

Looking at Patent Law: A Case Study Regarding the Patenting of a Plating Cell Invention Part II – From Office Actions to Issued U.S. Patents

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In this two-part article, we present a case study of an electrochemical plating cell invention. Part I of the case study¹ began with the initial concept as described in the Invention Disclosure and highlights key steps in the prosecution of the patent application by the U.S. Patent & Trademark Office (USPTO).

Recall from our previous article,² the prosecution history of a patent application is publically available in the file wrapper on the USPTO Patent Application Information Retrieval (PAIR) system and is the basis for this case study.³ We chose this invention as particularly illustrative of a diverse number of prosecution “events” an inventor may encounter during the prosecution of their inventions. Table I summarizes this journey from the initial documentation and filing of the invention, through various interactions with the USPTO, to the issue of four separate but related patents. Part I concluded with the publication of the patent application eighteen months after filing.

Restriction/Election Requirement Leading to Divisional Patent Applications

On December 1, 2006, the USPTO issued a requirement for “Restriction/Election” for the 10/804,841 patent application in accordance with US patent laws. The “Restriction/Election” basically says that the 10/804,841 patent application contains two or more inventions and the applicant must “elect” which invention to prosecute first:⁴

“If two or more independent and distinct inventions are claimed in one application, ... [the USPTO] may require the application to be restricted to one of the inventions.”

The restriction requirement separated the two inventions as those claims directed towards an apparatus and those claims directed towards a process. The “Restriction/Election” requirement stated:

Invention I: Directed towards a distinct apparatus as described in claims 1-20 and 41-43

Invention II: Directed towards a distinct process as described in claims 21-40 and 44-46

As described in the Manual of Patent Examination Practice (MPEP), two inventions are “distinct” if either of the following can be demonstrated:⁵

The process as claimed can be practiced by another materially different apparatus ..., or the apparatus as claimed can be used to practice another materially different process.

We “elected” to prosecute Invention I directed towards an apparatus. The “process claims” that were the subject of Invention II were canceled from the 10/804,841 patent application. We retained the option to prosecute the canceled “process claims” in a subsequently filed “Divisional” patent application provided it was filed prior to the issuance of the original 10/804,841 patent application. As will be described below, we exercised this option in April 2009. This “Divisional” process patent application would have the same “priority date” as that of the “elected” 10/804,841 apparatus patent application and if the 10/804,841 patent application issued as a patent, it cannot be used as a reference against the “Divisional” patent application.⁴

On March 23, 2007, the USPTO issued a “Non-Final Rejection” regarding the “elected” 10/804,841 apparatus patent application. The ’841 patent application was rejected based on anticipation⁶ and obviousness⁷ in light of the prior art. On June 25, 2007, we conducted a telephone interview with the patent examiner in order to better

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understand the basis for the rejections in lieu of the cited prior art. While telephone interviews can be helpful in clarifying the issue with the examiner, a caution regarding telephone interviews is that a

Table I. Timeline of steps in the subject case study.

Internal Invention Disclosure
Mar 19, 2004: Application filed
Jun 3, 2004: Notice to File Missing Parts
Jul 26, 2004: Submitted Information Disclosure Statement
Apr 4, 2005: Acknowledged federally sponsored research
Sep 25, 2005: Application published
Dec 1, 2006: USPTO required Restriction/Election
Elected Appl. 10/804,841: Apparatus
Elected Div. Appl. 12/431/030: Process
Mar 23, 2007: Non-Final Rejection
Jun 25, 2007: Examiner Phone Interview
Aug 10, 2007: Filed C-I-P Application
Sep 21, 2007: Final Rejection
Jan 22, 2008: Request for Continued Examination
Aug 10, 2007: Filed C-I-P Application
Apr 2, 2008: Non-Final Rejection
Sep 30, 2008: Submitted Affidavit
Jan 8, 2009: Final Rejection
Feb 20, 2009: Amended Claims
Mar 16, 2009: Notice of Allowance
Apr 28, 2009: Application Filed
May 21, 2009: Paid Issue Fee
Jun 30, 2009: 7,553,401 Patent Issued
Aug 20, 2009: Application Published
Sept 10, 2010: Non-Final Rejection & Restriction/Election
Elected C-I-P Appl. 11/836/903 Apparatus
Elected Div. Appl. 13/086,683: Process
Apr 14, 2011: Application Filed
Sep 11, 2011: Application Published
May 24, 2011: 7,947,161 Patent Issued
Jul 24, 2012: 8,226,804 Patent Issued
Dec 11, 2012: 8,329,006 Patent Issued

Legend

Patent Application 10/804,841: Apparatus
Continuation-in-Part Application 11/836,903: Apparatus
Divisional Patent Application from 10/804,841: 12/431/030: Process
Divisional Patent Application from C-I-P Application 11/836,903: 13/086,683: Process

verbal agreement by the examiner does not bind the examiner to the agreement.⁸ More specifically, all business with the USPTO should be conducted in writing:⁹

“The action of the Patent and Trademark Office will be based exclusively on the written record in the Office. No attention will be paid to any alleged oral promise, stipulation, or understanding in relation to which there is disagreement or doubt.”

During the phone call the examiner explained that there was no evidence that the claimed innovations in the apparatus made a difference in the performance of the cell in terms of uniformity, as compared to the prior art. Based on the examiner interview and cumulative information contained in the “Non-Final and Final” rejections of the ’841 patent application, we determined that a critical embodiment of our invention that could distinguish us from the prior art was the presence of the porous polymeric cloth (128) in combination with the shaped guides (136) shown in Fig. 1. We needed to perform additional experimental work to demonstrate that this embodiment did positively impact cell performance as compared to the prior art, so we ran tests with and without those embodiments. However, as will be shown below, we did not have time to run these experiments before we received the first Final Rejection of the 10/804,841 patent application. Therefore we had to submit a Request for Continued Examination and file an Affidavit containing the new experimental data.

Submission of Continuation-in-Part Applications Based on Ongoing Research Activities, and Types of Continuing Applications

Soon after the phone call with the examiner, we determined that we had invented a new embodiment related to plating of circuit boards containing through-holes, as a result of on-going plating cell research funded by the National Science Foundation. Based on this new embodiment, we elected to file a Continuation-in-Part patent application. Our “problem-solution” statement for this related invention was:

*The problem of ...
electroplating a work piece with small through-holes (z-axis interconnects) through which the plating electrolyte would normally flow too slowly resulting in a poorly plated through-hole
is solved by ...
generating a differential and alternating plating solution flow velocity on either side of the work piece such that the plating solution is pulled through the through hole, first one side and then the other, by the venturi effect and the combination of prior art elements such as work piece vibration and work piece oscillation leading to an improved plated through-hole.*

In Fig. 2, we illustrate the key elements of our new invention wherein the flow is sequentially alternated from either side of the circuit board creating a differential pressure causing a flow through the z-axis interconnect (through-hole). Since the alternating flow embodiment and the planar workpiece containing through-hole comprised new material compared to our original 10/804,841 patent application, our patent counsel drafted a new patent application and on August 10, 2007, we filed “Continuation-in-Part” (CIP) patent application 11/836,903. The ’903 CIP patent application is essentially the same as the 10/804,841 patent application with the exception of the addition of the new material and a new set of claims directed towards the new material. The ’903 CIP patent application claims the benefit of the filing date of ’841 patent application with respect to patent term, 20 years from filing. However, in terms of prior art, the new material receives the benefit of the filing date of the ’903 CIP

Request for Continued Examination of the Original Application with Affidavits

On September 21, 2007, the USPTO issued a “Final Rejection” regarding the original 10/804,841 patent application. On January 22, 2008, we submitted a “Request for Continued Examination” (RCE) regarding the ’841 patent application. A RCE essentially provides another “bite at the apple” after “Final Rejection” of a pending patent application.¹⁰

“If prosecution in an application is closed, an applicant may request continued examination ... by filing a submission and the fee ... prior to the earliest of:

1. *Payment of the issue fee ...*
2. *Abandonment of the application, or*
3. *The filing of a notice of appeal.”*

April 2, 2008, the USPTO issued a “Non-Final Rejection” regarding the 10/804,841 patent application. On September 30, 2008, we submitted an “Affidavit” regarding the ’841 patent application. There are generally three types of affidavits which may be submitted during the prosecution of a patent application:

1. Rule 130: To disqualify a disclosure as prior art:¹¹
“[B]y establishing that the disclosure was made by the inventor ... [or] by establishing that the subject matter disclosed had ... been publically disclosed by the inventor.”
2. Rule 131: To disqualify a commonly owned patent or published patent application as prior art:¹²
“[P]atent owner may submit an oath or declaration to ... establish invention of the subject matter of the rejected claim prior to the effective date of the reference or activity”
3. Rule 132: To provide evidence to traverse a rejection:¹³
“When any claim ... is rejected ... any evidence submitted to traverse the rejection ... on a basis not otherwise provided for must be by way of an oath or declaration under this section.”

Our “Affidavit” regarding the ’841 patent application was a “Rule 132 Affidavit” that presented additional experimental data demonstrating the positive impact on plating uniformity across an 18” × 24” panel with the subject combination. The experimental work supporting the “Rule 132 Affidavit” took approximately a year to complete and was conducted by an experienced research scientist who was not an inventor. In our opinion, this illustrates the importance of a team spanning numerous skill sets in order to move technology from concept to patentable invention.

On January 8, 2009, the USPTO issued a “Final Rejection” regarding the 10/804,841 patent application. The Final Rejection was based on that fact that the original claims were not commensurate in scope with the new evidence contained in the Rule 132 Affidavit.

The claims were amended to explicitly point out the subject combination of the porous polymeric cloth (128) and the shaped guides (136) (in Fig. 1) to redefine the boundaries of the “property” covered by the subject invention.¹⁴ Specifically, as described in independent claim 1:¹⁵

“[A] vertical solution flow that is uniform, parallel to and between the major surface of the workpiece and the parallel porous cloth of the anode chamber.”

On March 16, 2009, the USPTO issued a “Notice of Allowance” regarding the 10/804,841 patent application. We paid the issue fee on May 21, 2009 and the patent issued as US patent number 7,553,401 on June 30, 2009.

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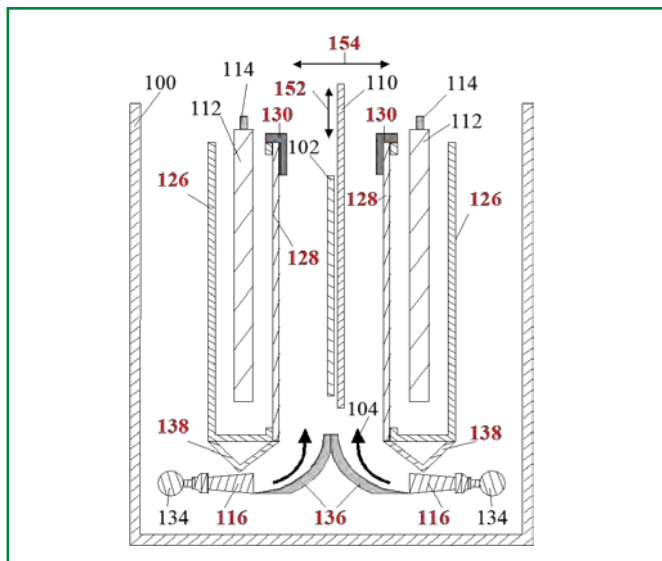


FIG. 1. Illustration of the subject plating cell invention.

patent application, not the filing date of the ’841 patent application. The ’903 patent application was published approximately seven months later on February 14, 2008. Note, the publication is based on eighteen months from the earliest priority date, which for the case of the ’903 CIP is the filing date of the ’841 patent application. The seven months from filing of the CIP was the time the USPTO needed to get the ’903 patent application in a publishable format. On September 30, 2010, the USPTO issued a “Non-Final Rejection” which consisted of a “Restriction/Election” requirement for the ’903 CIP patent application for the same reasons as denoted in the original 10/804,841 patent application. Therefore, as will be shown later, we elected to restrict the ’903 CIP application to an apparatus patent application, and also file a Divisional process patent application.

Since the new material in the CIP was federally funded, any patents issuing from the 11/836,903 CIP patent application will have the government rights acknowledgement:

“This application was developed under National Science Foundation Small Business Innovative Research Grant No. IIP-0944707.”

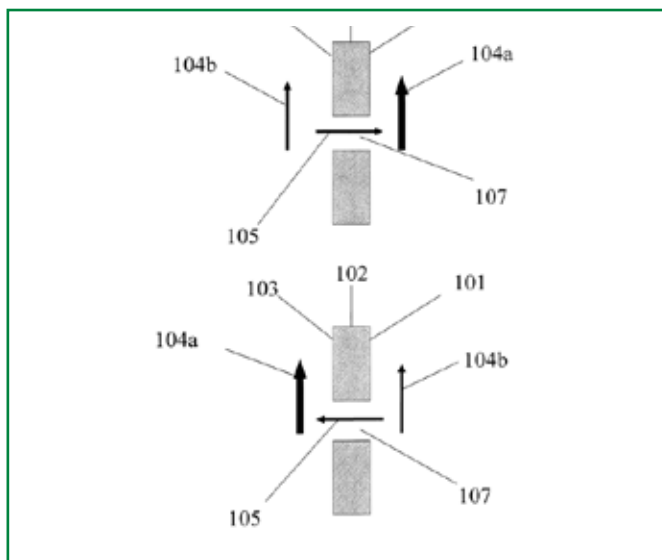


FIG. 2. Illustration of the subject plating cell invention with alternating electrolyte flow.

Table II. Types of continuing patent applications.

Type	Inventor Overlap	Disclosure in Parent	Claimed in Parent	Reason
Divisional	Yes — claim defined	Yes	Yes	Restriction requirement
Continuing	At least one common inventor	Yes	No	Applicant capture unclaimed embodiments
Continuation in Part	At least one common inventor	No	No	Applicant claim improvements after parent filing

Submission of Divisional Applications Based on Restriction/Election

On April 28, 2009, we filed a “Divisional” patent application 12/431,030 claiming priority to the 10/804,841 patent application. Note, a “Divisional” patent application must be filed **prior** to the issue date of the parent 10/804,841 patent application. The 12/431,030 “Divisional” patent application was published August 20, 2009, approximately four months after its filing date. Note, the publication is based on eighteen months from the earliest priority date, which for the case of this “Divisional” is the filing date of the 10/804,841 patent application. The four months from filing of the “Divisional” was the time the USPTO needed to get the 12/431,030 patent application in a publishable format.

Recall that the 10/804,841 patent application issued as US patent 7,553,401 on June 30, 2009, approximately two months **after** the 12/431,030 divisional patent application was filed.

In a general sense, once we overcame the objections of the USPTO examiner with the added supporting data in the “Rule 132 Affidavit”, then the CIP and both “Divisional” patent applications issued with similar arguments. As the primary technical argument regarding the original 10/804,841 patent application has been summarized above, we simply provide the timeline related to these continuing patent applications herein.

On April 14, 2011, we filed a “Divisional” patent application 13/086,683 claiming priority to CIP patent application 11/836,903. Note, a “Divisional” patent application must be filed **prior** to the issue date of the parent 11/836,903 patent application. The 13/086,683 “Divisional” patent application was published September 11, 2011, approximately five months after its filing date. Note, the publication is based on eighteen months from the earliest priority date, which for the case of this “Divisional” is the filing date of the 11/836,903 patent application. The five months from filing of the “Divisional” was the time the USPTO needed to get the 13/086,683 patent application in a publishable format.

The 11/836,903 patent application which is a CIP of US patent number 7,553,401, issued as US patent number 7,947,161 on May 24, 2011. The issue date is approximately a month **after** the 13/086,683 Divisional patent application was filed.

The 13/086,683 patent application which is a Divisional of US patent number 7,947,161, issued as US patent number 8,226,804 on July 24, 2012.

The 12/431,030 patent application which is a Divisional of US patent number 7,553,401, issued as US patent number 8,329,006 on December 11, 2012.

Concluding Remarks

In this installment of our “Looking at Patent Law” series, we presented a case study of the conception and patenting of an electrochemical plating cell invention. The case study begins with an “Invention Disclosure” (ID) including the basic items required therein including 1) inventors; 2) title; 3) references; 4) funding source; 5) public disclosure if any; 6) problem-solution statement; and 7) detailed description. We particularly illustrated the value of the problem-solution statement with regards to drafting the patent drawings, detailed description and claims of the invention. We provided examples of patent drawings and their effectiveness in distinguishing the subject invention vis-à-vis the prior art. We described the patent application submission requirements to establish a filing date and the additional submission requirements to maintain the filing date. We introduced the requirement for an “Information Disclosure Statement” (IDS) and the associated “Duty of Candor” in interacting with the USPTO. We touched on the requirement to acknowledge federal funding sources. We discussed the eighteen month publication requirement of patent applications. We illustrated the “Restriction/Election” requirement and the resulting “Divisional” patent applications. We described how on-going research activities can lead to “Continuation-in-Part” (CIP) patent applications. In Table II, we present a description of the types of “continuing” patent applications. We introduced the use of a “Request for Continued Examination” (RCE) and the types of “Affidavits” relevant to prosecution of a patent application. We particularly emphasized the “Rule 132 Affidavit” used in the subject patent application. Finally we provided a timeline (Table III) for the filing and issuing of the patents based on our initial “Invention Disclosure.” Our objective is that electrochemical and solid state scientists, engineers, and technologists are better prepared to interact with their patent counsel regarding their inventions. ■

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About the Authors




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Table III. Timeline for the filing and issuing of patents based on the subject plating cell invention.

Patent Appl. No.	Filing Date	Patent No.	Issue Date	Type
10/804,841	March 19, 2004	7,553,401	June 30, 2009	
11/836,903	August 10, 2007	7,947,161	May 24, 2011	C-I-P (7,553,401)
12/431,030	April 28, 2009	8,329,006	December 11, 2012	Divisional (7,553,401)
13/086,683	April 14, 2011	8,226,804	July 24, 2012	Divisional (7,947,161)


Taylor is an inventor on 40 patents. Taylor is admitted to practice before the United States Patent & Trademark Office (USPTO) in patent cases as a patent agent (Registration No. 53,676) and is a member of the American Intellectual Property Law Association (AIPLA). Taylor has been a member of ECS for 38 years and is a fellow of ECS. He may be reached at jenningstaylor@faradaytechnology.com.

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