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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte PIL HO KIM, SEUNG SHIK SHIN, and KYUONG SIK CHIN

Appeal 2019-006127
Application 15/518,585
Technology Center 1700

Before ROMULO H. DELMENDO, BEVERLY A. FRANKLIN, and JANE E. INGLESE, *Administrative Patent Judges*.

DELMENDO, *Administrative Patent Judge*.

DECISION ON APPEAL

The Appellant[1] appeals under 35 U.S.C. § 134(a) from the Primary Examiner's final decision to reject claims 1–6 and 9–12.[2] We have jurisdiction under 35 U.S.C. § 6(b).

We affirm.

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[1] We use the word "Appellant" to refer to "applicant" as defined in 37 C.F.R. § 1.42—i.e., "LOTTE ADVANCED MATERIALS CO., LTD." (Application Data Sheet filed April 12, 2017 at 4), which is also identified as the real party in interest (Appeal Brief filed May 16, 2019 ("Appeal Br.") at 3).

[2] *See* Appeal Br. 14–23; Reply Brief filed August 14, 2019 ("Reply Br.") at 1–3; Final Office Action entered November 16, 2018 ("Final Act.") at 3–16; Examiner's Answer entered June 14, 2019 ("Ans.") at 4–23.

I. BACKGROUND

The subject matter on appeal relates to a thermoplastic resin composition and to a molded article (Specification filed April 12, 2017 ("Spec.") ¶ 1). Representative claim 1 is reproduced from the Claims Appendix to the Appeal Brief, as follows:

> 1. A thermoplastic resin composition comprising:
>
> about 100 parts by weight of a polycarbonate resin;
>
> about 10 parts by weight to about 140 parts by weight of a (meth)acrylic resin including repeat units represented by Formula 1:
>
> [Formula l]
>
> 
>
>
> wherein R_1 is a hydrogen atom, a methyl group or an ethyl group and R_2 is a substituted or unsubstituted C_6 to C_{20} aryl group;
>
> about 10 parts by weight to about 80 parts by weight of an aromatic phosphoric acid ester compound; and
>
> about 10 parts by weight to about 110 parts by weight of glass fibers,
>
> *wherein a difference in index of refraction between the glass fibers and a resin mixture comprising the polycarbonate resin, the (meth)acrylic resin, and the aromatic phosphoric acid ester compound is about 0.02 or less*, and
>
> wherein the thermoplastic resin composition has *a total luminous transmittance of about 80% or higher and a haze of about 10% or less*, as measured on an about 1.0 mm thick specimen in accordance with ASTM D1003, *an Izod impact strength of about 3 kgf·cm/cm to about 15 kgf·cm/cm*, as measured on an about 1/8" thick specimen in accordance with ASTM D256, *a flexural modulus of about 40,000 kgf/cm^2 to about 70,000 kgf/cm^2*, as measured on an about 6.4 mm thick

> specimen in accordance with ASTM D790, and *a coefficient of linear thermal expansion of about 20 µm/(m°C) to about 60 µm/(m°C)*, as measured in accordance with ASTM D696.

(Appeal Br. 24 (emphases added)).

II. REJECTIONS ON APPEAL

The claims on appeal stand rejected under 35 U.S.C. § 103, as follows:

A. Claims 1, 2, 4–6, and 9–12 as unpatentable over Kwon et al.[3] ("Kwon") in view of Basham et al.[4] ("Basham") and Moy et al.[5] ("Moy"); and

B. Claim 3 as unpatentable over Kwon in view of Basham, as evidenced by "Panlite® L-1250Y: TEIJIN LIMITED – Polycarbonate" (July 2018) ("PANLITE L-1250Y") and "Panlite® L-1250Z100: TEIJIN LIMITED – Polycarbonate" (July 2018) ("PANLITE L-1250Z100").

(Ans. 4–23; Final Act. 3–16).

III. DISCUSSION

1. Grouping of Claims

The Appellant argues Rejections A and B together and relies on the same arguments for all claims on appeal except for claim 12 (Appeal Br. 14–23). Therefore, we decide this appeal on the basis of claim 1, which we

[3] US 2010/0152357 A1, published June 17, 2010.

[4] US 2006/0020075 A1, published January 26, 2006.

[5] US 2011/0034597 A1, published February 10, 2011.

select as representative, and separately argued claim 12. Claims 2–6 and 9–11 stand or fall with claim 1. *See* 37 C.F.R. § 41.37(c)(1)(iv).

2. The Examiner's Position

With respect to claim 1, the Examiner finds that Kwon describes a thermoplastic resin composition comprising a polycarbonate (e.g., PANLITE L-1250WP) and an acrylic copolymer (e.g., a copolymer of 50% by weight of methyl methacrylate and 50% by weight of phenyl methacrylate with a refractive index of 1.530) (Ans. 4; Final Act. 3). The Examiner finds further that, in Example 1, Kwon teaches a composition comprising 90 parts of the polycarbonate and 10 parts of the acrylic copolymer, which may be recalculated or rescaled to 11 parts of the acrylic copolymer per 100 parts of the polycarbonate (Ans. 4; Final Act. 3). Additionally, the Examiner finds that Kwon teaches that the compositions may also comprise flame retardants, fillers, and reinforcers, but acknowledges that such compositions are not exemplified (Ans. 5; Final Act. 4). The Examiner acknowledges further that although Kwon teaches reducing the difference in refractive index between the polycarbonate and the acrylic copolymer, it does not disclose or suggest making the "difference in index of refraction between . . . glass fibers and a resin mixture comprising the polycarbonate resin, the (meth)acrylic resin, and [an] aromatic phosphoric acid ester compound [to be] about 0.02 or less," as recited in claim 1.

To bridge the gaps between the subject matter recited in claim 1 and Kwon's disclosure, the Examiner relies on Basham (Ans. 5; Final Act. 4). Specifically, the Examiner finds that Basham teaches transparent polycarbonate compositions containing glass fibers that are selected to

match the refractive index of the thermoplastic resin component, which includes the polycarbonate and any other thermoplastic polymer, to within 0.04 units to provide compositions having an excellent combination of optical and physical properties, in particular transparency and dimensional stability (Ans. 5–6; Final Act. 4–5). According to the Examiner, Basham teaches that milled glass fibers offer a good balance of properties (Ans. 5; Final Act. 4). Furthermore, the Examiner finds that Basham would have reasonably suggested to a person having ordinary skill in the art that the difference in refractive index between the glass fibers and the thermoplastic resin component and any other additives, including flame retardant, is preferably in the range of 0.005–0.03 and that haze values are significantly reduced when the difference is less than 0.01 (Ans. 6; Final Act. 5). Based primarily on these findings, the Examiner concludes:

> It would have been obvious to one of ordinary skill in the art at the time the invention was filed to match the refractive index of glass fibers added to the compositions of Kwon to be within 0.04 of the thermoplastic resin composition including any additives, such as flame retardants, for the advantage of providing compositions that [have an] excellent combination of optical and physical properties, in particular transparency and dimensional stability as taught by Basham.

(Ans. 6; Final Act. 5).

The Examiner relies on Moy to establish the obviousness of selecting an aromatic phosphoric acid ester-based compound as the flame retardant in the composition resulting from the combination of Kwon and Basham in order to produce compositions with excellent flame retardancy and improved physical properties (Ans. 8; Final Act. 7).

As for the properties recited in the last clause of claim 1 and in claim 12, the Examiner finds that the compositions suggested by the prior art

compositions are similar to those disclosed by the Inventors in the Specification (Spec. ¶ 100 (Table 1, Example 6)), and that, therefore, these compositions would reasonably appear to meet the specified properties (Ans. 10, 13–14; Final Act. 9, 13).

3. The Appellant's Contentions

The Appellant contends that the prior art references do not teach or suggest the limitation "a difference in index of refraction between the glass fibers and a resin mixture comprising the polycarbonate resin, the (meth)acrylic resin, and the aromatic phosphoric acid ester compound is about 0.02 or less," as recited in claim 1, because Basham's teaching regarding matching the refractive index of glass with the refractive index of the thermoplastic resin component (polycarbonate and any other thermoplastic resin) "is not the same . . . as teaching or suggesting matching refractive indexes of glass fibers and a resin mixture comprising polycarbonate resin, (meth)acrylic resin, and aromatic phosphoric acid ester compound as recited in claim 1" (Appeal Br. 14, 16). The Appellant argues further that Basham teaches that other thermoplastic polymers may be used with a polycarbonate, but the only examples of such other thermoplastic polymers are polyester resins—not acrylic resins (*id.* at 16). Additionally, the Appellant argues that "[c]ontrary to the position taken by the Examiner, when [Basham's] paragraph [0092] is correctly read in context, the reference to 'any' additive is to the specific additives used in the examples" (*id.* at 17). According to the Appellant, "[t]here accordingly cannot be any reasonable expectation of success with regard to a composition and property thereof that is not even taught or recognized in the cited art" (*id.*). As for Kwon, the Appellant argues that "Kwon matches refractive index as between the noted

polymers" but "[t]his is not the same as suggesting matching the refractive indexes of any other unspecified components, and certainly does not provide any reasonable expectation of success with respect to matching refractive index values glass and a resin mixture comprising polycarbonate resin and any amount and/or type of additive" (*id.* at 18). As for Moy, the Appellant argues that Moy, like Basham, does not teach all of the elements recited in claim 1 (*id.* at 15).

Regarding the property limitations recited in claims 1 and 12, the Appellant argues that the Examiner's use of the Appellant's own inventive Example 6 constitutes impermissible hindsight based on the applicant's own disclosure (*id.* at 18–19, 21–22). In any event, the Appellant contends that the composition in Example 6 is not the same as the modified Kwon compositions proposed by the Examiner, and, "if anything, demonstrates unexpected benefits of the claimed compositions" (*id.* at 19, 22). According to the Appellant, the Examiner's position that the suggested prior art composition would have the claimed properties lacks a reasoned explanation and, therefore, is merely conclusory (*id.* at 22).

4. Opinion

The Appellant's arguments fail to identify reversible error in the Examiner's rejection. *In re Jung*, 637 F.3d 1356, 1365 (Fed. Cir. 2011).

Because we discern no reversible error in the Examiner's factual findings, analysis, and legal conclusions as set forth in the Examiner's Answer and the Final Action, we adopt them as our own and add the following for emphasis. *In re Cree, Inc.*, 818 F.3d 694, 698 n.2 (Fed. Cir. 2016); *In re Brana*, 51 F.3d 1560, 1564 n.13 (Fed. Cir. 1995).

Kwon describes a polycarbonate resin composition with improved transparency and scratch resistance comprising about 10 to about 99% by weight of a polycarbonate resin (A); about 1 to about 90% by weight of an acrylic copolymer with ultra-low molecular weight and high refractive index (B) (e.g., a refractive index of about 1.495 to about 1.590); and optionally less than 89% by weight of an acrylic resin (C) (Kwon Abstract; ¶ 18). According to Kwon, compatibility of the resins may be improved because the difference in the refractive indices of the resins is reduced and thus independent domains of polycarbonate and acrylic resin may not be observed, and excellent transparency may be achieved because phase separation is minimized during melt mixing (kneading) at high temperature (*id.* ¶ 54). As a result, Kwon states that the "[t]ransparency of the polycarbonate resin composition . . . can be similar to the transparency of a polycarbonate resin alone" (*id.*). Kwon further teaches that the polycarbonate resin composition may comprise one or more identified additives that include, *inter alia*, flame retarders, fillers, or reinforcers (*id.* ¶ 58).

In Example 1, Kwon discloses a polycarbonate resin composition containing (A) 90 parts by weight of a bisphenol-A based linear polycarbonate having a weight average molecular weight of 25,000 g/mol made by Teijin Chemicals Ltd. (PANLITE L-1250 WP)[6] and (B) 10 parts by weight an acrylic copolymer having a refractive index of 1.530 and a molecular weight of 25,000 g/mol prepared by suspension polymerizing

[6] In rejecting claim 3, the Examiner relies on PANLITE L-1250Y and PANLITE L-1250Z100 to show that PANLITE L-1250 WP would appear to have a refractive index of 1.585 (Ans. 15; Final Act. 14).

50% by weight of phenyl methacrylate and 50% by weight of methyl methacrylate (*id.* ¶ 83, Table 1)—monomers that fall within the scope of claim 1 (Spec. ¶¶ 43–47).[7] Kwon states that the transparency (as determined by measuring total light transmittance TT and haze value (as measured by Haze Meter NDH 2000 manufactured by Nippon Denshoku)) are 87.8% and 1.0%, respectively (Kwon ¶ 91, Table 1), and, therefore, Kwon's composition would reasonably appear to meet the total luminous transmittance and haze of 80% or higher and about 10% or less, as specified in claim 1, although the methods for measurement in Kwon may differ from that used for the claimed invention. *In re Best*, 562 F.2d 1252, 1255 (CCPA 1977).

Thus, Kwon's polycarbonate resin composition as described in Example 1 differs from that specified in claim 1 as follows: (i) Kwon does not disclose about 10 parts by weight to about 110 parts by weight of glass fibers as a filler or reinforcer material; (ii) Kwon does not disclose about 10 parts by weight to about 80 parts by weight of an aromatic phosphoric acid ester compound as a flame retarder (Spec. ¶ 57); (iii) Kwon does not disclose the difference in refractive index between the filler or reinforcer and the mixture containing the polycarbonate resin (A), acrylic resin (B), and any flame retarder; and (iv) Kwon does not provide sufficient information regarding the Izod impact strength, flexural modulus, or coefficient of linear thermal expansion as specified in claim 1. Notwithstanding these

[7] The Appellant does not dispute the Examiner's determination that when 90 parts of polycarbonate resin (A) is rescaled to 100 parts by weight, the amount of the acrylic resin (B) is calculated to be about 11 parts by weight (Appeal Br. 7–23; Ans. 4; Final Act. 3).

differences, we agree with the Examiner that claim 1's subject matter as a whole would have been obvious in view of the combined teachings found in Kwon, Basham, and Moy.

Regarding difference (i) (glass fibers), Basham teaches that compositions comprising a polycarbonate and a glass that closely matches the refractive index of the polycarbonate may provide films that retain transparency, yet have lower warping and/or wrinkling over a useful temperature range (Basham ¶ 15). Significantly, Basham teaches that "the films may have a low coefficient of thermal expansion ('CTE'); low yellowing; low haze; high transmission, and/or high flexural modulus" (*id.*). Basham teaches that, in addition to the polycarbonate, "it is also possible to use combinations of the polycarbonate resins with other thermoplastic polymers"—e.g., polyesters (*id.* ¶ 36). Regarding the glass component, Basham teaches that it may be used in an amount of about 0.05 to about 50% by weight, which would overlap the amount recited in claim 1, and may be in the form of milled glass fibers (*id.* ¶ 45). Basham teaches that "the glass is selected so as to provide the desired balance of optical and physical properties to the composition, in particular transparency (*as reflected by low haze and high transmissivity*) and optionally low yellowness in combination *with low coefficient of thermal expansion and high flexural modulus*" and that "[t]o achieve these properties, the refractive index of the glass as matched to that of the thermoplastic resin component (polycarbonate and any other thermoplastic polymer) to within 0.04"—about 0.001 units to about 0.04 units (*id.* ¶¶ 40–41 (emphases added)). According to Basham, such matching provides an excellent combination of optical and physical properties, in particular transparency and dimensional stability (*id.* ¶ 40).

Furthermore, Basham teaches that the composition "may further include various components and other additives ordinarily incorporated in resin compositions of this type, for example impact modifiers, fillers, . . . flame retardants . . . and the like, as well as combinations of various types of additives" and that "[i]t is to be understood that the type and amounts of such components and additives are selected so as to not significantly adversely affect the desired properties of the compositions, in particular haze, transparency, and coefficient of thermal expansion" (*id.* ¶ 58). Suitable flame retardants are said to include phosphorus compounds in amounts of about 1.0 to about 20 parts by weight per 100 parts by of the resin component (*id.* ¶ 68).

Although neither Kwon nor Basham discloses an aromatic phosphoric acid ester compound as a flame retarder, the Appellant (Appeal Br. 7–20) does not dispute the Examiner's finding that Moy shows that an aromatic phosphoric acid ester is a known flame retardant that provides polycarbonate-based compositions with excellent flame retardancy and physical properties (Appeal Br. 7–20; Final Act. 7 (citing Moy ¶¶ 4, 13; Abstract)).

Given the collective teachings found in these references, we share the Examiner's conclusion that a person having ordinary skill in the art would have been prompted to use a suitable amount of glass fibers with a refractive index that matches that of the mixture including the other components (polycarbonate resin (A), acrylic resin (B), and suitable amounts of other additives such as an aromatic phosphoric acid ester flame retardant) within 0.04 (e.g., 0.001) with a reasonable expectation of providing a composition that may be manufactured into films having a low coefficient of thermal

expansion, low yellowing, high transparency (low haze and high transmission), and/or high flexural modulus as well as dimensional stability. *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 416 (2007) ("[W]hen a patent claims a structure already known in the prior art that is altered by the mere substitution of one element for another known in the field, the combination must do more than yield a predictable result."); *id.* at 417 ("[I]f a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique is obvious unless its actual application is beyond his or her skill.").

The Appellant's argument that none of the references teach *all* the ingredients recited in claim 1 is misplaced, because, it fails to consider what the collective teachings of the references would have suggested to a person having ordinary skill in the art. *In re Merck & Co., Inc.*, 800 F.2d 1091, 1097 (Fed. Cir. 1986) ("Non-obviousness cannot be established by attacking references individually where the rejection is based upon the teachings of a combination of references.").

Here, Basham explicitly teaches that matching the refractive index of the glass fibers to that of the mixture containing the other components provides numerous advantages, as we recounted above, that coincide with many of the properties of interest in the current invention (Basham ¶¶ 40–41). Given that Kwon teaches the desirability of matching the refractive indices of the polycarbonate and the acrylic resin to provide compositions having high transparency and low haze (Kwon ¶¶ 54, 83, 96; Table 1), we are in complete agreement with the Examiner that the subject matter recited in claim 1 would have been obvious to a person having ordinary skill in the

art within the meaning of 35 U.S.C. § 103, as we concluded above. "Expected beneficial results are evidence of obviousness of a claimed invention, just as unexpected beneficial results are evidence of unobviousness." *In re Skoll*, 523 F.2d 1392, 1397 (CCPA 1975).

The Appellant's argument that Basham's disclosure is limited to those containing polyester as the additional thermoplastic resin and the additives disclosed in the working examples lacks merit. Basham places no such limitations (Basham ¶¶ 36, 58). "[I]n a section 103 inquiry, 'the fact that a specific [embodiment] is taught to be preferred is not controlling, since all disclosures of the prior art, including unpreferred embodiments, must be considered.'" *Merck & Co., Inc. v. Biocraft Labs., Inc*., 874 F.2d 804, 807 (Fed. Cir. 1989) (citing *In re Lamberti*, 545 F.2d 747, 750 (CCPA 1976)).

Regarding the properties recited in the last clause of claim 1, it appears that Kwon's exemplified compositions meet the specified haze and light transmittance, although Kwon appears to measure these properties by different methods (Kwon Table 1). As the PTO has no means to obtain and compare products, the burden of production was properly shifted to the Appellant to show Kwon's compositions would not necessarily possess these properties. *Best*, 562 F.2d at 1255.

Additionally, any improvement in terms of impact strength, flexural modulus, and coefficient of thermal expansion appear to be expected in view of Basham (Basham ¶ 40). Again, "[e]xpected beneficial results are evidence of obviousness of a claimed invention, just as unexpected beneficial results are evidence of unobviousness." *Skoll*, 523 F.2d at 1397.

Moreover, these properties would naturally flow from following the suggestion in the prior art. *Ex parte Obiaya*, 227 USPQ 58, 60 (BPAI 1985)

("The fact that appellant has recognized another advantage which would flow naturally from following the suggestion of the prior art cannot be the basis for patentability when the differences would otherwise be obvious."). *See also In re Dillon*, 919 F.2d 688, 692–93 (Fed. Cir. 1990) (reaffirming the principle that where the prior art gives reason or motivation to make the same composition recited in a claim, the burden and opportunity shifts to the applicant to rebut the prima facie case and the mere fact that the prior art does not explicitly disclose the same property discovered for the composition recited in a claim does not defeat that prima facie case.); *accord Merck*, 800 F.2d at 1096 ("'Structural similarity, alone, may be sufficient to give rise to an expectation that compounds similar in structure will have similar properties.'") (quoting *In re Pay*ne, 606 F.2d 303, 313 (CCPA 1979)).

The Appellant's argument (Appeal Br. 18–19) that the Examiner's consideration of Example 6 described in the Specification constitutes impermissible hindsight is also without merit. As the Examiner explains (Ans. 20 (citing *In re Kao*, 639 F.3d 1057, 1070 (Fed. Cir. 2011)), the use of the Specification to determine what is covered by a claim is always permissible as a matter of claim construction. Here, the Examiner merely consulted the Specification to compare the composition suggested by the prior art to the claimed composition. As for the Appellant's allegation that Example 6 constitutes evidence of unexpected results, this allegation is unpersuasive for the reasons stated above regarding expected results and structural similarity as well as in the Answer (Ans. 22).

Regarding claim 12, which depends from claim 1 through intervening claim 11 and recites that "the thermoplastic resin composition has a flame

retardancy of V-2 measured on a 0.8 mm thick specimen in accordance with the UL-94 vertical test" (Appeal Br. 26), we adopt the Examiner's reasoning on pages 13–14 of the Answer. In this regard, Moy teaches that the flame retardants disclosed therein provide excellent flame retardancy (Moy ¶ 4). *Best*, 562 F.2d at 1255.

For these reasons, and those well-stated by the Examiner, we uphold the Examiner's rejections.

IV. CONCLUSION

In summary:

Claims Rejected	35 U.S.C. §	Reference(s)/Basis	Affirmed	Reversed
1, 2, 4–6, 9–12	103	Kwon, Basham, Moy	1, 2, 4–6, 9–12	
3	103	Kwon, Basham, PANLITE L-1250Y, PANLITE L-1250Z100	3	
Overall Outcome			1–6, 9–12	

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