “suggests the use of the subject monomer including a single carboxylic acid group and a single amine-reactive group selected from acyl halide (e.g. 3-carboxybenzoyl chloride and 4-carboxybenzoyl chloride), isocyanate and epoxy,” as claimed. App. Br. 8.

We do not find Appellants’ arguments persuasive. Based on the record before us, the Examiner’s findings regarding Murakami’s and Cadotte’s teachings and rationale for why one of ordinary skill would have combined these teachings to arrive at Appellants’ claimed invention are supported by a preponderance of evidence and based on sound technical reasoning. Murakami, Abstract, col. 2, l. 62, col. 4, ll. 1–21, 30–44, col. 5, ll. 57–66, col. 7, ll. 32–39, 52–59, col. 8, ll. 50–54; Cadotte, Abstract, col. 8, ll. 38–45.

Appellants’ contentions that “neither Cadotte nor Murakami suggests the use of the subject monomer” and that the Examiner’s proposed rationale for combining the references “defeats the purpose of Murakami’s objective of improving upon Cadotte’s fundamental reaction by addition [of] a unique third monomer” (App. Br. 8), without more, are conclusory and insufficient to establish reversible error in the Examiner’s analysis and factual findings in this regard. *De Blauwe*, 736 F.2d at 705.

We disagree with Appellants’ argument that Cadotte teaches away from the use of either carboxylic acid anhydride or carboxylic acid functional groups (App. Br. 8). As the Examiner found (Ans. 4), Cadotte actually teaches that in the context of forming a polyamide membrane by

interfacial polymerization carboxylic acid anhydride groups and carboxylic acid groups react slowly—not that they do not react at all, as Appellants’ argument suggests. Cadotte, Abstract, col. 8, ll. 38–45. Moreover, as the Examiner correctly points out (Ans. 5) the fact that Cadotte teaches that carboxylic acid anhydride groups and carboxylic acid groups are slow reacting, without more, is insufficient to establish that the references teaches away from combining Cadotte’s teachings with Murakami’s teachings to arrive at the claimed invention as found by the Examiner. *Fulton*, 391 F.3d at 1201.

Accordingly, we affirm the Examiner’s rejection of claims 8 and 9 under pre-AIA 35 U.S.C. § 103(a) as unpatentable over the combination of Murakami and Cadotte.

Rejection 3

Claim 10 depends from claim 9 and recites the following additional limitation: “wherein the amine-reactive functional group of the first subject monomer present in steps i) or ii) is selected from: isocyanate and epoxy.” App. Br. 12 (Claims App’x).

The Examiner finds that the combination of Murakami, Cadotte, and Linder suggests all of claim 10’s limitations and would have rendered claim 10 obvious. Final Act. 7. The Examiner finds that the combination of Murakami and Cadotte as previously discussed above with respect to claim 8 suggests all of claim 10’s limitations, but that it does not “teach an isocyanate group.” *Id.* The Examiner, however, relies on Linder for teaching this missing limitation. *Id.* In particular, the Examiner finds that Linder teaches a method for forming a membrane through interfacial polymerization of an amine and a cross-linking agent “wherein the

crosslinking agent has at least two functional groups selected from isocyanates and carboxylic acid halides.” *Id.* (citing Linder, Abstract, col. 2, ll. 14–17, col. 5, ll. 61–62, col. 11, ll. 3–12).

Based on the above findings, the Examiner concludes that it would have been obvious to one of ordinary skill in the art at the time the invention was made “to practice the method of Murakami and Cadotte and substitute a carboxylic acid halide functional groups with an isocyanate functional group because Linder teaches that they are substitutable for the purpose of reacting with an amine.” Final Act. 7.

Appellants argue that this rejection should be reversed because “Linder’s teaching is not predictably applicable within the context of Cadotte or Murakami’s approach” and the “Examiner’s mere assertions that Linder’s teaching of substitutable functional groups for a crosslinking agent fail to provide the required factual basis to support the rejection.” App. Br. 9.

We do not find Appellants’ arguments persuasive because they do not identify sufficient evidence or provide an adequate technical explanation to support them. *De Blauwe*, 736 F.2d at 705. These arguments also fail to “take account of the inferences and creative steps that a person of ordinary skill in the art would employ” in overcoming difficulties in combining the teachings of the cited references. *KSR*, 550 U.S. at 418. Appellants also misconstrue Linder’s teachings. As the Examiner correctly points out (Ans. 5), Linder suggests the use of isocyanate functional groups as an alternative to carboxylic acid halides (i.e., acyl halides) for reacting with an amine and generally demonstrates that isocyanate groups show reactivity to amines in the same way as carboxylic acids halides, regardless of whether the amine is

in monomeric or polymeric form. *See* Linder, col. 11, ll. 3–12. Appellants’ arguments expose no reversible error in the Examiner’s factual findings in this regard.

Moreover, based on the record before us, the Examiner’s findings regarding Murakami’s, Cadotte’s, and Linder’s teachings, and the stated reasoning for why one of ordinary skill would have combined these teachings to arrive at Appellants’ claimed invention, are supported by a preponderance of evidence and based on sound technical reasoning. Murakami, Abstract, col. 2, l. 62, col. 4, ll. 1–21, 30–44, col. 5, ll. 57–66, col. 7, ll. 32–39, 52–59, col. 8, ll. 50–54; Cadotte, Abstract, col. 8, ll. 38–45; Linder, Abstract, col. 2, ll. 14–17, col. 5, ll. 61–62, col. 11, ll. 3–12.

Accordingly, we affirm the Examiner’s rejection of claim 10 under pre-AIA 35 U.S.C. § 103(a) as unpatentable over the combination of Murakami, Cadotte, and Linder.

DECISION/ORDER

The Examiner’s rejections of claims 1–3 and 5–10 are affirmed.

It is ordered that 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).

AFFIRMED