

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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AVX CORPORATION,  
Petitioner,

v.

GREATBATCH LTD,  
Patent Owner.

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Case IPR2014-01361  
Patent 6,687,117 B2

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Before JEREMY M. PLENZLER, JON B. TORNQUIST, and  
BETH Z. SHAW, *Administrative Patent Judges*.

TORNQUIST, *Administrative Patent Judge*.

FINAL WRITTEN DECISION  
*35 U.S.C. § 318 and 37 C.F.R. § 42.73*

## I. INTRODUCTION

### A. Background

AVX Corporation (“Petitioner”) filed a Petition (Paper 1, “Pet.”) requesting institution of *inter partes* review of claims 1–43 of U.S. Patent No. 6,687,117 B2 (“the ’117 patent”). Greatbatch Ltd. (“Patent Owner”) timely filed a Preliminary Response (Paper 7, “Prelim. Resp.”) to the Petition.

Pursuant to 35 U.S.C. § 314(a), we instituted *inter partes* review of claims 1–43 of the ’117 patent on the following grounds:

1. Whether claims 1–3, 5, 7–10, 12, 13, 18, 21, 22, 24, 25, 28–31, 33, 37, 38, 40, and 41 are anticipated under 35 U.S.C. § 102 by Shah;<sup>1</sup>
2. Whether claims 4, 6, 16, 17, 19, 20, 34, and 36 would have been obvious under 35 U.S.C. § 103 over Shah and Clark;<sup>2</sup>
3. Whether claims 11, 14, 15, 23, 26, 27, 39, 42, and 43 would have been obvious under 35 U.S.C. § 103 over Shah and Shiono;<sup>3</sup>
4. Whether claim 32 would have been obvious under 35 U.S.C. § 103 over Shah and Fresia;<sup>4</sup> and
5. Whether claim 35 would have been obvious under 35 U.S.C. § 103 over Shah and Liu.<sup>5</sup>

Paper 9 (“Decision on Institution” or “Dec. on Inst.”), 13.

Following institution of trial, Patent Owner filed a Patent Owner Response (Paper 11, “PO Resp.”) in which it concedes that no claims of the ’117 patent are patentable over the grounds set forth in the Petition. *Id.* at 1. Patent Owner also filed a non-contingent motion to amend the claims of the

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<sup>1</sup> EP 0989572 A2, issued March 29, 2000 (Ex. 1002).

<sup>2</sup> U.S. Patent No. 2,089,687, issued August 10, 1937 (Ex. 1003).

<sup>3</sup> U.S. Patent No. 5,870,275, issued February 9, 1999 (Ex. 1004).

<sup>4</sup> U.S. Patent No. 4,476,517, issued October 9, 1984 (Ex. 1005).

<sup>5</sup> U.S. Patent No. 5,507,966, issued April 16, 1996 (Ex. 1008).

'117 patent (Paper 13, "First Mot. to Amend"), to which Petitioner filed an opposition (Paper 18). With its opposition, Petitioner filed a supporting declaration from Mr. Jan Petrzilek (Ex. 1018).

On August 17, 2015, we granted a joint request from the parties to allow Patent Owner to file a second motion to amend. Paper 21. Subsequently, Patent Owner filed its Second Motion to Amend the claims of the '117 patent (Paper 22, "Second Motion to Amend" or "Mot."), to which Petitioner filed an opposition (Paper 24). With its second opposition, Petitioner filed a supporting declaration from Mr. Jan Petrzilek (Ex. 1020).

On September 28, 2015, Petitioner withdrew its second opposition. Paper 25. During an October 1, 2015 call with the Board, Petitioner confirmed that it intended to withdraw both its opposition to Patent Owner's Second Motion to Amend and the second declaration of Mr. Petrzilek. *Id.* at 2. Petitioner also confirmed that its first opposition (Paper 18) and the first declaration of Mr. Petrzilek (Exhibit 1018) were moot in light of Patent Owner's Second Motion to Amend. *Id.*

Although no opposition was then pending, on October 14, 2015, Patent Owner filed a Reply (Paper 28, "Reply") to Petitioner's second opposition.<sup>6</sup>

By stipulation of the parties, no oral hearing was held in this proceeding. Paper 21, 2 (noting the agreement of the parties to waive oral argument).

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<sup>6</sup> A reply may only respond to arguments raised in the corresponding opposition. 37 C.F.R. 42.23(b). As Petitioner's second opposition was withdrawn before Patent Owner filed its Reply, there were no arguments of record for Patent Owner to respond to. As such, we do not consider Patent Owner's Reply (Paper 28).

We have jurisdiction under 35 U.S.C. § 6(c). This Final Written Decision is issued pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73. For the reasons that follow, we determine that Petitioner has met its burden to prove, by a preponderance of the evidence, that claims 1–43 of the '117 patent are unpatentable. We also determine that Patent Owner has not carried its burden to show that proposed substitute claims 44 and 45 are patentable.

### *B. Related Proceeding*

U.S. Patent App. No. 14/534,357 (“the '357 application”) is a reissue application of U.S. Patent App. No. 10/354,324, which issued as the '117 patent. On July 21, 2015, prosecution was suspended in the '357 application pending resolution of the current *inter partes* review proceeding. Paper 19, 2; Ex. 3002.

### *C. The '117 Patent*

The '117 patent is directed to an electrolyte for high voltage wet tantalum or aluminum capacitors. Ex. 1001, 1:11–13. This electrolyte “preferably contains the following constituents, by weight: about 1% to about 80% de-ionized water and 0% to about 80% of an organic solvent along with about 1% to about 80% isobutyric acid and about 0.5% to about 50% of concentrated ammonium salt (28%).” *Id.* at 1:43–48. Although isobutyric acid is preferred, the '117 patent discloses that “other relatively weak organic acids of the general formula of  $c_nH_{2+n}O_2$  (where  $n=2$  to 7) are acceptable,” including “butyric acid, propionic acid, valeric acid (pentanoic acid), methylbutyric acid, trimethylacetic acid, and mixtures thereof . . . .” *Id.* at 2:7–13.

The organic solvent of the '117 patent may be a glycol, such as ethylene glycol. *Id.* at 1:48–53. The ammonium salt—which “provides electrical conductivity”—may be provided via the addition of “an ammonium salt of the corresponding acid constituent,” or generated in situ by combining the acid with ammonium hydroxide. *Id.* at 2:14–19.

*D. Illustrative Claims*

In its Motion to Amend, Patent Owner moves to add proposed claims 44 and 45 as substitutes for independent claim 18. Mot. 1. Proposed claims 44 and 45 are reproduced below (underlined material indicating language added to, and brackets indicating language removed from, original claim 18):

44. A capacitor, which comprises:
- a) an anode of tantalum [a valve metal];
  - b) an electrochemical cathode of  ruthenium oxide [selected from the group consisting of a transition metal oxide, a transition metal nitride, a transition metal carbide and a transition metal carbon nitride]; and
  - c) an electrolyte for the anode and the cathode, the electrolyte [comprising] consisting essentially of:
    - i) water;
    - ii) an organic solvent;
    - iii) an organic acid; and
    - iv) an ammonium salt of the organic acid,
    - v) wherein the ammonium salt and its corresponding organic acid are ammonium isobutyrate and isobutyric acid.
45. The electrolyte of claim 44 wherein the electrolyte has:
- a) a conductivity in the range of 6.9 to 11.5 mS/cm,
  - b) a pH in the range of 4.9 to 6.7, and

c) an anode breakdown voltage in the range of 370 to 400 volts when the electrolyte is at room temperature and the breakdown voltage is measured using a tantalum anode.

Mot. 17–18.

## II. ANALYSIS

### A. *Claim Construction*

In the Petition, Petitioner proposed constructions for the claim terms: “consisting essentially of,” “for an electrochemical energy storage device,” “for a capacitor,” “for activating a capacitor,” “ammonium salt of the organic acid,” “cathode,” “anode,” and “valve metal.” Pet. 9–11. In the Preliminary Response, Patent Owner proposed a construction for the transitional phrase “consisting essentially of.” Prelim. Resp. 3–4.

In our Decision on Institution, we discussed the meaning of the transitional phrase “consisting essentially of,” but otherwise found that no claim terms required express construction. Dec. on Inst. 4. In its Second Motion to Amend, Patent Owner does not dispute our interpretation of “consisting essentially of,” or propose constructions for any additional claim terms.

Upon review of Patent Owner’s evidence and arguments, we conclude that no explicit constructions are required in order to resolve the issues pending before the Board.

### B. *Patentability of Original Claims 1–43*

In our Decision on Institution, we found persuasive Petitioner’s analysis of how the elements of claims 1–43 are taught by the disclosures of the asserted prior art references. Dec. on Inst. 13. In its response, Patent Owner does not dispute Petitioner’s arguments or otherwise seek to establish the patentability of claims 1–43. Indeed, Patent Owner “concedes that none

of the claims of the '117 Patent is patentable over Grounds 1 to 6 raised in the Petition.” PO Resp. 1.

Given Patent Owner’s concession that claims 1–43 are unpatentable, *see* 37 C.F.R. § 42.73(b), and upon review of Petitioner’s arguments and supporting evidence, we conclude that Petitioner has proven by a preponderance of the evidence that claims 1–43 of the '117 patent are unpatentable under 35 U.S.C. § 103.

*C. Patentability of Proposed Substitute Claims 44 and 45*

As the moving party, Patent Owner bears the burden of proof in establishing that it is entitled to add proposed substitute claims 44 and 45. 37 C.F.R. § 42.20(c). As part of this showing, Patent Owner must demonstrate (1) the amendment responds to a ground of unpatentability involved in the trial; (2) the amendment does not seek to enlarge the scope of the claims of the patent or introduce new subject matter; (3) the amendment proposes a reasonable number of substitute claims; and (4) the proposed claims are supported in the original disclosure. 37 C.F.R. § 42.121.

Upon review of the Second Motion to Amend, we are persuaded that the requirements of 37 C.F.R. § 42.121 have been met. For example, Patent Owner seeks to add only two substitute claims, each of which serves to narrow the scope of original claim 18. Mot. 17–18. Patent Owner also identifies exemplary electrolytes disclosed in the originally-filed application that fall within the scope of proposed substitute claims 44 and 45. *Id.* at 9 (citing Ex. 1010, 33, 35–36 (disclosing an electrolyte containing ethylene glycol, water, isobutyric acid, and ammonium hydroxide (which results in an ammonium salt of the organic acid) with a pH of 4.9, a conductivity of 7.1

mS/cm, and an anode breakdown voltage of 395 volts)). Thus, we focus on whether Patent Owner has met its burden of proof to show that proposed substitute claims 44 and 45 are patentable over the prior art of record.

*D. Patentability of Proposed Substitute Claim 44*

In the Second Motion to Amend, Patent Owner contends that proposed substitute claims 44 and 45 would have been patentable over the prior art of record and, in particular, Shah, Clark, and GB 466,193. Mot. 4–8. We address this combination of references below.

*1. Shah*

Shah is directed to an “electrolyte solution having high conductivity and high breakdown voltage.” Ex. 1002, 1:5–8. The preferred cathode of Shah is a “porous ruthenium oxide film provided on a titanium substrate” and the preferred anode is formed of tantalum. *Id.* at 2:3–11. In its preferred form, the electrolyte of Shah contains by weight: “0% to 85% de-ionized water, 0% to 95% ethylene glycol, 0% to 80% acetic acid, 0% to 6% phosphoric acid and 0% to 50% ammonium acetate.” *Id.* at 1:44–48. The preferred pH of the electrolytes of Shah is “between about 1 to about 7.” *Id.* at 2:22–25.

Shah discloses the use of an organic acid (acetic acid) and an ammonium salt of the organic acid (ammonium acetate), but does not disclose the use of isobutyric acid and ammonium isobutyrate, as recited in proposed substitute claim 44. Mot. 7.

*2. Clark*

Clark is directed to “cryohydric electrolytes having greater stability or resistance to deterioration at elevated temperatures.” Ex. 1003, 1:13–16. In one embodiment of Clark, the electrolyte contains “by weight about 36 per

cent of boric acid, 32 per cent acetic acid and 32 per cent of lactic acid.” *Id.* at 2:36–38. Ammonia gas is conducted into such solution of acids, “thereby forming corresponding ammonium salts and water.” *Id.* at 2:40–43.

Clark discloses that “[i]n place of acetic acid other low molecular weight paraffin acids may be used,” including propionic acid and butyric acid, which each “contain less than five carbon atoms in the molecule.”<sup>7</sup> *Id.* at 3:46–61. Clark also discloses that “[t]he proportions of the ingredients above given may be varied within wide limits, without loss of the desirable characteristics . . . .” *Id.* at 3:7–9.

### 3. GB 466,193

GB 466,193 discloses an improved electrolyte for use in electrolytic condenser, rectifiers, and the like. Ex. 1015, 1:10–13. This electrolyte contains an organic acid associated with a salt, preferably in the form of acetic acid. *Id.* at 1:14–22. To this electrolyte, a thickening agent or a resistance-reducing salt “may” be added. *Id.* at 1:27–32. GB 466,193 also instructs that in place of acetic acid, other organic acids of the aliphatic series may be used, including propionic, butyric, isobutyric, and lactic acids. *Id.* at 3:73–82.

### 4. Analysis

As recited in proposed substitute claim 44, Shah discloses a capacitor with a tantalum anode, a ruthenium oxide cathode, and an electrolyte. Ex. 1002, 1:44–48, 2:7–22. The electrolyte of Shah is composed of water, an organic solvent (ethylene glycol), an organic acid (acetic acid), phosphoric

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<sup>7</sup> Isobutyric acid—an isomer of butyric acid—contains less than five carbon atoms in its structure and has the formula C<sub>4</sub>H<sub>8</sub>O<sub>2</sub>. Ex. 3003. In its Second Motion to Amend, Patent Owner does not dispute that isobutyric acid is a “low molecular weight paraffin acid.”

acid,<sup>8</sup> and ammonium acetate (ammonium salt of acetic acid). *Id.* at 1:44–50 (noting that ethylene glycol is used as a solvent); 3:15–24 (Table 1). Thus, Shah discloses every limitation of proposed claim 44, except the use of isobutyric acid and its corresponding ammonium salt. Mot. 5.

Clark, however, discloses successfully substituting acetic acid in an electrolyte solution with “other low molecular weight paraffin acids,” including butyric, propionic, and lactic acids, as well as forming corresponding ammonium salts of these organic acids. Ex. 1003, 2:40–46, 3:46–61. Likewise, GB 466,193 broadly discloses that acetic acid may be replaced in an electrolyte solution with organic acids of the aliphatic series, including butyric acid and isobutyric acid. Ex. 1015, 3:73–79.

In its Second Motion to Amend, Patent Owner does not point to any persuasive evidence to support or explain why a person of ordinary skill in the art would not have considered isobutyric acid, as implied in Clark and expressly identified in GB 466,193, to be a suitable substitute for acetic acid in the electrolyte of Shah. Indeed, similar to the disclosures of Clark and GB 466,193, the ’117 patent discloses that “other relatively weak organic acids of the general formula  $c_nH_{2+n}O_2$  (where  $n=2$  to 7) are acceptable.”<sup>9</sup> Thus, we are not persuaded that Shah, Clark, and GB 466,193 fail to teach or suggest every limitation of proposed substitute claim 44.

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<sup>8</sup> In its Second Motion to Amend, Patent Owner does not present any evidence to show that phosphoric acid would materially affect the properties of the electrolytes of the ’117 patent. *See* Dec. on Inst. 6.

<sup>9</sup> We note that the “ $H_{2+n}$ ” portion of this equation appears to be a typographical error, that was intended to read “ $H_{2*n}$ ”. Otherwise, the exemplary organic acids described in the ’117 patent would not fall within the scope of the equation as a whole.

With respect to the reason to combine these references, however, Patent Owner contends that the transitional phrase “consisting essentially of” in proposed substitute claim 44 precludes the combination of Shah with Clark and GB 466,193. Mot. 6. Specifically, Patent Owner contends that each of the electrolytes disclosed in Clark contains boric acid in “significant quantities,” and the addition of this constituent would have a “material affect on the claimed electrolyte.” Mot. 5–6; *see PPG Indus. v. Guardian Indus. Corp.*, 156 F.3d 1351, 1354 (Fed. Cir. 1998) (“By using the term ‘consisting essentially of,’ the drafter signals that the invention necessarily includes the listed ingredients and is open to unlisted ingredients that do not materially affect the basic and novel properties of the invention.”). Likewise, Patent Owner contends that the disclosed electrolyte of GB 466,193 was designed to operate with a thickening agent and a resistance-reducing salt that would clearly have a material effect on the electrolyte of proposed substitute claim 44. *Id.* at 8. As such, Patent Owner contends that proposed substitute claim 44 would not have been obvious over the combination of Shah, Clark, and GB 466,193. *Id.* at 6, 8.

Although we agree with Patent Owner that the transitional phrase “consisting essentially of” prohibits the inclusion of constituents that would “materially affect the basic and novel properties of the invention,” Patent Owner has not explained persuasively why the combination of Shah, Clark, and GB 466,193 requires the addition of either boric acid, a thickening agent, or a resistivity modifying salt in the electrolyte of Shah. *See* Pet. 20–21. Patent Owner also fails to explain persuasively why Clark and GB 466,193 do not evidence that one of ordinary skill in the art would have understood that the acetic acid in Shah’s electrolyte could be substituted

successfully with isobutyric acid to provide an electrolyte containing isobutyric acid and ammonium isobutyrate. *See* Pet. 21 (citing Ex. 1003, 3:46–48, 3:55–61); *see also 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.”). Thus, we are not persuaded by Patent Owner’s argument.

Moreover, even if boric acid, or a thickening agent and a resistivity-reducing salt were required in the combination of Shah, Clark, and GB 466,193, at this stage of the proceeding Patent Owner bears the burden of demonstrating that these constituents would have a material effect on the basic and novel properties of the claimed electrolytes. *See* 37 C.F.R. § 42.20(c) (“The moving party has the burden of proof to establish that it is entitled to the requested relief.”). In its first and second motions to amend Patent Owner does not point to persuasive evidence or argument to show that the addition of allegedly significant quantities of ammonium borate, as disclosed in Clark, or a thickening agent and resistivity-reducing salt, as disclosed in GB 466,193, would have a material effect on the “basic and novel” properties of the invention set forth in proposed substitute claim 44. For example, Patent Owner simply concludes without analysis or supporting testimony that because Clark contains “significant” or “material” levels of boric acid, the addition of this compound would “material[ly] affect” the properties of the electrolyte of proposed substitute claim 44. Mot. 6. Similarly, with respect to the thickening agent and resistivity-reducing salt of GB 466,193, Patent Owner summarily concludes that GB 466,193 “clearly intends for the thickening agent and resistivity modifying salt to

have a material affect on their prior art electrolyte.” *Id.* at 8. Such conclusory statements are not sufficient to carry Patent Owner’s burden to show that the boric acid of Clark or the thickening agent and resistivity-reducing salt of GB 466,193 would in fact “materially affect the basic and novel properties” of the electrolyte of proposed substitute claim 44. *See PPG*, 156 F.3d at 1354.

Patent Owner also directs our attention to the Board’s prior institution decision in IPR2015-00101, which Patent Owner contends supports its assertion that the transitional phrase “consisting essentially of” precludes the combination of Shah, Clark, and GB 466,193. Mot. 2–4. The institution decision in IPR2015-00101, however, is distinguishable from the present case. In contrast to the combination of references proposed by the petitioner in IPR2015-00101, which required the selection of individual components and the exclusion of other components from different examples in a prior art reference to arrive at a base electrolyte prior to substitution, here there is no need to combine elements from different examples in Shah to arrive at the base electrolyte prior to substitution of acetic acid with isobutyric acid. *See* IPR2015-00101, Paper 9, 13–14.

Accordingly, we are not persuaded that Patent Owner has carried its burden to demonstrate that proposed substitute claim 44 is patentable over the prior art of record.

*E. Patentability of Proposed Substitute Claim 45*

Proposed substitute claim 45 recites specific conductivity, pH, and anode breakdown voltage ranges for the electrolyte of claim 44:

45. The electrolyte of claim 44 wherein the electrolyte has:  
a) a conductivity in the range of 6.9 to 11.5 mS/cm,

- b) a pH in the range of 4.9 to 6.7, and
- c) an anode breakdown voltage in the range of 370 to 400 volts when the electrolyte is at room temperature and the breakdown voltage is measured using a tantalum anode.

Mot. 17–18.

In its Second Motion to Amend, Patent Owner does not provide specific arguments to explain why proposed substitute claim 45 would have been patentable over the prior art, relying instead on its arguments with respect to the transitional phrase “consisting essentially of” in proposed claim 44. Mot. 12 (“This combination has been thoroughly discussed above and is believed to be rendered untenable by use of the transitional phrase ‘consisting essentially of’ in claim 44.”). For the reasons set forth above, we are not persuaded that the transitional phrase “consisting essentially of” in proposed substitute claim 44 prohibits or teaches away from the combination of Shah, Clark, and GB 466,193. Thus, we are not persuaded that Patent Owner has carried its burden to demonstrate that proposed claim 45 is patentable.

Patent Owner does present arguments regarding the ranges set forth in proposed substitute claim 45 in its First Motion to Amend, albeit in the context of a different set of proposed substitute claims. This First Motion to Amend, however, was replaced by Patent Owner’s Second Motion to Amend. Regardless, even if we were to consider the First Motion to Amend, for the reasons set forth below, we would still not be persuaded that proposed substitute claim 45 is patentable over the prior art of record.

In its First Motion to Amend, Patent Owner compares the constituents, conductivity, and anode breakdown voltages for “electrolyte 1”

of Shah and “electrolyte 2” of the ’117 patent. First Mot. to Amend 7–9. As part of this analysis, Patent Owner provides Table 3, reproduced below:

Table 3

Shah vs. The ‘117 PATENT

pH	4.89	4.9
	Electrolyte 1 <i>Shah Publication</i>	Electrolyte 2 <i>The ‘117 Patent</i>
water	49.41	52.88
ethylene glycol	19.45	39.17
<i>ammonium constituent</i>	15.55	1.5
phosphoric acid	0.31	0.06
<i>carboxyl acid</i>	15.28	6
Conductivity (mS/cm)	<i>47.5</i>	<i>7.1</i>
Anode Breakdown (Volts)	<i>245</i>	<i>395</i>

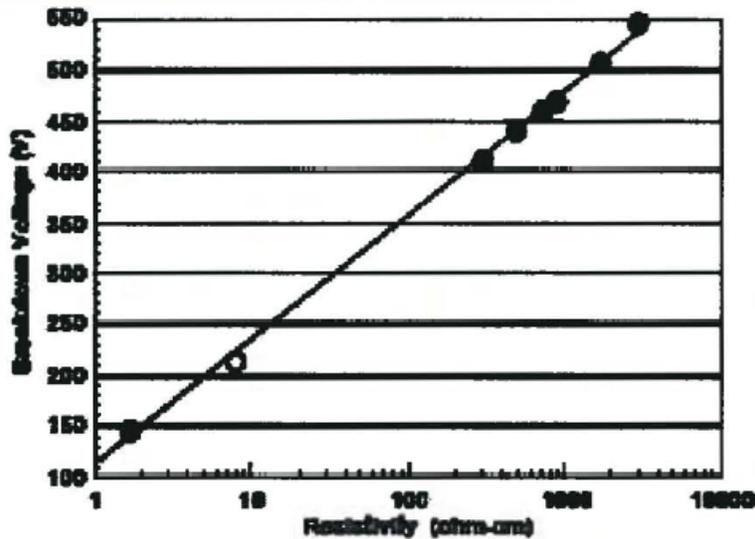
*Id.* at 9. As shown in Table 3, at a pH of roughly 4.9, electrolyte 1 of Shah exhibits an anode breakdown voltage of 245V, whereas electrolyte 2 of the ’117 patent exhibits an anode breakdown voltage of 395V. *Id.* at 6–10. Patent Owner “submits that the difference of 150 V in anode breakdown voltage” between these two electrolytes, “both of which have almost identical pH ~4.9, is nonobvious and patentably significant.” *Id.* at 10–11. In particular, Patent Owner contends that the disclosed results are contrary to the teaching of Evans,<sup>10</sup> which discloses that anode breakdown voltage is independent of electrolyte composition. *Id.*

To evaluate Patent Owner’s argument, a review of Evans is required. Evans discloses the design of “Hybrid capacitors” and, in particular, the design of “a tantalum Hybrid capacitor with a 170 V working voltage.” Ex. 2004, Abstract. According to Evans, “[t]he breakdown voltage of the

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<sup>10</sup> David A. Evans, *A 170 Volt Tantalum Hybrid Capacitor – Engineering Considerations*, SEVENTH INTERNATIONAL SEMINAR ON DOUBLE LAYER CAPACITORS AND SIMILAR ENERGY STORAGE DEVICES (Dec. 8–10, 1997).

dielectric follows a semilogarithmic relationship with electrolyte resistivity, and is independent of dielectric thickness, formation voltage, electrolyte composition, or temperature.” *Id.* at 3. Figure 4 of Evans, reproduced below, shows this relationship for tantalum anodes:



**Figure 4. Breakdown voltage vs. Log electrolyte resistivity for Ta<sub>2</sub>O<sub>5</sub> dielectric in various aqueous and non-aqueous electrolytes.**

*Id.* at 3. Using Figure 4, Evans discloses that an anode breakdown voltage of 213 volts can be achieved by providing an electrolyte with a resistivity of 8  $\Omega\cdot\text{cm}$ , or a conductivity of 125 mS. *Id.*

As shown in Table 3 above, the ammonium constituent in electrolyte 1 of Shah is ten times higher than electrolyte 2 of the '117 patent, and the resulting conductivity (47.5 mS/cm) is 6.7 times higher than that of electrolyte 2 of the '117 patent (7.1 mS/cm). First Mot. to Amend 9 (Table 3); Ex. 1001, 2:14–16 (confirming that the ammonium salt “provides electrical conductivity” in the electrolyte). Given the disclosure of Evans that anode breakdown voltage decreases with increasing conductivity

(conductivity being the inverse of resistivity), Patent Owner does not explain persuasively why the 150 volt difference in anode breakdown voltage between electrolyte 1 of Shah and electrolyte 2 of the '117 patent is “contrary to” the teachings of Evans. First Mot. to Amend 9 (Table 3), 11; Ex. 2004, 3 (Figure 4). Nor does Patent Owner explain why a person of ordinary skill in the art could not use the disclosure of Evans to modify the resistivity of the electrolyte of Shah, Clark, and GB 466,193 to obtain an anode breakdown voltage within the 370 to 400 volt range of proposed substitute claim 45. Thus, we are not persuaded that the 150 volt difference between electrolyte 1 of Shah and electrolyte 2 of the '117 patent is nonobvious or surprising.

Patent Owner also contends that if acetic acid was equivalent to isobutyric acid, such that it could be replaced interchangeably, “a substantially similar anode breakdown voltage would have been achieved in both Shah’s electrolyte and the '117 Patent electrolyte, both of which have almost identical pH~4.9.” First Mot. to Amend 11. We note, however, that, as set forth in Table 3 above, electrolyte 1 of Shah has a conductivity that is 6.7 times higher than electrolyte 2 of the '117 patent, as well as ten times the ammonium constituent, two and a half times the acid constituent, half the ethylene glycol, and five times the phosphoric acid as compared to electrolyte 2 of the '117 patent. In view of the wide difference in constituents and resulting conductivity levels between the two electrolytes, and in view of the teaching of Evans that anode breakdown voltage depends on the resistivity of the electrolyte, Patent Owner provides insufficient argument or evidence to explain why one of ordinary skill in the art would expect that “[i]f acetic acid were equivalent to isobutyric acid . . . a

substantially similar anode breakdown voltage would have been achieved in both Shah's electrolyte and the '117 patent electrolyte . . . ." First Mot. to Amend 11.

Accordingly, even if arguments made in the First Motion to Amend were considered, we would still not be persuaded that proposed substitute claim 45 is patentable over the prior art. Thus, we are not persuaded that Patent Owner has carried its burden to demonstrate, by a preponderance of the evidence, that proposed substitute claim 45 is patentable over the prior art of record.

### III. CONCLUSION

We conclude that Petitioner has demonstrated, by a preponderance of the evidence, that claims 1–43 of the '117 patent are unpatentable under 35 U.S.C. § 103. In addition, we conclude that Patent Owner has not demonstrated, by a preponderance of the evidence, that proposed substitute claims 44 and 45 are patentable over the prior art of record. Accordingly, Patent Owner's Second Motion to Amend is *denied*.

### IV. ORDER

In consideration of the foregoing, it is  
ORDERED that claims 1–43 of U.S. Patent No. 6,687,117 B2  
are *unpatentable*;

FURTHER ORDERED that Patent Owner's Second Motion to Amend is *denied* with respect to proposed substitute claims 44 and 45;  
and

FURTHER ORDERED that because this is a final decision, parties to the proceeding seeking judicial review of the decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

IPR2014-01361  
Patent 6,687,117 B2

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