

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES

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*Ex parte* JOHN R. CAMPBELL, PATRICK A. RODGERS, RONALD J.  
WROCZYNSKI, and JAMES P. BARREN

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Appeal 2008-2626  
Application 10/385,314  
Technology Center 1700

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Decided: September 30, 2008

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Before CHUNG K. PAK, TERRY J. OWENS, and  
MICHAEL P. COLAIANNI, *Administrative Patent Judges*.

PAK, *Administrative Patent Judge*.

DECISION ON APPEAL

This is a decision on an appeal under 35 U.S.C. § 134 from the Examiner's final rejection of claims 1, 3, 4, 8 through 11, and 13 through 17, all of the pending claims in the above-identified application. We have jurisdiction pursuant to 35 U.S.C. § 6.

We AFFIRM.

*STATEMENT OF THE CASE*

This is Appellants' third appeal of subject matter involving a thermoplastic composition comprising at least one aromatic polycarbonate and a flame-retarding amount of an organophosphorous flame retardant (App. Br. 1-2). In comparison with the claims considered by the previous merits panels in the earlier decisions on Appeal Nos. 2001-0876 (Application 09/023,929) and 2005-1529 (Application 10/385,314) entered May 30, 2002 and August 31, 2005, respectively, the currently appealed claims as represented by claim 1 specify the aromatic polycarbonate to be a bisphenol A polycarbonate resin and the organophosphorous flame retardant to be a bisphenol A diphosphate oligomer flame retardant compound. *Compare, e.g.*, claim 1 at page 3 of the decision on Appeal No. 2005-1529 with claims 1, 14 and 17 of the instant application. The flame retardant compound recited in the currently appealed claims, like the flame retardant recited in the previously considered claims in the earlier decisions on Appeal Nos. 2001-0876 and 2005-1529, has acid generating impurities equivalent to a titratable acid level of less than 1.0 milligram of potassium hydroxide per gram of the flame retardant compound. The term "mg KOH equivalent" means the number of milligrams of KOH required to neutralize the acid or acid precursors present in the organo-phosphorus compound (Spec. 2, ll. 15-17).

According to Appellants, the currently claimed composition, like the previously considered composition, is said to impart "improved hydrolytic stability" (Spec. 1. ll. 1-2). As indicated in our earlier decision on Appeal No. 2005-1529 entered August 31, 2005 (pp. 2-3):

The term “hydrolytic stability” is defined as “a tendency of the composition not to undergo a change in molecular weight of the thermoplastic resin components of the composition, particularly the poly carbonate resin, when the resin composition is exposed to hydrolytic conditions.” See the specification, page 2, line 25 to page 3, line 2. The term “hydrolytic conditions” is defined as “conditions that favor hydrolysis of any acids and any acid generating impurities present...” See the specification, page 2, lines 13-15. The hydrolysis favoring condition are well known as is apparent the undisputed findings of the earlier Board decision [on Appeal No. 2001-0876] entered on May 30, 2002, which states in relevant part (pages 12 and 13):

*Kirk-Othmer Encyclopedia of Chemical Technology*, 4<sup>th</sup> Ed., article on polycarbonates, authored by Daniel J. Brunelle, of the General Electric Co., the real party in interest in this case, teaches that “BPA [bisphenol A] polycarbonate exhibits excellent thermal stability, especially in the absence of oxygen and water.” (Vo. 19 at page 591, emphasis added.) Moreover, Brunelle writes that “[p]olycarbonates should be dried prior to melt processing, because the low levels of water present in the resin can lead to partial hydrolysis and lowering of the molecular weight.” (Id. at 592, emphasis added.)

Details of the appealed subject matter are recited in representative claim 1 reproduced below<sup>1</sup>:

1. The thermoplastic resin composition, comprising:

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<sup>1</sup> Appellants have not presented substantive arguments for patentability of the individual claims on appeal with reasonable specificity (App. Br. 3-14 and Reply Br. 1-4). Therefore, for purposes of this appeal, we select claim 1 and decide the propriety of these grounds of rejection based on this representative claim alone consistent with 37 C.F.R. § 41.37(c)(1)(vii) (2005).

(a) a thermoplastic resin comprising a bisphenol A polycarbonate resin, and

(b) a flame-retarding amount of a bisphenol A diphosphate oligomer flame retardant compound, wherein any acids initially present in the compound and any acid-generating impurities initially present in the compound do not exceed a level at which the combined amount of any such acids and any acids that may be generated under hydrolytic conditions from any such acid generating impurities is equivalent to a titratable acid level of less than 1.0 milligram of potassium hydroxide per gram of the bisphenol A diphosphate oligomer flame retardant compound.

As evidence of unpatentability of the appealed subject matter, the Examiner has proffered the following prior art references:

Simmons	US 3,125,529	Mar. 17, 1964
Garrett	US 3,553,155	Jan. 5, 1971
Albright	US 3,997,505	Dec. 14, 1976
Eimers	US 4,367,303	Jan. 4, 1983
Bright	US 5,750,756	May 12, 1998

James T. Morrison et al. (Morrison), *Organic Chemistry*, 3rd Ed., pp. 680-81 (1973).

Daniel J. Brunelle (Brunelle), *Kirk-Othmer Encyclopedia of Chemical Technology*, 4<sup>th</sup> Ed., Vol. 19, pp. 591-92 (1993).

Appellants' admission at page 1 of the Specification (hereinafter referred to as "the admitted prior art").

The Examiner has rejected claims 1, 3, 4, 8 through 11, and 13 through 17 under 35 U.S.C. § 103(a) as unpatentable over the combined

teachings of the admitted prior art, either Bright, Garrett or Simmons, Albright, Eimers, Brunelle, and Morrison.<sup>2</sup>

Appellants appeal from the Examiner's decision rejecting the claims on appeal under 35 U.S.C. § 103(a).

*RELEVANT FACTUAL FINDINGS (FF)*

The relevant factual findings set forth in the earlier decisions and the Answers are adopted in this decision as shown below:

1. Appellants acknowledge (Spec. 1, ll. 4-8):

The use of organophosphorous flame retardants for imparting fire-retarding properties to thermoplastic resin is known. For example, U.S. Patent No. 5,204,394 discloses thermoplastic resin compositions that contain an aromatic polycarbonate resin, a styrene-containing graft copolymer and an oligomeric organophosphorus flame retardant.

2. Appellants acknowledge that the claimed polycarbonate resin and bisphenol A diphosphate flame retardant are individually known (Tr. 3).

3. Brunelle teaches that "BPA [bisphenol A] polycarbonate exhibits excellent thermal stability, especially in the absence of oxygen and water"

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<sup>2</sup> Although the statement of rejection in the Answer inadvertently does not refer to the admitted prior art, Morrison and Brunelle, both the Examiner and Appellants were fully aware that that prior art was included in the rejection as mentioned in the earlier Board decisions on Appeal Nos. 2001-0876 (Application 09/023,929) and 2005-1529 (Application 10/385,314). Indeed, the Examiner relied on the teachings of the admitted prior art, Brunelle, and Morrison, at pages 3 and 6 of the Answer.

and that “the low levels of water present in the resin can lead to partial hydrolysis and lowering of the molecular weight” [pp. 591 and 592].

4. Morrison teaches that hydrolysis of polycarbonates is also promoted by acids (pp. 680 and 681) and Appellants also acknowledge that it was known that “polycarbonate can undergo hydrolysis if there is acid present...” (Tr. 3).

5. Eimers teaches that it was known that acid degradation products reduce the stability of the polycarbonate to hydrolysis (col. 3, ll. 9-10).

6. Bright is directed to high purity phosphate esters and processes for making them (col. 1, ll. 35-42)

7. Bright’s process involves removing hydrohalide byproduct (i.e., acid) during esterification reaction (col. 1, ll. 54-62).

8. Bright’s desired phosphate compounds have the following formula:  $(RO)_2(PO)-OR'O-(PO)(OR)_2$ , where R can be substituted or unsubstituted aryl and R’ is an alkylene-arylene groups such as bisphenol-A (col. 2, ll. 14-27).

9. Bright’s products have less undesired byproducts such as isopropenyl phenyl diphenyl phosphate and other impurities from product breakdown (col. 1, ll. 35-42).

10. Bright teaches that the esterification reaction combines a halophosphate,  $(RO)_2PO-X$ , where R is hydrocarbyl and X is halogen, with a dihydroxy reactant such as bisphenol-A, in the presence of a Lewis acid catalyst, such as magnesium chloride, aluminum chloride, zinc chloride, titanium tetrachloride, etc. (col. 2, ll. 33-54).

11. Bright teaches that the esterification reaction occurs preferably in a liquid hydrocarbon, which allows a high-purity product to be formed at lower temperatures than possible in the absence of the liquid hydrocarbon (col. 2, ll. 55-67).

12. Bright teaches that undesired volatile products such as hydrogen halides (acids) may be removed by a combination of solvent, sparging with inert gas, or application of a vacuum (col. 3, ll. 1-14).

13. Bright provides Examples 6 and 7, in which chlorophosphates are reacted with bisphenol A in the presence of magnesium chloride and n-heptane (col. 4, ll. 33-40 and 53-63).

14. In Bright's Examples 6 and 7, the "hazy" crude product is washed with aqueous base (caustic), dried, and filtered through CELITE filter aid (col. 4, ll. 41-46 and col. 4, l. 64 to col. 5, l. 2).

15. Bright's phosphate ester products of Examples 6 and 7 have acid numbers of 0.11 mg KOH/g and 0.02 mg KOH/g, respectively (col. 4, l. 45 to col. 5, l. 2) and are known flame retardants for polycarbonate resins (the earlier decision on Appeal No. 2005-152 entered August 31, 2005, p. 7).

16. Simmons teaches improved aryl phosphates useful as lubricants in hydraulic systems or as plasticizers in thermoplastic materials inclusive of polycarbonates, which are formed by reacting ester-forming derivatives of phosphoric acid with a phenolic mixture (col. 1, ll. 10 and 35-37, and col. 3, ll. 72-74).

17. Simmons teaches that "[t]he esters of this invention are highly stable to hydrolysis and show substantially no tendency of ignite or bum even

when subjected to extremely high temperatures in the presence of air” (col. 3, ll. 41-44).

18. Simmons teaches that, after synthesizing the compounds, the crude product may be washed with weak aqueous alkali to remove acidity and excess phenols, followed by treatment with an oxidizing agent to remove “the last traces of oxidizing impurities” (col. 2, ll. 13-22).

19. Simmons provides Example 1, which reports an aryl phosphate having an acid number of 0.04 (col. 3, l. 7).

20. Garrett teaches plasticized resin compositions with the most preferred plasticizer being triaryl phosphates having the formula  $(RO)_3PO$ , where each R represents a phenyl or alkyl phenyl group (col. 2, ll. 34-35 and col. 2, l. 16).

21. Garrett teaches that the “trialkyl [sic. triaryl] phosphate esters” are recovered from the synthesis reaction mixture by extracting the crude product with an aqueous alkali to remove acidity and excess phenols, followed by an optional treatment with an oxidizing agent to remove oxidizable impurities (col. 3, ll. 64-73).

22. Garrett teaches its phosphate esters may be also used as hydraulic fluid or lubricants, especially where non-inflammable materials are required. (col. 4, ll. 37-41).

23. Albright teaches, *inter alia*, diphosphate esters useful as flame retardant compounds for polymers (col. 2, ll. 1-32)

24. Albright teaches that a flame retardant “compound’s acid number is inversely proportional to the hydrolytic stability to that compound, i.e., the

larger a compound's acid number, the poorer will be said compound's hydrolytic stability" (col. 12, ll. 14-17).

25. Appellants rely on Figures 1 and 2 appearing at pages 7 and 8 of the Appeal Brief to support their assertion of unexpected results (Br. 4-14).

26. Figures 1 and 2 are said to be derived from paragraphs 10 and 11 of the Rule 132 declaration of record and Table II at page 25 of the Specification (App. Br. 6-9).

27. Figures 1 and 2 show declining in percent molecular weight losses in 24 hours or 20 hours relative to increased acid contents in compositions containing 67% PC 145, 8.3% SAN, 0.4% Teflon dispersion, 0.75% unidentified additives and 13.8% BPA-DP (Declaration 5, para. 10).

28. According to page 22 of the Specification, "PC" represents "[a] linear polycarbonate resin derived from bisphenol A and phosgene and having an intrinsic viscosity of 0.48dl/gm" and "SAN" represents "[s]tyrene-acrylonitrile copolymer (75pbw styrene/25 pbw acrylnitrile)."

29. At page 23 of the Specification, "BPA-DP" is defined as a mixture of bisphenol A disphosphate oligomers with an average degree of polymerization of 1.08, with BPA-DP1, BPA-DP2, and BPA-DP3 having different contents of acid levels (mg/KOH/g), hydrolyzable chloride (ppm), and magnesium.

30. The Specification and the Declaration do not identified the unidentified additives or "PC 145" employed in the compositions used in the tests to arrive at Figures 1 and 2.

31. The Rule 132 declaration states in reference to Figure 1 relied upon by Appellants (p. 7) that:

When the % weight loss at 24 hours was determined and combined on a graph with the [sic.,] BPA-DP2 and BPA-DP3 the results are shown below [Figure 1]. The datum for PBA-DP1 was omitted because of the anomalously low starting value for Mw.

32. Figure 1 shows a steady decline in weight losses from three data points reflective of three acid contents, with the exception of one anomalous datum, i.e., an acid content of 3.25.
33. According to page 5 of the Rule 132 declaration, the low acid composition used in Figure 2 contains 67% PC 145, 8.3% SAN, 0.4% Teflon dispersion, 0.75% unidentified additives and 13.8% BPA-DP with a low titratable acid level of <0.01mg KOH/g.
34. According to page 5 of the Rule 132 declaration, the high acid composition used in Figure 2 contains 67% PC 145, 8.3% SAN, 0.4% Teflon dispersion, 0.75% unidentified additives and 13.8% BPA-DP with a high titratable level of 0.5 mg KOH/g.
35. According to page 5 of the Rule 132 declaration, “High Acid + 0.5” and “High Acid + 1.0” in Figure 2 are the high acid compositions with the additional amounts of acids.
36. Figure 2 shows that the different levels of molecular weight losses per given hours in relation to the low acid, high acid, high acid+0.5 and high acid+1.0 compositions.
37. Appellants have not demonstrated that the test data relied upon are accurate, reliable and/or well accepted in the art.
38. Appellants have not explained, much less demonstrated, the margin of error applicable to the test data relied upon.

39. Appellants have not explained why a certain anomalous datum was included in Figure 1, but not other anomalous data referred to in the Rule 132 Declaration.

40. Appellants have not shown that the test data relied upon are attributable solely to acid impurities (not the absence or presence of other impurities in other additives).

#### *PRINCIPLES OF LAW*

Under 35 U.S.C. § 103, the factual inquiry into obviousness requires a determination of: (1) the scope and content of the prior art; (2) the differences between the claimed subject matter and the prior art; (3) the level of ordinary skill in the art; and (4) secondary considerations, if any. *Graham v. John Deere Co.*, 383 U.S. 1, 17-18 (1966). “[A]nalysis [of whether the subject matter of a claim would have been prima facie obvious] need not seek out precise teachings directed to the specific subject matter of the challenged claim, for a court can take account of the inferences and creative steps that a person of ordinary skill in the art would employ.” *KSR Int’l Co., v. Teleflex, Inc.*, 127 S. Ct. 1727, 1740-41 (2007)); *see also DyStar Textilfarben GmbH & Co. Deutschland KG v. C.H. Patrick Co.*, 464 F.3d 1356, 1361 (Fed. Cir. 2006) (“The motivation need not be found in the references sought to be combined, but may be found in any number of sources, including common knowledge, the prior art as a whole, or the nature of the problem itself...”).

“[W]here the prior art gives reason or motivation to make the claimed [invention]...the burden (and opportunity) then falls on an applicant to rebut

that prima facie case. Such rebuttal or argument can consist of ...any other argument or presentation of evidence that is pertinent.” *In re Dillon*, 919 F.2d 688, 692-93 (Fed. Cir. 1990) (*en banc*). In other words, Appellants bear the burden of showing that the claimed invention imparts unexpected results. *In re Geisler*, 116 F.3d 1465, 1470 (Fed. Cir. 1997); *In re Klosak*, 455 F.2d 1077, 1080 (CCPA 1972); *see also In re Skoner*, 517 F.2d 947, 950 (CCPA 1975) (“Expected beneficial results are evidence of obviousness of a claimed invention just as unexpected beneficial results are evidence of unobviousness”). Such a showing of unexpected results must be reasonably commensurate with the scope of protection sought by the claims on appeal. *In re Grasselli*, 713 F.2d 731, 743 (Fed. Cir. 1983); *In re Clemens*, 622 F.2d 1029, 1035 (CCPA 1980). The determination of the sufficiency of a showing of unexpected results is a question of fact. *In re Mayne*, 104 F.3d 1339, 1343 (Fed. Cir. 1997) (“An examination for unexpected results is a factual, evidentiary, inquiry...”). Appellants’ mere arguments in the Brief or conclusory statements in the Specification cannot take the place of objective evidence. *See, e.g., In re De Blauwe*, 736 F.2d 699, 705 (Fed. Cir. 1984); *In re Lindner*, 457 F.2d 506, 508 (CCPA 1972).

#### *ANALYSIS AND ISSUE*

Appellants have not challenged the Examiner’s determination that it would have been a prima facie obvious to combine the claimed polycarbonate and bisphenol A diphosphate flame retardant having the

claimed acid purity level within the meaning of 35 U.S.C. § 103(a).<sup>3</sup> (Compare Ans. 3-9, with App. Br. 3; see also FF 1-24). Rather, Appellants contend that their showing of unexpected results is sufficient to rebut any prima facie case of obviousness established by the Examiner (App. Br. 3-14 and Reply Br. 1-4). In support of their position, Appellants rely on Figures 1 and 2 derived from the Rule 132 declaration of record and Table II at page 25 of the Specification (App. Br. 6-13).

Therefore, as indicated above, the dispositive question is: Have Appellants demonstrated that the claimed subject matter imparts unexpected results, thereby rebutting any prima facie case of obviousness established by the Examiner within the meaning of 35 U.S.C. § 103(a)? On this record, we answer this question in the negative.

Initially, we note that Appellants have not carried the burden of showing that the claimed subject matter imparts unexpected results. *Geisler*, 116 F.3d at 1470; *Klosak*, 455 F.2d at 1080. Figures 1 and 2 relied upon by Appellants show generally steady declining in weight losses in relation to the decreased acid contents in compositions containing 67% PC 145, 8.3% SAN, 0.4% Teflon dispersion, 0.75% unidentified additives and 13.8% BPA-DP (FF 25-27). However, Appellants have not shown that one of

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<sup>3</sup> Given the knowledge of the role of acid impurities in hydrolytic instability problems in polycarbonates and organophosphate flame retardant, we concur with the Examiner that one of ordinary skill in the art would have been led to employ highly purified known organophosphate flame retardants, such as the claimed oligomeric bisphenol A diphosphate flame retardant, as the organophosphate flame retardant of an admittedly known flame retarding thermoplastic composition containing an aromatic polycarbonate resin, such as thermally stable bisphenol A polycarbonate.

ordinary skill in the art would not have reasonably expected such decline in weight losses from reducing acid impurities. As pointed out by our previous decision entered August 31, 2005 (p. 14; and FF 5, 24, and 25):

Albright, in reference to organophosphorus flame-retardant compounds useful for polymers in general, teaches that the “compound’s acid number is inversely proportional to the hydrolytic stability to that compound, i.e., the larger a compound’s acid number, the poorer will be said compounds hydrolytic stability.” More importantly, .... Eimers, in reference to stabilizing polycarbonates with organophosphorus flame-retardant compounds, teaches that “as is known, acid degradation products reduce the stability of the polycarbonate to hydrolysis.”

Indeed, as acknowledged by Appellants and as taught by Morrison, hydrolysis of polycarbonates is promoted by the presence of acids, which according to Brunelle, can lead to lowering of the molecular weight (FF 3-4).

Accordingly, we concur with the Examiner that the showing in Figures 1 and 2 derived from the Rule 132 declaration and the Specification evinces what is reasonably expected by one of ordinary skill in the art. “Expected beneficial results are evidence of obviousness of a claimed invention just as unexpected beneficial results are evidence of unobviousness.” *Skoner*, 517 F.2d at 950.

In reaching this determination, we consider Appellants’ argument directed to an alleged significant and sudden declining in weight loss after the acid content is dropped to 1% or below (App Br. 5-12 and Reply Br. 1-4). However, we do not find any sudden or significant decline in weight loss when the anomalous datum (acid content of 3.25 in Figure 1) is excluded

just as other anomalous data were excluded by Appellants (FF 27, 31-36, and 39). This is especially true in this situation since the tests performed could have a margin of error reflective of the anomalous data in the record (FF 38). In this regard, we note that Appellants have not evinced, much less discussed, the margin of error applicable to the tests performed, as well as the reliability and acceptability of the tests performed in the art (App. Br. 4-13 and Reply Br. 1-4; see also FF 37-38).

Secondly, we observe that Appellants have not demonstrated that the showing in Figures 1 and 2 is commensurate with the scope of protection sought by the claims on appeal. *Grasselli*, 713 F.2d at 743; *Clemens*, 622 F.2d at 1035. While the showing is limited to compositions containing 67% PC 145 (possibly, a linear polycarbonate resin derived from bisphenol A and phosgene and having an intrinsic viscosity of 0.48dl/gm), 8.3% SAN (styrene-acrylonitrile copolymer (75pbw styrene/25 pbw acrylnitrile)), 0.4% Teflon dispersion, 0.75% unidentified additives, and 13.8% BPA-DP (mixture of bisphenol A disphosphate oligomers with an average degree of polymerization of 1.08), the claims on appeal are not so limited. (*Compare* the claims on appeal *with* FF 27-36.) The claims on appeal do not require the presence of SAN, Teflon dispersion, and unidentified additives, which were employed in the compositions tested (e.g., claim 1). The claims are also open to additional ingredients and thermoplastics which are materially different from those tested (*id.*). However, on this record, Appellants have not shown that the showing limited to two specific thermoplastic compositions having specific amounts of specific ingredients is reasonably

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supportive of those materially different thermoplastic compositions covered by the claims on appeal.

Accordingly, based on the totality of record relied upon by the Examiner and Appellants, including due consideration of Appellants' arguments in the Appeal and Reply Briefs, we determine that the preponderance of evidence weighs most heavily in favor of obviousness of the subject matter recited in the claims on appeal within the meaning of 35 U.S.C. § 103.

*ORDER*

The decision of the Examiner is affirmed.

*TIME PERIOD*

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

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