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UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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*Ex parte* JON TIPPET, JOHN ASHBAUGH,  
FENGKUI LI, DOUGLAS BURMASTER, JEFFREY E. NAIRN,  
MARC MAYHALL, LELAND DANIELS, and  
LEONARDO CORTES

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Appeal 2017-010618  
Application 14/268,826<sup>1</sup>  
Technology Center 1700

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Before LINDA M. GAUDETTE, JEFFREY B. ROBERTSON, and  
SHELDON M. McGEE, *Administrative Patent Judges*.

McGEE, *Administrative Patent Judge*.

DECISION ON APPEAL

Pursuant to 35 U.S.C. § 134, Appellant seeks our review of the  
Examiner's rejections of claims 1–13 and 15–25.<sup>2</sup> App. Br. 9–18.

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<sup>1</sup> Appellant is the Applicant, Fina Technology, Inc., which is also identified  
as the real party in interest. App. Br. 5.

<sup>2</sup> In the Final Office Action dated October 6, 2016 (“Final”) the Examiner  
refers to the “reasons of record.” Final 2, 3. Thus, our Decision refers to the  
Non-Final Office Actions dated November 10, 2015 (“Non-Final I.”) and  
April 25, 2016 (“Non-Final II.”), which provide those “reasons of record.”  
We also refer to the Appeal Brief dated April 3, 2017 (“App. Br.”), the

We have jurisdiction. 35 U.S.C. § 6.

We affirm.

## BACKGROUND

The appealed subject matter is directed to polymer foams (claims 1–13, 15–18, 21, 22, 24, and 25) and methods of producing polymer foams (claims 19, 20, and 23).

Claim 1 is illustrative of the appealed subject matter, and is copied below from the Claims Appendix to the Appeal Brief, with emphasis added to relevant limitations at issue in this appeal:

1. A polymer foam comprising:

[i]) a polymer composition comprising a *propylene based polymer having a molecular weight distribution of greater than or equal to 8* as measured by GPC; and

[ii]) between 0.001 and 8 percent of a metallic acrylate salt,

wherein the polymer foam comprises *a density of less than 0.50 g/cc* and an open cell content of less than 80%.

App. Br. 19.

## REFERENCES

Zeitler et al. (“Zeitler”)	US 4,020,025	Apr. 26, 1977
Altepping et al. (“Altepping”)	US 4,940,736	Jul. 10, 1990
Ewen	US 4,975,403	Dec. 4, 1990
Shiga et al. (“Shiga”)	US 5,026,889	Jun. 25, 1991
Buysch et al. (“Buysch”)	US 5,061,752	Oct. 29, 1991
Park et al. (“Park”)	US 5,116,881	May 26, 1992
Zhao et al. (“Zhao”)	US 6,602,956 B1	Aug. 5, 2003
Li et al. (“Li ’152”)	US 2009/0326152 A1	Dec. 31, 2009
Li et al. (“Li ’838”)	US 2012/0034838 A1	Feb. 9, 2012
Ninbo	CN 102174209 A	Sept. 7, 2011

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Examiner’s Answer dated June 6, 2017 (“Ans.”), and the Reply Brief dated August 7, 2017 (“Reply Br.”).

## REJECTIONS

The claims are rejected under 35 U.S.C. § 103 as follows:

- I. Claims 1–7, 15–21, and 23 over Zhao in combination with Ewen or Shiga (Final 2–3; *see also* Non-Final I. 8–9).
- II. Claims 8–10 over Zhao in combination with Ewen or Shiga, and further in combination with Buysch (Final 3; *see also* Non-Final I. 11).
- III. Claims 11–13 over Zhao in combination with Ewen or Shiga, and further in combination with Li '152 or Li '838 (Final 3; Non-Final II. 3–4).
- IV. Claim 22 over Zhao in combination with Ewen or Shiga, and further in view of Zeitler (Final 4; Non-Final II. 4).
- V. Claim 24 over Zhao in combination with Ewen or Shiga, and further in view of Altepping or Park (Final 4).
- VI. Claim 25 over Zhao in combination with Ewen or Shiga, and further in view of Ninbo (Final 4–5).

### *Rejection I*

We address the claims separately to the extent they are so argued by Appellant. 37 C.F.R. § 41.37(c)(1)(iv).

#### *Claim 1*

The Examiner finds, and Appellant does not dispute, that Zhao discloses a polymer foam comprising a polypropylene and a zinc diacrylate salt in the amount recited in claim 1. Non-Final I. 8. The Examiner acknowledges that Zhao does not expressly disclose the molecular weight distribution (i.e., “MWD”) of the polypropylene, but finds that polypropylenes having the recited molecular weight distribution were known in the art at the time of the invention. *Id.* at 9 (citing Ewen and Shiga as

evidence for this finding); *see also* Final 6 (explaining that “Ewen or Shiga are merely used in the rejection as the evidence that metallocene polymers that are already disclosed by Zhao exhibit various MWD, including the claimed MWD”), and Ans. 6 (“Ewen and Shiga were referred to by the examiner as evidence of common knowledge of such metallocene [polypropylene] exhibiting MWD greater than 8 and their availability on the market”). The Examiner thus determines that the skilled artisan would have had a “reasonable expectation of achieving results consistent with the use of [polypropylene] with [the] specific MWD in the absence of [a] showing of unexpected results.” Non-Final Act. I. 9. The Examiner also finds that the recited foam density “is a common density for polyolefin-based foams,” and relies on Collins<sup>3</sup> — prior art that is incorporated by reference into Zhao — for evidentiary support for this finding. *Id.* at 10.

Appellant argues that the rejection of claim 1 is in error because the art fails to teach or suggest the recited polymer foam density and molecular weight distribution, and further because the Examiner has not provided a reason to combine Ewen and Shiga with Zhao. App. Br. 9–12. For the following reasons, we are not persuaded of reversible error in the Examiner’s rejection of claim 1.

Regarding the recited foam density, Appellant urges that the density values disclosed in the evidentiary Collins reference are not applicable to polypropylene foams, but rather are specific only to the polystyrene or polyethylene foams exemplified in Collins. App. Br. 9–10. We disagree. It is undisputed on this record that Collins — incorporated by reference into

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<sup>3</sup> US 4,323,528, issued April 6, 1982.

Zhao — discloses foamed thermoplastics having density values within the claimed range.<sup>4</sup> Zhao 9:63–66; Collins 1:8–13. Appellant has not identified error in the Examiner’s determinations that thermoplastic foams having the recited density of “less than 0.50 g/cc” were known at the time of the invention, and that the recited foam having such density would have been obvious from Zhao’s disclosure. Non-Final I. 10; Non-Final II. 7; Final 6; Ans. 3–4. Zhao incorporates Collins’ polyolefin foam extrusion process by reference. Zhao 9:63–66. Collins’ disclosure is generic to foamed thermoplastics, and is not limited to the specific thermoplastics exemplified therein. Collins 1:8–13 (“This invention relates to methods and apparatus for producing foamed thermoplastic, *e.g.*, polystyrene or polyethylene.” (emphasis added)); *see also id.* at 5:1–5 (“Thermoplastic polymers usable in the present invention include polystyrene, high and low density, polyethylene, polyvinylchloride, *and any other thermoplastic polymer suitable for use in manufacturing thermoplastic foams.*” (emphasis added)). Thus, because Zhao incorporates Collins by reference, we agree with the Examiner (Ans. 4) that the skilled artisan would have reasonably expected that Zhao’s polypropylene foams, if prepared by Collins’ process, would exhibit a density value consistent with such process — *i.e.*, “not more than 4 pounds per cubic foot.” Collins 1:12–13.

Regarding the molecular weight distribution of Zhao’s polypropylene, Appellant focuses its arguments on the Examiner’s identification of Ewen’s use of a metallocene catalyst to prepare the polypropylene. App. Br. 10–11. Specifically, Appellant urges that “[t]he Examiner provides no reason why

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<sup>4</sup> Appellant also does not dispute the Examiner’s finding that 4 pounds per cubic foot is equal to 0.064 g/cc. Ans. 4.

every one of near infinite number of metallocene catalyzed polypropylenes must have a molecular weight distribution of greater than 8.” *Id.* at 11. This argument does not reveal error in the Examiner’s obviousness determination because it does not address the rationale as set forth in the rejection. As explained in the Answer (Ans. 6), the rejection states that using a polypropylene with the claimed molecular weight distribution would have been obvious because such polymers were “well known in the art.” Non-Final I. 9. Appellant’s focus on the metallocene catalysts used to prepare polypropylene does not address, and thus does not identify error in, the Examiner’s determination that the skilled artisan would have had a reasonable expectation of successfully using a polypropylene with the recited molecular weight distribution in Zhao’s compositions. *Id.*

We also find Appellant’s conclusory argument that the Examiner does not provide “reasons for [the] combination of the references” unpersuasive. App. Br. 12. We discern no error in the Examiner’s reliance on Ewen or Shiga in the rejection because these evidentiary references establish that polypropylene may generally have a molecular weight distribution of greater than or equal to 8 as recited in claim 1. As determined by the Examiner (Non-Final I. 9), the use of propylene based polymers with the recited molecular weight distribution in Zhao’s compositions “would have been obvious as a known [polypropylene] and with [a] reasonable expectation of achieving results consistent with the use of” such polymers.

Thus, because Appellant has not identified reversible error in the Examiner’s rejection of claim 1, we sustain this rejection. Because

Appellant does not argue claims 2–7, 15–21, or 23 separately,<sup>5</sup> we sustain the rejection of these claims as well.

*Rejection II*

Claim 8, dependent from claim 1, “further comprises from 0.001 to 3 weight percent of a peroxydicarbonate peroxide.” App. Br. 20.

The Examiner rejects claim 8 relying on the disclosures of Zhao and Buysch in combination with Ewen or Shiga. Final 3; Non-Final I. 11. The Examiner finds that Zhao discloses peroxides which function “as free radical generating compounds,” and that Buysch discloses the specifically recited peroxydicarbonate peroxide as a “radical forming substance.” Non-Final I. 11 (citing Buysch 3:40–60). Thus, the Examiner determines that “the claimed peroxide carbonates are known functional equivalents to the peroxides disclosed by Zhao as free radical generating compounds,” and their use in Zhao’s compositions “would have been obvious with [a] reasonable expectation of adequate results.” *Id.*

Appellant argues that the Examiner has not established that the peroxides of Zhao and peroxidicarbonate peroxides of Buysch are functionally equivalent. App. Br. 13–14. Specifically, Appellant urges that the Examiner did not establish that the peroxydicarbonate peroxides

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<sup>5</sup> We do not consider Appellant’s statements regarding claims 15, 16, and 19 to be separate arguments for patentability. App. Br. 12–13. The statements provided regarding claims 15 and 16 are not specific to the limitations appearing in these claims, and our Rules require greater specificity than the skeletal assertion provided for claim 19. 37 C.F.R. § 41.37(c)(1)(iv). *See In re Lovin*, 652 F.3d 1349, 1357 (Fed. Cir. 2011) (“[T]he Board [has] reasonably interpreted Rule 41.37 to require more substantive arguments in an appeal brief than a mere recitation of the claim elements and a naked assertion that the corresponding elements were not found in the prior art.”).

disclosed by Buysch possess other characteristics exhibited by Zhao's preferred peroxides, e.g., "low volatility, higher decomposition temperature, and lower residual odor." *Id.* at 14.

We disagree. To establish that Zhao's and Buysch's peroxides are functionally equivalent for their disclosed purpose of forming free radicals, the Examiner need not show that the separately disclosed peroxides are identical in every respect. Here, the Examiner establishes that both Zhao's peroxides and Buysch's peroxydicarbonate peroxides generate free radicals during thermoplastic polymerization. Non-Final I. 11; *see also* Ans. 10–11 (explaining "[i]t is the Buysch reference that establishes functional equivalency of the claimed peroxydicarbonate peroxides and the peroxides disclosed in Zhao *for the same function*[,] i.e., as radical generation compounds" (emphasis added)). It is obvious to those skilled in the art to substitute one known equivalent for another. *See In re Omeprazole Patent Litigation*, 483 F.3d 1364, 1374 (Fed. Cir. 2007) ("[T]his court finds no . . . error in [the] conclusion that it would have been obvious to one skilled in the art to substitute one ARC [alkaline reactive compound] for another."); *see also In re Mayne*, 104 F.3d 1339, 1340 (Fed. Cir. 1997) ("Because the applicants merely substituted one element known in the art for a known equivalent, this court affirms [the Board's ruling affirming the Examiner's obviousness rejection].").

Appellant's arguments (Reply Br. 8–9) regarding Zhao's preference for certain peroxides likewise do not persuade us of reversible error. Specifically, Appellant's arguments regarding certain different preferred embodiments of Zhao underscore the Examiner's point (Ans. 9–10) pertaining to Zhao's broad disclosure with respect to peroxides (col 3, ll. 29–34; col. 5, l. 56 – col. 6, l. 7). That is, Zhao's disclosure is not limited to its

preferred embodiments for “[i]t is well settled that a prior art reference is relevant for all that it teaches to those of ordinary skill in the art.” *In re Fritch*, 972 F.2d 1260, 1264 (Fed. Cir. 1992).

For these reasons, and those provided by the Examiner, we sustain the rejection of claim 8, as well as claims 9 and 10 not separately argued.

*Rejections III & VI*

Claim 11, dependent from claim 1, “further comprises from 0.001 to 3 weight percent of a polar polymer.” App. Br. 20. Claim 25 indirectly depends from claim 11 and recites specific polar polymers such as polyethylene glycol. *Id.* at 22.

*Claim 11*

The Examiner relies on the combined disclosures of Zhao, Ewen or Shiga, and Li ’838 or Li ’152 (collectively, “the Li references”) in rejecting claim 11. Final 3; Non-Final II. 3. The Examiner finds that each Li reference discloses “that adding small amounts of polar polymer to olefin based compositions not only improves some of the polymer composition[’]s properties, but also renders the compositions more biodegradable.” Non-Final II. 3. Thus, the Examiner reasons that adding a polar polymer such as polylactic acid to Zhao’s composition would have been obvious. *Id.* at 3–4.

Appellant argues that the Examiner failed to establish a motivation to combine the Li references with Zhao and Ewen or Shiga because none of these references “provide[s] a reason why one of ordinary skill in the art would find a biodegradable foam to be advantageous,” and fail to teach that the foams formed of polypropylene and a polar polymer would be biodegradable. App. Br. 14–15.

For the following reasons, these arguments fail to reveal reversible error in the rejection. First, we note that Appellant does not address the Examiner's proffered motivation to add a polar polymer to obtain improved compositional properties. Non-Final II. 3. Also, for the well-stated reasons provided by the Examiner in the Answer (Ans. 11), we discern no persuasive merit in Appellant's argument contesting the Examiner's determination that the skilled artisan would have been motivated to make the foam more biodegradable. App. Br. 14–15. We are likewise not persuaded by Appellant's argument (Reply Br. 10) that making Zhao's composition biodegradable would render it unsatisfactory for its intended purpose. Appellant has produced no evidence demonstrating that enhanced biodegradability would negate a given polymer's recyclability.

For these reasons, and those provided by the Examiner, we sustain the Examiner's rejection of claim 11, as well as the rejection of claims 12 and 13 not separately argued.

*Claim 25*

The Examiner finds that Zhao, Ewen, and Shiga do not disclose the polar polymers recited in claim 25, and relies on the disclosure of Ninbo to address this difference. Final 5. The Examiner determines that it would have been obvious to add the polar polymers disclosed in Ninbo such as polycaprolactone to Zhao's composition because Ninbo teaches that the addition of such a polar monomer "renders the foamed polypropylene based foams biodegradable with [a] controlled rate of degradation." *Id.*

Appellant relies on essentially the same arguments regarding biodegradability as provided with respect to claim 11. App. Br. 18. We find these arguments unpersuasive for the reasons already discussed, *supra*, and sustain the Examiner's rejection of claim 25.

*Rejection IV*

Claim 22 depends from claim 1 and requires the polymer foam to have a narrower density range and open cell content than required by claim 1. App. Br. 22. The Examiner rejects claim 22 over Zhao and Zeitler, and Ewen or Shiga as set forth in the Non-Final Office Action dated April 25, 2016. Non-Final II. 4.

Appellant argues that the Examiner failed to establish that Zeitler's process "is applicable to the foam of Zhao." App. Br. 16. This argument does not persuade us of reversible error in the rejection. As well-stated by the Examiner (Ans. 12), Zeitler's foams are predominantly polyolefin-based, where such polyolefin may include polypropylene. Zeitler 2:18–23; *see also id.* at 6:14–32 (where claim 1 expressly recites an "[e]xtrusion-foamable composition" which may include up to 90% by weight of propylene.). We agree with the Examiner's determination that the similarity of Zeitler's foams to those of Zhao would have provided the skilled artisan with a reasonable expectation that Zhao's propylene foam "may be modified to the desired open cell/density content in a way similar to the disclosure of Zeitler." Ans. 12.

It follows that we sustain the rejection of claim 22.

*Rejection V*

Claim 24, dependent from claim 1, requires the polymer foam to comprise "a density of greater than 0.15 g/cc and less than 0.50 g/cc." App. Br. 22. The Examiner again relies on the combined disclosures of Zhao and Ewen or Shiga, and adds either Altepping or Park, in determining that claim 24 is obvious. Final 4. Specifically, the Examiner finds that both

Altepping and Park evince that the recited density range is common to polypropylene foams.

Altepping discloses “[a] method of producing a foamed product having a density less than  $0.2 \text{ g/cm}^3$ , which comprises foaming a composition comprising a major proportion of a low viscosity polypropylene component.” Altepping, Abstract. Park discloses “[a] thermoformable, rigid or semi-rigid polypropylene foam sheet having a . . . density of at least  $2.5 \text{ lbs/ft}^3$ .” Park, Abstract.

Appellant argues that “neither Park nor Altepping teach[es] a ‘common density’ for polypropylene foams,” and that the skilled artisan would not have been motivated to use such polypropylenes in Zhao’s compositions. App. Br. 17. We discern no persuasive merit in these arguments. Appellant’s focus on what is or is not a “common density” for polypropylene foams does not negate the Examiner’s well-supported findings that polypropylene foams having a density falling within the range recited in claim 22 existed in the prior art at the time of the invention. Final 4; Altepping, Abstract; Park, Abstract. Appellant advances no reasonable argument supporting the assertion that the skilled artisan would not have been motivated to use the polypropylene foams of Altepping or Park in Zhao’s composition as determined by the Examiner.

Therefore, for these reasons and for those provided by the Examiner, the rejection of claim 24 is sustained.<sup>6</sup>

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<sup>6</sup> We view the Altepping and Park references as further evidence that polypropylene foams having a density falling within the range recited in claim 1, from which claim 24 depends, were known in the prior art at the time of the invention.

DECISION

The Examiner's final decision to reject claims 1–13 and 15–25 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