

The opinion in support of the decision being entered today is not binding precedent of the board

Paper 17

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES

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Ex parte GAYLORD M. KISSINGER

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Appeal 2001-0455  
Application 08/509,891<sup>1</sup>

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Before: McKELVEY, Senior Administrative Patent Judge,  
and SCHAFER and LEE, Administrative Patent Judges.

McKELVEY, Senior Administrative Patent Judge.

**Decision on appeal under 35 U.S.C. § 134**

The appeal is from a decision of a primary examiner rejecting claims 1-5. We affirm, but make a recommendation pursuant to 37 CFR § 1.196(c).

**A. Findings of fact**

The record supports the following findings by at least a preponderance of the evidence.<sup>2</sup>

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<sup>1</sup> Application for patent filed 1 August 1995. The real party in interest is General Electric Company, GE Plastics Division, of Pittsfield, MA (Paper 13, Appeal Brief, page 1).

<sup>2</sup> To the extent these findings of fact discuss legal issues, they may be treated as conclusions of law.

### The claims

1. The application on appeal contains claims 1-5.
2. According to applicant (Appeal Brief, page 4), dependent claims 2-5 stand or fall with independent claim 1.
3. Claim 1 reads (matter in [brackets] added):

A process for purification of diaryl carbonates, which comprises:

[1] providing a crude solution of diaryl carbonate in admixture with contaminant by-products of a diaryl carbonate preparation;

[2] cooling the solution to a temperature of about 1-2°C below the nucleation temperature of the diaryl carbonate whereby nucleation occurs;

[3] subsequently further cooling the solution containing nucleated diaryl carbonate at a controlled rate, between about 0.01 to 1.0°C per minute whereby crystals of the diaryl carbonate form in a residue of cooled solution;

[4] separating the residue of cooled solution from the formed crystals of the diaryl carbonate;

[5] heating the separated crystals at a controlled rate to their melt temperature, incrementally;

[6] separating sweat exuding from the heated crystals in each increment; and

[7] collecting the melted crystals to obtain high purity diaryl carbonate.

### The rejection

4. The examiner has rejected claims 1-5 as being unpatentable under 35 U.S.C. § 103(a) over Shafer, U.S. Patent 5,239,106 (1993).

5. Shafer is prior art vis-a-vis applicant under 35 U.S.C. § 102(b).

Shafer

6. Shafer describes a process very similar to that of applicant's claim 1.

7. With reference to the language of applicant's claim 1, Shafer describes the following:

A process for purification of diaryl carbonates<sup>3</sup>, which comprises:

[1a] providing [a] a crude solution of diaryl carbonate in admixture with contaminant by-products<sup>4</sup> of a diaryl carbonate preparation and [b] sufficient phenol so as to be able to form a crystalline 1:1 molar diphenyl carbonate to phenol adduct;<sup>5</sup>

[2] cooling the solution to a temperature of about 1-2°C below the nucleation temperature<sup>6</sup> of the diaryl carbonate at a controlled rate,<sup>7</sup> between about 0.01 to 1.0°C

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<sup>3</sup> Col. 1, lines 12-14: "The present invention relates to a method for recovering diphenylcarbonate in substantially pure form from a solution of diphenylcarbonate and phenol." Thus, both applicant and Shafer have as an ultimate objective recovery of essentially pure diphenyl carbonate.

<sup>4</sup> Col. 2, line 1. The diphenyl carbonate would contain contaminants from its preparation (col. 2, lines 61-63).

<sup>5</sup> Col. 1, line 66 to col. 2, line 4.

<sup>6</sup> According to Example 1 in the specification, the nucleation (crystallization) temperature of diphenyl carbonate is 53.8°C (specification, page 6, line 32). Further according to Example 1, the crude diphenyl carbonate was cooled to 53°C, which is about "1-2°C" below the nucleation temperature of diphenyl carbonate.

According to Shafer, adduct crystals form at 51°C. Shafer also describes cooling to a temperature of 50°C to 25°C, with 50°C being 1°C below the crystallization temperature of the adduct.

<sup>7</sup> Shafer describes lowering the temperature in stages, for example a first stage at 44.5°C to obtain a certain level of crystallization, followed by a second stage at 37°C to provide additional level of crystallization (col. 2, lines 36-53).

per minute<sup>8</sup> whereby crystals of the diaryl carbonate form in a residue of cooled solution;

[3] separating the residue of cooled solution from the formed crystals of the diaryl carbonate;<sup>9</sup>

[4] heating<sup>10</sup> the separated crystals at a controlled rate<sup>11</sup> to their melt temperature, incrementally;

[5] separating sweat<sup>12</sup> exuding from the heated crystals in each increment; and

[6] collecting the melted crystals to obtain high purity diaryl carbonate.<sup>13</sup>

#### Difference

8. As noted by the examiner, the difference between Shafer and claim 1 is that claim 1 requires cooling at a controlled rate, between about 0.01 to 1.0°C per minute, whereas Shafer does not describe the precise rate at which cooling takes place.

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<sup>8</sup> The examiner acknowledges that Shafer does not describe the rate at which temperature is lowered (Paper 14, Examiner's Answer, page 4).

<sup>9</sup> The crystalline diphenyl carbonate-phenol adduct is recovered from the crystallization solution (col. 2, line 21--step (2); see also col. 4, lines 3-6).

<sup>10</sup> Shafer describes heating to preferably 60°C to 120°C (col. 2, line 56; see also col. 4, lines 6-8).

<sup>11</sup> According to Shafer, a crystalline diphenyl carbonate phenol adduct at 40°C was heated to 120° to effect separation of phenol (col. 4, lines 6-9). In heating from 40°C to 120°C heating occurred over time. Phenol was constantly being separated over time.

<sup>12</sup> As noted in the previous note, phenol was removed over time during distillation.

<sup>13</sup> Ultimately, diphenyl carbonate was recovered (col. 4, line 9).

Level of skill in the art

9. Shafer provides considerable guidance to those having ordinary skill in the art with respect to cooling (col. 2, lines 26-58).

10. For example, Shafer describes adduct crystallization in two stages (col. 2, lines 44-46), each stage using different temperatures (col. 2, line 48 and 52).

11. From Shafer, one having ordinary skill in the art would learn that the rate and yield of crystallization is a function of how crystallization is effected over different temperatures.<sup>14</sup>

12. Shafer suggests to one skilled in the art that lowering the temperature incrementally is a suitable method of effecting cooling and that the rate of cooling is a matter to be determined on a case-by-case basis.

13. Applicant, on this record, has not established that the rate at which temperature is lowered is in any way critical to obtaining the result sought by the process, i.e., essentially pure diphenyl carbonate.

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<sup>14</sup> The level of skill in the art provides substantial evidence for the examiner's rather cryptic holding that "[c]hanging the rate at which a lower temperature is reached is an obvious variation" (Examiner's Answer, page 4). Given the discussion by Shafer, what the examiner probably intended to say was that determining the rate at which the temperature should be lowered to obtain acceptable results for a given process is a matter within the skill of the art to be determined on a case-by-case basis.

## B. Discussion

1.

We have found that there is one difference between the prior art, cooling at a particular rate, but that Shafer suggests to one skilled in the art that cooling occur incrementally.

We agree with the examiner that the precise rate of cooling is not described by Shafer--if it were, then the examiner would have rejected claim 1 under 35 U.S.C. § 102 over Shafer.

However, we also find that Shafer tells one skilled in the art that incremental cooling is one way to effect crystallization. We further find that Shafer would suggest to one skilled in the art that for any given process the degree at which the material is cooled is a result oriented variable to be determined by one skilled in the art on a case-by-case basis through routine experimentation. Cf. In re Woodruff, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936-37 (Fed. Cir. 1990) (where the difference between the claimed invention and the prior art is some range or other variable within the claims, the applicant must show that the particular range is critical, generally by showing that the claimed range achieves unexpected results relative to the prior art range). Substantial evidence supports the examiner's § 103 rejection.

2.

Applicant's principal, if not only, argument on appeal claiming that the rejection is "incorrect" (Appeal Brief, pages 5-6) is that Shafer involves co-crystallization of diphenyl carbonate with a solvent--phenol. As noted by applicant (Appeal Brief, page 5: "the process disclosed in Shafer relies on crystallizing DPC [diphenyl carbonate] with a phenol solvent to form 1:1 molar crystals, and subsequently distilling off the phenol." Applicant tells us that his claimed process (1) does not employ a solvent (i.e., phenol), (2) does not involve forming an adduct, and (3) merely heats the crystals to their melting point rather than distilling off a solvent (Appeal Brief, page 6).

The difficulty with applicant's arguments is that claim 1 does not exclude the steps which applicant says claim 1 does not cover.

It is true that claim 1 does not "employ", i.e., expressly call for adding, a solvent such a phenol. However, adding phenol to the crude diphenyl carbonate containing contaminants is not excluded by claim 1.

It is further true that claim 1 does not mention formation of an adduct. However, formation of an adduct is not excluded from the claim.

It is still further true that claim 1 does not mention distilling off phenol. However, distilling off phenol is not excluded by claim 1. Moreover, in reaching the temperature to

distill off phenol the Shafer process reaches a temperature which is at least equal to the melt temperature.

**C. Recommendation under 37 CFR § 1.196(c)**

We think that the difficulty with the appeal is that applicant has presented a claim which is too broad in the sense of 35 U.S.C. § 103(a). On the record before us, it is our view that claim 1 includes subject matter which would have been obvious and subject matter which would not have been obvious. Hence, claim 1 is not patentable. Cf. In re Muchmore, 433 F.2d 824, 167 USPQ 681 (CCPA 1970) (claims which include obvious subject matter and non-obvious subject matter are not patentable under § 103).

The specific problem with claim 1 is that claim 1 does not preclude providing a solution of diphenyl carbonate, contaminants and phenol albeit that it is clear from applicant's arguments on appeal, and perhaps the specification, that applicant does not seek to cover a process which uses an adduct. In this respect, we recommend that applicant consider amending claim 1 to read as follows (matter in [brackets] and **bold** added to claim 1:

A process for purification of diaryl carbonates, which comprises:

[1] providing a crude solution [**consisting**] of [**a**] diaryl carbonate in admixture with [**b**] contaminant by-products of a diaryl carbonate preparation;

[2] cooling the solution to a temperature of about 1-2°C below the nucleation temperature of the diaryl carbonate whereby nucleation occurs;

[3] subsequently further cooling the solution containing nucleated diaryl carbonate at a controlled rate, between about 0.01 to 1.0°C per minute whereby crystals of the diaryl carbonate form in a residue of cooled solution;

[4] separating the residue of cooled solution from the formed crystals of the diaryl carbonate;

[5] heating the separated crystals at a controlled rate to their melt temperature, incrementally;

[6] separating sweat exuding from the heated crystals in each increment; and

[7] collecting the melted crystals to obtain high purity diaryl carbonate.

The phrase "consisting of" is a transition phrase commonly used in claims to signal a closed claim,<sup>15</sup> and in the case of our suggested claim to signal closing only one clause of a multi-clause claim. Cf. (1), Manual of Patent Examining Procedure, § 2111.03 (8th ed. Aug. 2001), (2) Mannesmann Demag Corp. v. Engineered Metal Products Co., Inc., 793 F.2d 1279, 1282, 230 USPQ 45, 46 (Fed. Cir. 1986) ("consisting" within element (a) of a claims with elements (a) through (d) limited only element (a); the district court correctly observed that the phrase "consisting of" appears in clause (a), not the preamble of the claim and thus limits only the element set forth in clause (a) and (3) Berenter v. Quigg, 737 F.Supp. 5, 14 USPQ2d 1175 (D.D.C. 1988) (claim with "comprising" in preamble and "consisting of" in one step; step limited because of consisting

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<sup>15</sup> Ex parte Davis, 80 USPQ 448, 450 (Bd. App. 1948) ("consisting of" closes the claim to inclusion of materials other than those recited except for impurities ordinarily associated therewith).

of; "A method \*\*\* comprising identifying said first habitat, and applying lethally effective amount of pesticide to an area consisting of said first habitat, whereby \*\*\*.").

A review of the invention described in applicant's specification would suggest that applicant intends to recover diaryl carbonate solely from a mixture of (a) diaryl carbonate and (b) contaminant by-products of a diaryl carbonate preparation. As observed in the Appeal Brief (page 6) and the Reply Brief (page 2), while "contaminants" might include small amounts of residual phenol, "contaminants" would not include adding sufficient phenol to make an adduct having a 1:1 molar ratio of diaryl carbonate to phenol. Adding large amounts of phenol would be inconsistent with step [1] of the process as set out in our suggested claim. While claim 1 as presented on appeal does not preclude the addition of other materials, claim 1 as suggested would not permit other material to be added, including additional phenol as set out in step [1a] supra (Finding 7) in our opinion because to do so would contravene the solution to be treated as defined in step [1] of our suggested claim.

#### **D. Order**

Upon consideration of the appeal, and for the reasons given, it is

ORDERED that the examiner's rejection of claims 1-5 as being unpatentable under 35 U.S.C. § 103(a) over Shafer is affirmed.

FURTHER ORDERED that a recommendation is made pursuant to 37 CFR § 1.196(c) to authorize applicant to amend claim 1 as set out in Part C of our opinion.

FURTHER ORDERED that if applicant desires to amend claim 1 as suggested then within **one (1) month** of the date of this decision applicant shall present an amendment (to be filed with the board by fax at 703-305-0942) making the suggested amendment to claim 1.

FURTHER ORDERED that no time period for taking any subsequent action in connection with this appeal, including presentation of the amendment to claim 1 authorized herein, may be extended under 37 CFR § 1.136(a).

**AFFIRMED.**  
**(37 CFR § 1.196(c))**

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FRED E. McKELVEY, Senior )	
Administrative Patent Judge )	
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_____ )	
RICHARD E. SCHAFER )	BOARD OF PATENT
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