

Reproduced with permission from BNA's Patent, Trademark & Copyright Journal, 88 PTCJ 502, 6/13/14. Copyright © 2014 by The Bureau of National Affairs, Inc. (800-372-1033) <http://www.bna.com>

PATENTS

The author discusses the various challenges that innovators may face when trying to seek patents for materials used in 3D printing or additive manufacturing.

3D Printing, Materials Development, and IP: Protecting What's in the Printer



By **BRYAN J. VOGEL**

The many different kinds of machines that allow 3D printing or additive manufacturing—including new, more affordable consumer products—have captured the attention of business, the media, Wall Street, and the IP legal community. Though not generating quite the same buzz, 3D printing has also inspired multiple advancements in materials development. From nanoparticles to human tissue and other complex chemical components, inventors are reimagining what's possible through inventions involving the materials that go into the 3D printers. For the most part, the patent system should protect those inventions that meet the

Bryan J. Vogel is a trial lawyer and partner in the New York office of Robins, Kaplan, Miller & Ciresi L.L.P. He is a registered patent attorney with a background in chemical engineering. He helps clients in litigation and arbitration and provides legal counsel in a broad range of industries, including 3D printing, life sciences, emerging technologies, electronics, and media and entertainment.

Patent Act's requirements for patentability. But some patenting rules may end up surprising—and challenging—those seeking patents for materials used in 3D printing.

3D Printing's Changing Material Inputs. Currently, plastics dominate the commercial 3D printing market. Some industry experts believe that the limited availability of other types of materials is holding back greater use of 3D printing. But research labs around the world have begun experimenting with everything from living human cells to bacteria, microscopic electrodes, and semiconductors. Taking advantage of 3D printing techniques, university labs have used some of these newly invented materials to print a bionic ear comprised of living tissues and electronics (Princeton/John Hopkins),¹ create items encoded with self-assembly capabilities (MIT),² and produce a lithium-ion microbattery the size of a grain of sand (Harvard).³

Researchers at Harvard have also invented a single fabrication process that takes place at room temperature using a multiple material output printer where each “nozzle” is loaded with different cell tissue and matrix materials. The intention is to print vascularized, functional organs.⁴ Similarly, various publicly traded companies hold patents and/or have plans to enter the

¹ Manu Mannoer, Ziwen Jiang, Teena James, Yong Lin Kong, Karen Malatesta, Winston Soboyejo, Naveen Verma, David Gracias, and Michael McAlpine, *3D Printed Bionic Ears*, *Nano Letters* (2013). <http://scholar.princeton.edu/manus/files/M.S.%2520Mannoer-Nanoletters-2013.pdf>.

² See generally MIT Self-Assembly <http://www.selfassemblylab.net/index.php>.

³ Ke Sun, Teng-Sing Wei, Bok Yeop Ahn, Jung Yoon Seo, Shen J. Dillon, and Jennifer A. Lewis, *3D Printing of Interdigitated Li-Ion Microbattery Architectures*, 25 *Advanced Materials* 33, September 6, 2013 at 4539.

market using proprietary biotech materials and 3D printing.⁵

In addition to producing wonder, the inventive concepts contained within these and similar material advances connected to the 3D printing world may also generate unexpected patenting problems for those who seek patent protection for their discoveries.

3D Printing Materials Patent Problem: Too New. To survive a validity challenge, a patent must contain a description of the invention sufficient to allow a “person of ordinary skill in the art” to practice the claimed invention. As inventors seek patent rights to cover advancements in 3D printing materials, the very newness of their inventions may make it difficult to create an adequate description that meets that requirement. The problem? Prior art and other background information that provides guidance on the sufficiency of the language of the specification may simply not exist.

The validity of an invention involving a microbial host cell in a biosynthetic pathway to produce a fuel additive serves an illustration. In *Butamax Advanced Biofuels LLC v. Gevo, Inc.*, the patent holder’s claimed invention relied on the use of a recombinant yeast microorganism comprised of “inactivated genes” that disabled a competing synthetic pathway.⁶ The district court found that patent claims involving the inactivated genes were invalid because the patent specification did not sufficiently describe how to inactivate the genes to achieve the desired effect. The district court said that while the specification “may be interpreted as identifying both the [] problem and solution, it does not even begin to describe how to put into practice the solution.”⁷

On appeal, the Federal Circuit found that material questions of fact existed regarding the validity issue—but just barely. In addition to arguing the specifications taught the required inactivation, the patent holder also claimed that “it was well known in the art how to deactivate the genes that express the [competing] pathway.”⁸ The appeals court found, however, that the expert testimony upon which the patent holder relied “merely agreed that, in light of the specification, the deactivation described would have been desirable.”⁹ But, because one of the prior art references used did describe the deactivation process—though it seemed to teach away from the outcome claimed in the patent—the appeals court concluded the district court had erred when it granted summary judgment.

Butamax exemplifies the problem innovative new materials used in 3D printing technologies may face when seeking to adequately describe and teach an invention’s claims. As advancements multiply, those whose innovations push the bounds of what is known will need to make sure the four corners of their patent specification contains enough information—a daunting

task—or clear reference to intended prior art to make their patent claims valid.¹⁰

3D Printing Materials Patent Problem: Not New Enough.

The new materials under development for use in 3D printing may seem like an unlikely target for a validity attack based on anticipation. Yet materials advancements can be vulnerable to anticipation defenses based on the doctrine of inherency.

A single prior art reference can be found to anticipate a patent claim without explicitly disclosing each and every feature of the claimed invention if the missing feature is an “inherent” part of that anticipating reference.¹¹ As a result, “the discovery of a previously unappreciated property of a prior art composition, or of a scientific explanation for the prior art’s functioning, does not render the old composition patentably new to the discoverer.”¹² Further, the claiming of a new use, new function, or unknown property which is inherently present in the prior art does not necessarily make the claim patentable.¹³

And, there is no requirement that a person of ordinary skill in the art would have recognized the inherent disclosure at the time of invention, but only that the subject matter is in fact inherent in the prior art reference.¹⁴ As one court put it:

Humans lit fires for thousands of years before realizing that oxygen is necessary to create and maintain a flame. The first person to discover the necessity of oxygen certainly could not have obtained a valid patent claim for ‘a method of making a fire by lighting a flame in the presence of oxygen.’ Even if prior art on lighting fires did not disclose the importance of oxygen and one of ordinary skill in the art did not know about the importance of oxygen, understanding this law of nature would not give the discoverer a right to exclude others from practicing the prior art of making fires.¹⁵

For the materials advancements in 3D printing, inherency’s limitations may mean that advancements that allow for temperature stabilization, molecular reformation, necessary pathway opening, inactivation or accelerations rest on potentially inherent aspects of prior art—even if that inherent characteristic was not explicitly considered at the time of discovery.

Inherency does, however, have its limitations. When grappling with the application of the inherency doctrine, the Federal Circuit has held that a finding of inherency requires recognition that the undisclosed feature be *necessarily* present in the prior art reference.¹⁶

¹⁰ Being “too new” may also complicate damage assessment in future infringement litigation. See, e.g., Jake Holdreith, Christine Yun Sauer, and Ryan Schultz, *Using Regression Models To Isolate The Value Of A Patented Feature*, Intellectual Asset Management, at 20 (May/June 2013).

¹¹ *Schering Corp. v. Geneva Pharms., Inc.*, 339 F.3d 1373, 68 U.S.P.Q.2d 1760 (Fed. Cir. 2003) (66 PTCJ 428, 8/8/03).

¹² *Atlas Powder Co. v. Ireco Inc.*, 190 F.3d 1342, 1347, 51 U.S.P.Q.2d 1943, 1947 (Fed. Cir. 1999).

¹³ *In re Best*, 562 F.2d 1252, (62 PTCJ 519, 10/5/01) 195 U.S.P.Q. 430 (CCPA 1977).

¹⁴ *Schering*, 339 F.3d at 1377.

¹⁵ *EMI Group N. Am., Inc. v. Cypress Semiconductor Corp.*, 268 F.3d 1342, 60 U.S.P.Q.2d 1423 (Fed. Cir. 2001) (62 PTCJ 519, 10/5/01).

¹⁶ See, e.g., *Rexnord Indus. v. Kappos*, 705 F.3d 1347, 2013 BL 19017, 105 U.S.P.Q.2d 1727, (Fed. Cir. 2013) (85 PTCJ 449, 2/1/13); *Toro Co. v. Deere & Co.*, 355 F.3d 1313, 69 U.S.P.Q.2d 1584 (Fed. Cir. 2004) (67 PTCJ 259, 1/30/04).

⁴ David Rotman, *Microscale 3-D Printing*. MIT Technology News (Spring 2014) <http://www.technologyreview.com/lists/technologies/2014/>

⁵ See, e.g., Organovo, (bioprinting technology enables the creation of 3D tissues). <http://www.organovo.com/>

⁶ *Butamax Advanced Biofuels LLC v. Gevo, Inc.*, 746 F.3d 1302, 2014 BL 41635, 109 U.S.P.Q.2d 1701 (Fed. Cir. 2014) (87 PTCJ 876, 2/21/14).

⁷ *Id.*

⁸ *Id.*

⁹ *Id.*

When it comes to 3D printing materials facing an assertion of anticipation based on inherency, what's "necessarily present" will depend, as always, on the invention and claims involved.

3D Printing Materials Patent Problem: Product-By-Process. As 3D printing technologies evolve, processes that use different kinds of materials in a single fabrication may encounter the difficulties that surround a product-by-process invention. Product-by-process claims "developed in response to the need to enable an applicant to claim an otherwise patentable product that resists definition by other than the process by which it was made."¹⁷ These types of claims may have interesting implications in the context of 3D printing due to the use of 3D printing for making old products.

It has long been the case that an old product is not patentable even if it is made by a new process. In determining validity of a product-by-process claim, the focus is on the product and not on the process of making it. In that sense, product-by-process claims are unique in the way they are treated for validity versus infringement purposes. As the Federal Circuit explained: "[E]ven though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art,

¹⁷ *In re Thorpe*, 777 F.2d 695, 698, 227 U.S.P.Q. 964 (Fed. Cir. 1985).

the claim is unpatentable even though the prior product was made by a different process."¹⁸

After struggling with the issue in earlier decisions, the Federal Circuit concluded in *Abbot Labs v. Sandoz, Inc.* that process steps in product-by-process claims serve as limitations in determining infringement and that such claims are not infringed by the same product made by a different process.¹⁹ That means product-by-process claims are currently treated as product claims when it comes to validity, but that infringement is limited to those instances where the accused product is made by the same process.

If product-by-process patenting is the only way to protect a 3D printed product, inventors will want to consider the novelty of the product and material themselves, as well as the structure implied by the process steps, especially where the product or material can only be defined by the process steps by which the product or material is made, or where the manufacturing process steps would be expected to impart distinctive structural characteristics to the final product or material.

Conclusion. As with any disruptive technology, 3D printing will challenge the patent system's ability to describe and define the inventions being practiced. As scientific advancements allow achievements at various levels, the materials used within the 3D printing industry will also challenge imaginations, inventors and attorneys as they seek to protect and defend these inventions.

¹⁸ *Id.*; see also, e.g., *Amgen Inc. v. F. Hoffman-La Roche Ltd.*, 580 F.3d 1340, 1370 n.14, 92 U.S.P.Q.2d 1289 (Fed. Cir. 2009) (78 PTCJ 645, 9/25/09).

¹⁹ *Abbot Labs v. Sandoz, Inc.*, 566 F.3d 1282, 1292, 90 U.S.P.Q.2d 1769 (Fed. Cir. 2009) (78 PTCJ 106, 5/29/09).