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PATENTING PHYSIBLES: A FRESH PERSPECTIVE FOR CLAIMING 3D-PRINTABLE PRODUCTS

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TABLE OF CONTENTS

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The views expressed in this article, as well as any errors, are solely my own and should not be attributed to The Webb Law Firm or any of its clients. Questions and comments are welcome to dbrean@webblaw.com.

INTRODUCTION

3D printing is an emerging technology that is moving fast from the workshop into the home. No longer are the rapid prototyping and additive manufacturing capabilities of 3D printers reserved for engineers and researchers. Today consumers, hobbyists, and technophiles can download a computer-aided design or CAD file (a digital representation of a physical product) and additively "print" a three-dimensional product or component as simply as one can print words to a page.[1] In 2012, these digital printable items were coined as "physibles" by the notorious online piracy website The Pirate Bay.[2]

This technology has wide-ranging and profound effects on intellectual property rights, particularly patents. Centuries of traditional manufacturing processes and commercial infrastructure have shaped patent law under the assumption that physical goods are traded in physical form. For example, a factory infringes a patent by "making" the patented product, a retailer infringes a patent by "selling" the patented product, and a purchaser of a product infringes a patent by "using" the patented product.[3] Because these various acts each constitute direct infringement, patent owners are generally able to enforce their patents against different entities to extinguish any harmful infringement at the source.

Sometimes it can be difficult or impractical to target a direct infringer and extinguish infringement. Suppose a patented machine is only partially assembled (and thus noninfringing)[4] but is sold across the country to individuals

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1. For an overview of 3D printing technology, *see* Daniel H. Brean, *Asserting Patents to Combat Infringement Via 3D Printing: It's No "Use,"* 23 FORDHAM INTELL. PROP. MEDIA & ENT. L.J. 771 *2013).

2. *Evolution: New Category*, The Pirate Bay (January 23, 2012), http://thepiratebay.org/blog/203 ("We believe that the next step in copying will be made from digital form into physical form. It will be physical objects. Or as we decided to call them: Physibles. Data objects that are able (and feasible) to become physical. We believe that things like three dimensional printers, scanners, and such are just the first step.").

3. 35 U.S.C. § 271(a) ("[W]hoever without authority makes, uses, offers to sell, or sells any patented invention, within the United States or imports into the United States any patented invention during the term of the patent therefor, infringes the patent.").

4. Becton Dickinson & Co. v. C.R. Bard, Inc., 922 F.2d 792, 796 (Fed. Cir. 1990) ("To establish infringement of a patent, every limitation set forth in a claim must be found in an accused product or process exactly or by a substantial

who later assemble the entire machine (and thus infringe).[5] One could sue each individual customer for "making" or "using" the device,[6] but it is obviously more efficient and effective to somehow stop the manufacture of the partially-assembled components before they are distributed. Situations like this gave rise to indirect infringement claims—causes of action based on providing a component of a patented product or actively encouraging others to infringe.[7] As the Supreme Court has explained, these indirect infringement doctrines essentially "provide for the protection of patent rights where enforcement against direct infringers is impracticable."[8]

There is a considerable drawback to having to rely on indirect theories of infringement, however. "Direct infringement has long been understood to require no more than the unauthorized use of a patented invention" by performing one of the enumerated activities under Section 271(a).[9] In other words, direct infringement is a strict liability tort. Indirect infringement, by contrast, requires proof of a culpable intent—namely, the intent to cause infringement, which includes both knowledge of the patent and knowledge that the third party direct infringer's conduct was, in fact, infringing.[10] In practice, this is quite hard to prove, and is generally proven only with circumstantial evidence. For these reasons, patent owners almost universally prefer not to rely on indirect

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equivalent.").

5. 35 U.S.C. § 271(a) (providing that "making" an invention constitutes infringement);Bauer & Cie v. O'Donnell, 229 U.S. 1, 10 (1913) ("The right to make can scarcely be made plainer by definition, and embraces the construction of the thing invented.").

6. 35 U.S.C. § 271(a) ("[W]hoever without authority makes, uses, offers to sell, or sells any patented invention, within the United States or imports into the United States any patented invention during the term of the patent therefor, infringes the patent.").

7. 35 U.S.C. § 271(b) ("Whoever actively induces infringement of a patent shall be liable as an infringer."); 35 U.S.C. § 271(c) ("Whoever offers to sell or sells within the United States or imports into the United States a component of a patented machine . . . constituting a material part of the invention, knowing the same to be especially made or especially adapted for use in an infringement of such patent . . . shall be liable as a contributory infringer.").

8. Aro Mfg. Co. v. Convertible Top Replacement Co., 377 U.S. 476, 511 (1964) (quoting H.R. 5988, 80th Cong., 2d Sess. (1948); H.R. 3866, 81st Cong., 1st Sess. (1949))

9. Global-Tech Appliances, Inc. v. SEB S.A., 131 S. Ct. 2060, 2065 n.2 (2011).

10. Global-Tech Appliances, Inc. v. SEB S.A., 131 S. Ct. 2060, 2068 (2011); Aro Mfg. Co. v. Convertible Top Replacement Co., 377 U.S. 476, 488 (1964).

infringement theories unless obtaining relief for direct infringement is impracticable.

Between direct and indirect infringement, patent law attempts to promote efficiency in enforcement by minimizing the number of parties that must be sued to obtain meaningful relief. This reflects sound policy that avoids waste of private and public resources. And, of course, the exclusive right of a patent is of little value without a meaningful remedy for infringement.

In a world of in-home 3D printing, it is the printer of the 3D product, not the provider or seller of the digital file from which the product is printed, who is directly infringing any patents directed to the product. Specifically, the person who downloads a CAD file and prints a product on a home 3D printer is the person "making" the product for purposes of direct infringement.[11] The maker or seller of the CAD file, by contrast, is not making anything physical, nor are they using,[12] selling,[13] or offering to sell[14] the patented physical product. Thus, they are not direct infringers under Section 271(a).

The fact that the customers are the manufacturers in this scenario reveals how fundamentally in-home 3D printing departs from longstanding commercial traditions. In turn, the fact that source of the infringement—the effective provider of the entire patented invention—cannot be targeted as a direct infringer reveals that the law has not yet caught up to the technological reality that physical goods can now be bought and sold digitally.[15]

In theory, indirect infringement claims might still be able

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11. While Section 271 does not define "make" or "making," the Supreme Court has stated that "[t]he right to make can scarcely be made plainer by definition, and embraces the construction of the thing invented." Bauer & Cie v. O'Donnell, 229 U.S. 1, 10 (1913).

12. "The ordinary meaning of 'use' is to 'put into action or service.'" NTP, Inc. v. Research in Motion, Ltd., 418 F.3d 1282, 1317 (Fed. Cir. 2005).

13. "[I]n order for there to have been a sale . . . the entire apparatus must have been constructed and ready for use." Ecodyne Corp. v. Croll-Reynolds Eng'g Co., 491 F. Supp. 194, 197 (D. Conn. 1979); *accord* Lang v. Pacific Marine & Supply Co., 895 F.2d 761, 765 (Fed. Cir. 1990).

14. "[An] offer [to sell] must be for a potentially infringing article," i.e., a tangible object. Transocean Offshore Deepwater Drilling, Inc. v. Maersk Contractors, 617 F.3d 1296, 1309 (Fed. Cir. 2010).

15. For a more detailed discussion of why the provider of a CAD file is not directly infringing a product patent under 35 U.S.C. §271(a), *see* Brean, *supra* note 1, at 783-803.

to reach the makers and sellers of CAD files. But contributory infringement, which requires that the item being accused be a "component" of the infringing product,[16] is not viable because CAD files are akin to software in the abstract, which the Supreme Court recently held cannot be considered a "component" of a computer.[17] Like software, a CAD file"might be compared to a blueprint (or anything containing design information, [e.g., a schematic, template, or prototype])," but is not itself a "component" combinable into a device.[18] This leaves only active inducement of infringement, which, while technically viable, is undesirable because it still has the considerable hurdle of proving the requisite scienter discussed above.[19]

What remains is a gap in patent law that should be filled with a way that digital printable products may be patented per se.[20] Anything less would go against the recognized "adaptability of the patent system to new technologies."[21] Now that physical goods can be and are designed, developed, bought, and sold in digital form, it would disincentivize

16. 35 U.S.C. § 271(c).

17. Microsoft Corp. v. AT&T Corp., 550 U.S. 437, 449-50 (2007).

18. *Id.*

19. Global-Tech Appliances, Inc. v. SEB S.A., 131 S. Ct. 2060, 2068 (2011).

20. *See* Brean, *supra* note 1, at 804 ("This state of the law leaves patentees virtually helpless to combat a large class of infringement of their product claims. If patent law is to continue to encourage innovation, however, Congress or the courts must eventually close this gap."). Professors Timothy Holbrook and Lucas Osborn take a different view, arguing that existing law can close this gap to a large degree. *Digital Patent Infringement in an Era of 3D Printing*, 48 UC DAVIS L. REV. 1319 (2015). However, the approach taken by Holbrook and Osborn is largely policy driven, and parses the various acts of direct infringement under Section 271(a) such that some, but not all, would be able to reach CAD files. Specifically, they suggest that a "sale" of or "offer[] to sell" a CAD file should be actionable because such acts appropriate the "economic value" of the patented invention. *Id.* at 1356-57. But they conclude that "making" a CAD file should not be actionable because it has a less direct economic effect on the patent owner, and can lead to undesirable liability for incidental infringers. *Id.* at 1385. Such an approach, while very persuasively presented, lacks any statutory support for distinguishing whether a CAD file *per se* may be protected based on the act accused of infringing, and would likely require an act of Congress to be implemented.

21. *In re* Schrader, 22 F.3d 290, 297 (Fed. Cir. 1994) (Newman, J., dissenting) ("The nation has benefitted from the adaptability of the patent system to new technologies, as was recognized in *Diamond v. Chakrabarty*, 447 U.S. 303, 316, 206 USPQ 193, 200, 65 L. Ed. 2d 144, 100 S. Ct. 2204 (1980) ("Mr. Justice Douglas reminded that the inventions most benefiting mankind are those which 'push back the frontiers of chemistry, physics and the like.'")").

designers and developers of 3D-printable products from innovating in their spaces if they were placed at a legal disadvantage from their more traditional manufacturing counterparts. The patent system must, equally for all kinds of innovators, "promote the Progress of Science and useful Arts."[22]

Part I of this Article examines whether *Beauregard* claims, which are a well-settled form of patent protection for digitally stored instructions, can provide adequate protection for 3D printable objects. Although the use of *Beauregard* claims is found to be permissible for covering instructions for printing 3D objects, the legal and technological limitations of using *Beauregard* claims to protect CAD files suggests that the improved enforceability of patent rights under this approach is marginal. Part II of this Article explores the feasibility of creating a new *Beauregard*-like claim format to protect CAD files per se.

I. CAN *BEAUREGARD* CLAIMS PROTECT PHYSIBLES?

This Part provides an overview of *Beauregard* claims and questions whether such a claiming format can provide additional patent protection for 3D-printable objects that will adequately bridge the current gap in patent rights for such inventions. Although the short answer is that, yes, *Beauregard* claims can in theory be used to gain broader patent scope, the enhanced scope is modest.

A. An Overview of Beauregard *Claims*

In *In re Beauregard*, the patent applicant drafted claims directed to a tangible storage medium (e.g., a floppy disk) having a computer program stored on the medium.[23] The Patent Office rejected the claims based on the printed matter doctrine,[24] which prohibits patenting printed material where there is no "new and unobvious functional relationship between the printed matter [i.e., the software code] and the substrate [i.e., the disk]."[25] While the applicant's appeal was pending, the Patent Office changed its position and held that

22. U.S. Const. art. I, § 8, cl. 8.
23. In re Beauregard, 53 F.3d 1583, 1584 (Fed. Cir. 1995).
24. *Id.* at 1584.
25. In re Gulack, 703 F.2d 1381, 1386 (Fed. Cir. 1983).

"computer programs embodied in a tangible medium, such as floppy diskettes, are patentable subject matter under 35 U.S.C. § 101 and must be examined under 35 U.S.C. §§ 102 and 103."[26] Because there was no longer a case or controversy, the appeal was dismissed for lack of subject matter jurisdiction.[27]

Following *Beauregard*, even though the Federal Circuit did not affirmatively endorse the Patent Office's shift in policy, so-called *Beauregard* claims were widely adopted by patent practitioners and remain acceptable for use in patents. As some commentators explained,

[s]uch claims take the general form: "a computer usable medium having computer readable code" or "a computer readable medium storing a computer program." The distinguishing feature of this type of claim is that it is for an algorithm (the "program code") fixed in a well-known tangible form (the "computer usable medium"). Yet the novelty usually lies in the code, not the medium. Large numbers of patent claims have been issued in this form, and many more such patent applications are pending.[28]

Notably, in *Beauregard* there was apparently nothing preventing the applicant from seeking protection on the software method itself. But, as Donald Chisum observes, the purpose of seeking distinct protection on the software storage medium "seemed to be to convert a potential claim for *indirect* infringement of the method claim (active inducement of infringement by others through instruction) into an easier to prove claim for *direct* infringement (sales of a patented medium or 'kit' with the instructions)."[29] Patenting the method would make the user of the software the direct infringer, but patenting a disk containing the software[30] would make the seller of the software the direct infringer.[31]

The *Beauregard* application was owned by IBM, a key

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26. *Beauregard*, 53 F.3d at 1584.

27. *Id.*

28. Andrei Iancu & Jeremiah Helm, *Code on Disks and Hat Tricks—Is Computer Software on a Medium Really Patentable?,* 90 J. Pat. & Trademark Off. Soc'y 97, 99 (2008).

29. 1 Donald S. Chisum, CHISUM ON PATENTS § 1.02[4][d] (2014).

30. When *Beauregard* was decided in 1995, nearly all software was sold on disks because broadband Internet was not yet widely available to consumers to download large software files.

31. 35 U.S.C. § 271(a) (proscribing that use and sale of a patented method or object, respectively, constitutes direct infringement).

player in the electronics and software industry, and was known to be a "test case."[32] "In *Beauregard*, IBM sought to bring before the Federal Circuit its idea that algorithms (or software inventions, if you prefer) *should* be claimable in essentially this format."[33] The rule of law that IBM sought and the USPTO ultimately adopted[34] was plainly driven by the idea that, from a policy standpoint, software on disk should be patentable because otherwise there was no good way to protect against unauthorized distribution of software per se.[35] As IBM argued, "[t]he claim to the floppy disk was needed to facilitate patent infringement suits against contributory infringers and inducers of infringement of the allowed apparatus and process claims. There was no devious purpose to reach anything wider or to obtain a broader monopoly than the legitimate monopoly of the apparatus and process claims."[36]

Facially, because 3D-printable objects are made by instructing a 3D printer, there is no reason that such instructions could not be protected by *Beauregard*-style claims, for example:

A computer readable medium storing computer readable instructions which, when acted upon by a 3D printer, cause the 3D printer to print a widget comprising:

element A;

element B; and

element C disposed between elements A and B.

This form of claiming, because it does not claim the method of printing per se but the storage medium containing the printing instructions, avoids some of the enforceability issues noted above. Although one could presumably draft acceptable claims of this fashion, the following sub-parts address important legal and technological limitations on the efficacy of such an approach.

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32. Richard H. Stern, *An Attempt to Rationalize Floppy Disk Claims*, 17 J. Marshall J. Computer & Info. L. 183, 195 (1998).

33. *Id.* (emphasis added).

34. *Inacu & Helm*, *supra* note 28, at 99; *see also* Manual of Patent Examining Procedure, at § 211.05 III (9th ed. 2014) (describing ability to claim invention as "a computer-readable medium containing certain programming")

35. *Stern*, *supra* note 32, at 195.

36. *Id* at n. 64.

B. Legal Limitations of Using Beauregard *Claims for 3D-Printable Files*

An important limitation on *Beauregard* claims is the fact that the mere recitation of a "computer readable medium" will not automatically avoid a challenge that the claimed invention is too abstract to constitute patent-eligible subject matter under 35 U.S.C. § 101.[37] This is because "[r]egardless of what statutory category ('process, machine, manufacture, or composition of matter,' 35 U.S.C. § 101) a claim's language is crafted to literally invoke, we look to the underlying invention for patent-eligibility purposes."[38]

Beauregard claims involving computer-implemented business methods, methods of processing data, etc. are increasingly scrutinized for abstractness in the wake of recent Supreme Court precedent expounding upon the abstractness doctrine.[39] To this author's knowledge, no successful abstractness challenge has ever been made to a method of manufacturing a particular product. Indeed, such a challenge would surely fail because a manner of constructing a specifically-claimed object is undoubtedly limited to a narrow physical application of manufacturing abstractions.[40]

The more pronounced limitations of *Beauregard* claims (for purposes of this Article) arise from the fact that the claimed subject matter is confined to a tangible storage medium. Only certain actions constitute direct infringement

37. Alice Corp. Pty. Ltd. v. CLS Bank Int'l, 134 S. Ct. 2347, 2353–54 (2014) (explaining that abstract ideas are not eligible for patent protection).

38. CyberSource Corp. v. Retail Decisions, Inc., 654 F.3d 1366, 1374 (Fed. Cir. 2011); *see also Alice*, 134 S. Ct. at 2360 (holding system claims patent-ineligible just like method claims because "the system claims are no different from the method claims in substance. The method claims recite the abstract idea implemented on a generic computer; the system claims recite a handful of generic computer components configured to implement the same idea. This Court has long 'warn[ed] . . . against' interpreting § 101 in ways that make patent eligibility 'depend simply on the draftsman's art.'") (citations and internal quotation marks omitted).

39. *See, e.g., CyberSource*, 654 F.3d at 1375 (deeming *Beauregard* claim ineligible and discussing *Bilski v. Doll*, 129 S. Ct. 2735 (2009)); *Alice*, 134 S. Ct. at 2360 (holding that "[p]etitioner's claims to a computer system and a computer-readable medium fail for substantially the same reasons. Petitioner conceded below that its media claims rise or fall with its method claims.")

40. *See, e.g.,* Diamond v. Diehr, 450 U.S. 175, 184 (1981) (deeming "process for molding precision synthetic rubber products" patent eligible, and explaining that "[i]ndustrial processes such as this are the types which have historically been eligible to receive the protection of our patent laws").

of such claims. Unlike dealing in actual physical disks, "selling" or "offering to sell" a CAD file that a user downloads onto his or her own computers is not providing the user with any "storage medium." Arguably, the CAD file provider is not "using" the data on the storage medium because the provider is only passively permitting access to the data, not "put[ting] [it] into service."[41] At most, the CAD file distributor has "made" the claimed invention because the act of storing the digital file on the server created the claimed storage medium with the claimed data on it.[42] This act of infringement is enough to potentially warrant an injunction, but injunctions are far more difficult to obtain today than they used to be.[43] And because the CAD file need only be placed onto a server once to be downloaded countless times, the damages for this single infringing act of "making" may not be adequate to compensate for the resulting infringement. Thus, even if a *Beauregard*-style claim is permitted for CAD files, the practical effect of enhancing enforceability is modest.

A claim that is not restricted to a physical storage medium might avoid these enforceability issues, but would run into different abstractness problems. As the Federal Circuit recently emphasized in *Digitech Image Technologies., LLC v. Electronics for Imaging, Inc.*, "[d]ata in its ethereal, non-physical form is simply information that does not fall under any of the categories of eligible subject matter under section 101."[44] While that case involved pure data that did not, and was not intended to, represent a precise 3D physical product,

41. NTP, Inc. v. Research in Motion, Ltd., 418 F.3d 1282, 1316–17 (Fed. Cir. 2005).

42. "The right to make can scarcely be made plainer by definition, and embraces the construction of the thing invented." Bauer & Cie v. O'Donnell, 229 U.S. 1, 10 (1913).

43. eBay, Inc. v. MercExchange, LLC, 547 U.S. 388, 391–394 (2006) (rejecting presumption that injunctive relief is appropriate upon a finding of infringement, and holding that "the decision whether to grant or deny injunctive relief . . . must be exercised consistent with traditional principles of equity," which includes consideration of whether the plaintiff "has suffered an irreparable injury" and whether "remedies available at law . . . are inadequate to compensate for that injury"); *see also* Daniel Harris Brean, *Will the 'Nexus' Requirement of* Apple v. Samsung *Preclude Injunctive Relief in the Majority of Patent Cases?*, 51 SAN DIEGO L. REV. 153 (2014) (demonstrating that the Federal Circuit's post-eBay "nexus" requirement created a substantial new hurdle to injunctive relief in cases involving complex or multi-component products).

44. Digitech Image Techs., LLC v. Electronics for Imaging, Inc., 758 F.3d 1344, 1350 (Fed. Cir. 2014).

it nonetheless presents a substantial hurdle to patenting digital products per se.[45]

C. Technological Limitations of Using Beauregard *Claims for 3D-Printable Files*

Designers work in CAD programs to create CAD files, and those CAD files can themselves be used to print objects.[46] Thus, unsurprisingly, the commerce surrounding 3D-printable objects appears to be done via CAD files.[47]

Instructing a 3D printer to print an object is not quite as simple as inputting a CAD file into the printer, however—there is an important intermediate step where the CAD file is converted into a format that the printer can understand and use. The following explanation from 3DPrinting.com provides a helpful summary of the process of "slicing" the CAD file into many two-dimensional images reflecting the additive printing sequence:

> How does 3D Printing work?
>
> It all starts with making a virtual design of the object you want to create. This virtual design is made in a CAD (Computer Aided Design) file using a 3D modeling program (for the creation of a totally new object) or with the use of a 3D scanner (to copy an existing object). A 3D scanner makes a 3D digital copy of an object.
>
> To prepare a digital file [created in a 3D modeling program] for printing, the 3D modeling software "slices" the final model into hundreds or thousands of horizontal layers. When the sliced file is uploaded in a 3D printer, the object can be created layer by layer. The 3D printer reads every slice (or 2D image) and creates the object, blending each layer with hardly any visible sign of the layers, with as a

45. A representative claim in *Digitech* was: A *device profile for describing* properties of a device in a digital image reproduction system to capture, transform or render an image, said device profile comprising: *first data for describing* a device dependent transformation of color information content of the image to a device independent color space; and *second data for describing* a device dependent transformation of spatial information content of the image in said device independent color space. *Digitech*, 758 F.3d at 1349.

46. Brean, *supra* note 1, at 773-74.

47. *See, e.g.,* SHAPEWAYS, http://www.shapeways.com/tutorials/pre-print_checklist (last visited July 24, 2015) (allowing customers to upload CAD files for printing); THINGIVERSE GROUPS, http://www.thingiverse.com/ (last visited July 24, 2015) (website where users can download CAD files of various designs).

result the three dimensional object.[48]

In view of this required slicing process, it appears that CAD files arguably do not themselves constitute "instructions" to a 3D printer. This suggests that the CAD files may not comprise the kind of computer-readable method steps or algorithms that are the subject of typical *Beauregard* claims.[49] Arguably, CAD files are more akin to mere data, which is problematic under cases like *Digitech*.[50]

A sliced CAD file, however, behaves more like the software code that provides algorithms and instructions for computers and is commonly covered by a *Beauregard* claim. To optimally protect the digital object in a CAD file using a *Beauregard* claim, it would seemingly be best to somehow claim the sliced version of the CAD file rather than the native CAD file itself. But the industry does not appear to trade in this format, so such a requirement would be disruptive. And even if the industry adapted so that, technologically speaking, *Beauregard* claims were suitable protection for physibles, the legal limitations discussed above may more than offset the value of the disruption to the industry players.

* * *

The foregoing analysis shows that what would better enhance patent protection for physibles than *Beauregard* claims would be to somehow patent the CAD files per se—untethered to a digital storage medium and not requiring that the files be pre-sliced. This avoids both the technical and legal limitations that prevent *Beauregard* claims from being more effective, as discussed above. A discussion of the feasibility of patenting CAD files per se follows in the next Part.

II. PATENTING CAD FILES PER SE

There are two considerable hurdles that stand in the way of patenting CAD files per se. First is the prohibition on claims

48. 3DPrinting.com, *What is 3D Printing?*, http://3dprinting.com/what-is-3d-printing/ (last visited December 30, 2014).

49. *Inacu & Helm*, *supra* note 28, at 99 ("Such claims take the general form: 'a computer usable medium having computer readable code' or 'a computer readable medium storing a computer program.'").

50. *Digitech*, 758 F.3d at 1349 ("Data in its ethereal, non-physical form is simply information that does not fall under any of the categories of eligible subject matter under section 101.").

directed to abstract ideas or mere data.[51] Second is the prohibition on patenting what amounts essentially to mere printed matter.[52] This Part explains why neither doctrine should have absolute preclusive effect as to CAD files for 3D-printable objects and that, in any event, strong policy concerns favor patent protection in this context.

For purposes of the following discussion, it is proposed that a CAD file could be claimed in *Beauregard*-like *sui generis* fashion in the following exemplary format:

A digital representation of a physical object printable on a 3D printer, the object comprising:

element A;

element B; and

element C disposed between elements A and B.

A. CAD Files for Physibles are Not Merely Abstract Data—They Are More Akin to Patent-Eligible "Manufactures"

As noted above, in *Digitech*, the Federal Circuit held that "[d]ata in its ethereal, non-physical form is simply information that does not fall under any of the categories of eligible subject matter under section 101."[53] The technology at issue in that case involved "device profiles" that contained information concerning color-related and spatial-related aspects of a digital display.[54] By referencing and accounting for the information in a device profile, the images displayed can be optimized and displayed more clearly.[55] The claims encompassed:

> A *device profile for describing* properties of a device in a digital image reproduction system to capture, transform or render an image, said device profile comprising:
>
> *first data for describing* a device dependent transformation of color information content of the image to a device independent color space; and
>
> *second data for describing* a device dependent transformation of spatial information content of the image in said device independent color space.[56]

Having started from the premise that "[f]or all categories [of

51. *Digitech*, 758 F.3d at 1349.
52. Gulack, 703 F.2d at 1386.
53. *Digitech*, 758 F.3d at 1350.
54. *Id.* at 1347–48.
55. *Id.*
56. *Id.* at 1349.

patentable subject matter under Section 101][57] except process claims, the eligible subject matter must exist in some physical or tangible form,"[58] the claims were deemed ineligible because "[t]he device profile, as claimed, is a collection of intangible color and spatial information."[59]

The Federal Circuit's premise in *Digitech* is not entirely accurate, at least not with respect to the Section 101 class of patentable "manufactures." The court cited to dictionary definitions in *In re Nuijten*[60] (which was relied on in *Digitech*),[61] stating that "manufactures" in Section 101 "refers to 'articles' resulting from the process of manufacture," and an article is "a particular substance or commodity: as, an *article* of merchandise; an *article* of clothing; salt is a necessary *article*."[62] Nothing in these definitions requires every "manufacture" to be physical, though. And as Judge Linn noted in dissent, the definitions relied on by the majority in *Nuijten* were from an 1895 dictionary, long after the "manufacture" language was enacted in the 1700s—language that has remained unchanged through the present.[63] Looking at contemporary definitions from the 1700s, the scope of manufacture was much broader, and encompassed "any thing made by art," where "'art,' in turn is defined as 'the power of doing something not taught by nature and instinct'; . . . 'artfulness, skill, dexterity.'"[64] Accordingly, Judge Linn concludes:

> it appears that rather than delineate specific, narrow categories, Congress has consistently intended statutory subject matter to cover the full scope of technological ingenuity, however it might best be claimed. Thus, "art" and "process[es]" might be viewed, in rough terms, as the

57. 35 U.S.C. § 101 ("Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor.").

58. *Digitech*, 758 F.3d at 1348.

59. *Id.* at 1350.

60. In re Nuijten, 500 F.3d 1346, 1351–52 (Fed. Cir. 2007) (holding that a transitory signal with embedded data was unpatentable despite the fact that the claimed signal caused tangible effects—essentially, encoding a discernible "watermark" to a signal).

61. *Digitech*, 758 F.3d at 1350 (discussing the facts of *Nuijten* and holding that "[t]he claims at issue here are even broader than the claim in *Nuijten*.").

62. Nuijten, 500 F.3d at 1356.

63. *Id.* at 1360-61 (Linn, J., concurring in part and dissenting in part).

64. *Id.* at 1361 (Linn, J., concurring in part and dissenting in part).

> exercise of technological skill, "manufacture[s]" and "composition[s] of matter" as the products of that skill, and "machine[s]" as the tools through which that skill is exercised.[65]

This sentiment is consistent with the Supreme Court's statement in *Diamond v. Chakrabarty* that "Congress intended statutory subject matter to 'include anything under the sun that is made by man,'"[66] but is most likely overbroad in light of subsequent Supreme Court abstractness precedent.[67]

Nevertheless, a more general and moderate view from renowned patent commentator Donald Chisum suggests that "manufactures" need not necessarily be tangible. Chisum explains that "manufacture" is a "catch-all" category of patentable subject matter:

> which is defined as including all man-made articles except machines and compositions of matter. Under this view, the only products excluded from Section 101 are products occurring in substantially the same form naturally (not 'made by mankind') and so-called 'printed matter' (in which the novelty and utility rest other than in the structure of the entity). Therefore, the patentability of *any man-made structural entity* should depend on the issues of other standards of patentability such as novelty, utility, and nonobviousness.[68]

While it is fairly easy to see how mere information about a digital screen display in *Digitech* might be a rare exception to patent eligibility because the information claimed is unconnected to something physical, a CAD file representing a complete three-dimensional object is a far cry from such disembodied data and can be fairly considered a "man-made structural entity." The law provides a more than colorable

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65. *Id.* at 1362 (Linn, J., concurring in part and dissenting in part).

66. Diamond v. Chakrabarty, 447 U.S. 303, 309 (U.S. 1980) (quoting S. Rep. No. 1979, 82d Cong., 2d Sess., 5 (1952); H. R. Rep. No. 1923, 82d Cong., 2d Sess., 6 (1952)).

67. Alice Corp. Pty. Ltd. v. CLS Bank Int'l, 134 S. Ct. 2347, 2354–55 (2014) ("[W]e must distinguish between patents that claim the building blocks of human ingenuity and those that integrate the building blocks into something more, thereby transforming them into a patent-eligible invention. The former would risk disproportionately tying up the use of the underlying ideas, and are therefore ineligible for patent protection. The latter pose no comparable risk of pre-emption, and therefore remain eligible for the monopoly granted under our patent laws.").

68. 1 Donald S. Chisum, CHISUM ON PATENTS § 1.02 (2014).

basis for printable CAD files to be treated as patent-eligible manufactures.

Returning to the issue of abstractness, aside from the statutory text of Section 101, the key reason to treat certain kinds of claims as unpatentably abstract is due to concerns about preemption. Specifically, "no one can patent . . . abstract ideas" because "[t]hese are the basic tools of scientific and technological work, and therefore, if patented, would stifle the very progress that Congress is authorized to promote."[69] The kinds of abstract ideas that have recently been deemed impermissibly abstract by the Supreme Court were characterized as "fundamental economic practice[s]" and "building block[s] of the modern economy."[70]

Patenting a CAD file drawn to a specific structural object preempts the technological field no more than a patent on the actual physical object itself—i.e., hardly at all. Specifically-claimed objects are not "basic tools" but completed products, so there is no preemption concern that should tip the scale against finding CAD files to be non-abstract, patent-eligible manufactures.

Compared to the cases such as *Digitech* and *Nuijten*, which involve essentially pure data untethered to any specific device or object, a CAD file is remarkably concrete. A CAD file is intended to be precise, detailed, and suitable for use in tooling and manufacturing—it is not an abstraction of an object but an accurate representation of it.

For reasoning much like the foregoing, the International Trade Commission recently held that "digital datasets . . . representing the initial, intermediate, and final positions of patients' teeth for use in fabricating dental appliances for orthodontic treatment of individual patients" qualified as "articles" that could be prevented from importation if they infringed a U.S. patent.[71] The accused data sets were created in Pakistan, transmitted electronically to a computer in Texas, and printed on a 3D printer to make a physical model.[72] In

69. Bilski v. Kappos, 561 U.S. 593, 649 (2010).

70. *Alice*, 134 S. Ct. at 2356.

71. Certain Digital Models, Inv. No. 337-TA-833, USITC (Apr. 10, 2014) (Commission Opinion) at 34. Infringing "articles" can be excluded from entry into the U.S. under 19 U.S.C. § 1337.

72. Certain Digital Models, Inv. No. 337-TA-833, USITC (Apr. 10, 2014) (Commission Opinion) at 17.

finding such data sets to be non-abstract articles, the ITC distinguished the patient-specific set of teeth data with mere "information in the abstract."[73] The ITC also noted the breadth of the statutory term "articles," which "appears to broadly cover infringing imports, without express limitation as to form or type," as well as Supreme Court precedent treating digital files as "articles of commerce" in other contexts.[74] Ultimately, the ITC concluded that the data sets were "true articles of international commerce" largely on policy grounds, because "an interpretation of 'articles' that allows the Commission to reach the imported physical aligners . . . but does not include the infringing digital data sets from which the aligners are produced, simply because they are in digital form, is unreasonable and inconsistent with the purpose of the statute."[75]

To the extent there remains some question of whether, doctrinally speaking, CAD files can be considered "manufactures," it should be emphasized that "[t]hese terms [in Section 101] may not be read in a strict literal sense entirely divorced from the context of the patent law."[76] When Section 101 is construed in a manner mindful of the innovation-encouraging purpose of patent law as a whole, designing new products in CAD programs that represent real-world printable objects should not be excluded from protectability at the threshold, as discussed *infra*. Indeed, as the Federal Circuit has explained, "[r]egardless of what statutory category ('process, machine, manufacture, or composition of matter,' 35 U.S.C. § 101) a claim's language is crafted to literally invoke, we look to the underlying invention for patent-eligibility purposes."[77] Here, the underlying invention of a printable CAD file is the physical printed object.

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73. *Id.* at 49–50 (discussing Bayer AG v. Housey Pharms., Inc., 340 F.3d 1367, 1372 (Fed. Cir. 2003) (holding that "knowledge that a substance possesses a particular quality" is not an "article" under 35 U.S.C. § 271(g))

74. *Id.* at 38, 40–42.

75. *Id.* at 53–55.

76. In re Alappat, 33 F.3d 1526, 1553 (Fed. Cir. 1994) (Archer, J., concurring-in-part and dissenting-in-part).

77. CyberSource Corp v. Retail Decisions, Inc., 654 F.3d 1366, 1375 (Fed. Cir. 2011).

B. CAD Files for Physibles Do Not Violate the Printed Matter Doctrine

A CAD file is essentially a three-dimensional picture drawn digitally and can be considered analogous to unpatentable "printed matter." Whether something should be treated as printed matter turns on whether "a significant or the sole difference between the claimed subject matter and the prior art lies in the content of the information" in relation to the substrate.[78] Generally, the mere arrangement of information, symbols, or text on a substrate is simply not considered inventive and worthy of patent protection.[79]

The policy behind the printed matter doctrine is closely related to the prohibition against abstract ideas and mere mental steps being patented. As Chisum explains, "[i]ntroduction of a printed matter or symbolic element into a claim for a patent often calls for human mental interpretation or participation and hence brings the mental steps doctrine into play."[80] For this reason, the Federal Circuit noted an exception in *In re Lowry* for situations where "the information [is] processed not by the mind but by a machine, the computer."[81] The source code claims in *Beauregard* certainly fit into this exception, as do CAD files which, by definition, are digital files read and interpreted by a computer in order to be understandable to humans.

C. Sound Public Policy Favors Protecting Printable CAD Files

The current technological reality is that many designers work largely, and sometimes entirely, in CAD programs.[82]

78. 1 Donald S. Chisum, CHISUM ON PATENTS § 1.02(4) (2014).

79. *In re Miller*, 57 C.C.P.A. 809, 812 (C.C.P.A. 1969) ("In this instance the claimed indicia and legend, being merely placed on the claimed structure in any desired location and manner, do not produce the required cooperative structural relationship necessary before the printed matter can be given patentable weight."); In re Russell, 18 C.C.P.A. 1184, 1185 (C.C.P.A. 1931) ("The mere arrangement of printed matter on a sheet or sheets of paper, in book form or otherwise," is not patentable.).

80. 1 Donald S. Chisum, CHISUM ON PATENTS § 1.02(4)(e).

81. In re Lowry, 32 F.3d 1579, 1583 (Fed. Cir. 1994) (explaining that "[t]he printed matter cases 'dealt with claims defining as the invention certain novel arrangements of printed lines or characters, useful and intelligible only to the human mind.' In re Bernhart, 417 F.2d 1395, 1399 (CCPA 1969)").

82. *See* Brean, *supra* note 1, at 773-74.

CAD files are a major madium, if not the prevailing medium, for industrial design work and also of 3D-printing commercial activity.[83] In order for the patent system to "promote the Progress of . . . useful Arts," it should reflect these realities.[84]

As Judge Newman has noted, "[t]he nation has benefitted from the adaptability of the patent system to new technologies."[85] To credit an invention designed and sold in the real world but not the *same invention* designed and sold digitally draws a distinction without a difference. The patent system should not discourage innovation merely because of the design tools utilized. As Section 103 of the Patent Act concerning obviousness has long proscribed, "patentability shall not be negatived by the manner in which the invention was made."[86]

Mark Lemley recently published an article that suggests we should not be too quick to enhance patent protection in response to 3D printing.[87] In the article, Lemley compares Internet piracy of copyrighted works to the piracy concerns raised by 3D printing technology, and explores whether enforcement of IP rights in both contexts serve their innovation-encouraging purposes.[88] He shows that as the cost of production and distribution of copyrightable works decreased (with the advent of personal computers and the Internet), counter to traditional IP theory, creativity was not stifled but flourished. Lemley ultimately concludes that, over time, 3D printing technology will likewise encourage innovation in the absence of IP to the point that IP rights may someday become unnecessary to further technological progress.[89] Lemley's analysis is thought-provoking, but

83. *Id.*

84. U.S. Const. art I., § 8., cl. 8.

85. *In re* Schrader, 22 F.3d 290, 297 (Fed. Cir. 1994) (Newman, J., dissenting) (noting that this point "was recognized in *Diamond v. Chakrabarty*, 447 U.S. 303, 316 (1980) ("Mr. Justice Douglas reminded that the inventions most benefiting mankind are those which 'push back the frontiers of chemistry, physics and the like.'")).

86. 35 U.S.C. § 103.

87. *See* Mark A. Lemley, *IP in a World Without Scarcity*, 90 NYU L. Rev. 460 (2015).

88. *Id.* at 507-08 ("Incumbent industries are always threatened by new technologies and they often turn to regulation to create barriers to those technologies in order to protect the old way of doing thing. IP owners will do the same thing.").

89. *Id.* at 515.

although his point might be true for music, movies, etc. and the Internet, it would be premature to conclude that 3D printing is anywhere near the same point or that strong utility patent rights are no longer necessary.

Lemley first notes the Internet was originally viewed by copyright owners as a piracy-facilitating evil that would discourage artists and authors from creating their music, movies, books, etc. by removing financial incentives.[90] Those copyright owners "responded just as IP theory said they should":

> They persuaded Congress to pass a multitude of new laws, criminalizing copyright infringement on the Internet even if done for no financial gain and ramping up the penalties for copyright infringement to an extreme degree. They filed tens of thousands of lawsuits against people who posted copyrighted content online. They sued anyone with even a vague connection to the pirates . . . .[91]

These aggressive enforcement efforts were ineffective.[92] Copyright infringement on the Internet is still rampant, and yet the amount of new artistic content being created is higher than ever.[93] A lot of quality content is even generated for the purpose of giving it away for free over the Internet.[94]

Lemley attributes the phenomenon of mass creative activity in the face of minimal or no underlying IP incentives to several factors, including: (1) that the ease of copying and distributing content over the Internet facilitates legitimate reproduction and distribution every bit as much as it does piracy, lowering and even eliminating barriers to entry on the publishing end; (2) that the technology needed for generating quality music and movies at home emerged along with the Internet and lowered production costs considerably; and (3) that the presence of people using these tools to create inspires

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90. *Id.* at 482-83 ("Consistent with IP theory, as the cost of reproduction and distribution dropped to zero, piracy became rampant on the Internet. The companies that produced content in the pre-Internet world worried that they could not make money in an environment where copying was so easy.").

91. *Id.* at 483.

92. *Id.* at 484.

93. *Id.* at 485. Lemley notes that "economic scholarship suggests" the new music is "at least as high quality as before the Internet." *Id.* at 485. The relative quality of music is obviously highly subjective.

94. *Id.* at 487.

creativity by others.[95] And, more fundamentally, Lemley posits that "it may simply be that IP theory is wrong about what motivates people to create."[96] Inspiration, competition, problem-solving, attribution, and recognition have been shown to be at least as motivating, and in many cases more motivating, than money.[97]

Lemley concedes that some kinds of creative works cannot flourish in the absence of IP rights—namely, big budget movies and video games, where the cost of creation remains very high and thus it is more important to be able to recoup one's investment.[98] A nuanced balancing act is therefore required to ensure that the law "protect[s] those exceptional works without blocking the creativity that is happening despite, not because of, IP."[99] The problem is that trying to target the facilitators of harmful infringement (e.g., shutting down peer-to-peer file sharing services) carries the risk of "killing off what is good about the Internet" in the process.[100]

According to Lemley, 3D printing will likely endure the same trials and face the same challenges. Initially, "[p]rofessional industrial design firms will resist having their works 'Napsterized' because they fear losing control over who can use their design and not getting paid when people do."[101] I agree with Lemley that the solution to those design firms' legitimate concerns is certainly not to shut down or overly regulate the sale of 3D printers because the "social value in [3D printing] technolog[y], like the Internet, is enormous."[102] Like the Internet, 3D printing technology will reduce production and distribution costs in manufacturing like never before, and will in turn give rise to a new generation of designers and manufacturers that, while disruptive to industries, will be for the good of the society in the form of better, cheaper, and/or more environmentally-friendly products.[103]

But we are not there yet. While laptops and the Internet

95. Lemley, *supra* note 87, at 487-95.
96. *Id.* at 493.
97. *Id.* at 463, 493.
98. *Id.* at 496.
99. *Id.* at 496.
100. *Id.* at 462, 500.
101. Lemley, *supra* note 87, at 498.
102. *Id.* at 500-01. The advent of 3D-printed guns, for example, have caught the attention of lawmakers. *Id.* at 500.
103. *Id.* at 58–59.

allowed anybody with a guitar to record and distribute copyrightable songs on an unprecedented scale, productive use of 3D printing technology outside of the industrial manufacturing context is in its infancy and likely will be for a while.[104] Most people can learn to play a song on a guitar in a time that is *de minimis* compared to the time needed to learn to use a CAD program to design a patentable utilitarian device. The amount of specialized knowledge, research, and development involved in designing a new engine part, consumer electronic, or robot, for example, tends to be quite substantial. And these examples are not on par with the big-budget movie and video game "exceptions" noted by Lemley where IP rights are still vital for copyrightable works[105]—they represent typical subject matter for utility patents. Indeed, in 2013 the top fifty recipients of utility patents in the United States were almost exclusively household-name consumer electronics, software, automotive, and telecommunications companies.[106] To the extent 3D printing brings engineering and product design to the masses, it is not likely to be *patentable* utilitarian engineering on a large scale any time soon. Inventions are not patentable unless useful, novel, and nonobvious,[107] whereas all that is required for copyrightability is originality—a very low threshold requiring only a modicum of investment.[108]

Lemley ultimately suggests that "[i]t may be that we simply do not need IP protection when both the cost of creation and the cost of distribution fall below a certain point."[109] While in the copyright context I am inclined to agree that "creation that relies on IP is likely to play a less and less significant role in a post-scarcity world,"[110] the realm of utility patent subject

104. *See Brean*, supra note 1, at 774-81.

105. *Lemley*, *supra* note 87, at 506.

106. *See* USPTO, *Patenting By Organizations (Utility Patents)*, Part B1-1–B1-2 (2013), *available at* http://www.uspto.gov/web/offices/ac/ido/oeip/taf/topo_13.pdf. The top ten companies were, in order, IBM, Samsung, Canon, Sony, Microsoft, Panasonic, Toshiba, Qualcomm, LG, and Google. *Id.*

107. 35 U.S.C. §§ 101-103.

108. 17 U.S.C. § 102; Feist Publ'ns, Inc. v. Rural Tel. Serv. Co., 499 U.S. 340, 345 (1991) ("To be sure, the requisite level of creativity is extremely low; even a slight amount will suffice. The vast majority of works make the grade quite easily, as they possess some creative spark, 'no matter how crude, humble or obvious' it might be.").

109. Lemley, *supra* note 87, at 50.

110. Lemley, *supra* note 87 at 48. The reference to "post-scarcity" refers to a

matter in many technology sectors is still well above the cost threshold where the value of IP might diminish.[111] The distribution costs may fall across most sectors thanks to 3D printing, but the cost of creation may differ considerably depending on the technology. Robotics, for example, might see a tremendous reduction in the cost of development and prototyping, while consumer electronics probably will not. The same is true for artistic works—as Lemley notes, while music recording is cheaper than ever, the cost of creating big-budget movies may never decrease even though the distribution cost is much smaller now due to the Internet.[112]

The day may come when the tools needed to create and distribute most 3D-printable inventions are so sophisticated and user-friendly that amateurs will easily and routinely create patentable innovations across many industries.[113] But that day does not appear to even be on the horizon at this point in time, and the prospect does not warrant declining to protect the related IP now, while we could be fanning the flames of this emerging technology with appropriate patent protection. Indeed, maintaining meaningful patent protection after crossing a new technological frontier is exactly what Judge Newman had in mind when praising the adaptability and success of the patent system.[114]

On the other hand, Lemley concludes that, based on the lessons we can learn from the copyright content industry's response to the Internet, "we should resist the tendency to expand IP reflexively to meet every new technological challenge."[115] This is a sound principle, but perhaps one with broader applicability to artistic, rather than technological,

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world where goods are all dig,ital or traded as disembodied information. As Lemley explains, the advent of the Internet and 3D printing has made it sko that "[e]xisting content is no longer scarce. Once created, it costs virtually nothing to reproduce, and anyone can copy and distribute it." *Id.* at 12.

111. *Id.* at 50–51.

112. *Id.* at 506.

113. *Id.* at 487-89.

114. Judge Newman's above quotation referenced *Diamond v. Chakrabarty*, 447 U.S. 303 (1980). *See supra* note 65. Had the Court in *Chakrabarty* decided not to deem genetically-engineered bacteria patent-eligible, arguably that entire industry would have collapsed from lack of up-front investment.

115. Lemley, *supra* note 87, at 52 ("Incumbent industries are always threatened by new technologies and they often turn to regulation to create barriers to those technologies in order to protect the old way of doing thing. IP owners will do the same thing.").

innovation. Working on cutting-edge technology to push technological boundaries often requires utilizing the most current tools and state-of-the-art equipment. This tends to require a substantial up-front investment that might not happen as often absent the monetary incentives IP can provide. Put another way, being too far behind on our IP laws might lead to technological complacency that stalls innovation. Some will continue to rely on older tools to innovate, but most technological innovation does not come from using outdated tools. Maintaining strong IP rights for inventions made using the newest tools promotes technological progress by encouraging adoption of, and improvement upon, the latest technologies.

Patenting physibles will allow inventions to be protected to the same extent, in substance, regardless of whether the inventive and distributive medium is physical or digital. To the extent IP protection for physical utilitarian objects remains valuable for encouraging technological innovation (and I believe it does), the same is true for physibles. But there is a gap in the law that precludes protecting these two versions of the same thing with the same scope of protection. This gap should be closed just like other areas where the form of patent claims tends to be exalted over the claims' substance.[116]

Even the Supreme Court's recent *Alice Corp. v. CLS Bank* case, which took a broad view of unpatentably abstract computerized inventions, treats claims on their substantive merit rather than their style, and considered method, system, and computer-readable medium claims all to be directed to essentially the same invention.[117] *Alice* would therefore support the treatment of physical product and corresponding CAD claims as both equally eligible for patent protection.

1. Safe Harbor for Incidental Infringers

Protecting CAD files against unauthorized sales over the Internet is in keeping with, and essentially co-extensive with, patent protection for product claims as asserted against traditional manufacturers. Admittedly, however, patenting

116. *See, e.g.,* Alice Corp. Pty. Ltd. v. CLS Bank Int'l, 134 S. Ct. 2347, 2357 (2014) ("A claim that recites an abstract idea must include 'additional features' to ensure 'that the [claim] is more than a drafting effort designed to monopolize the [abstract idea].'").

117. *Id.* at 2360.

CAD files for physibles will allow for some modest incidental infringement to be actionable that is currently immunized. For example, one who merely downloads or makes available for download a CAD file would arguably be infringing a CAD-file claim by "making" the patented invention, but would not infringe a physical product claim. To the extent this occurs over a peer-to-peer network or on a CAD file sharing service such as Thingiverse,[118] widespread enforcement against end-users, peer-to-peer software providers, or proprietors of user-generated online CAD file repositories risks "killing off" what is good about 3D printing in the process.[119]

Enforcement against end-users who merely download a CAD file (or possess it and make it available via a peer-to-peer network) is highly unlikely because such *de minimis* infringement, while actionable, results in little to no recoverable damages or other remedies that would make enforcement worthwhile.[120] Should those end-users proceed to "use" the CAD file to make and sell a similar competing CAD file, a more legitimate claim of infringement can be made.[121]

The trickier issues surround peer-to-peer network providers and user-generated CAD file repositories because direct infringement is a strict liability tort, and there is no safe harbor for unknowingly infringing.[122] To some extent this concern is offset again by the likelihood that much of the infringement will be *de minimis* (e.g., a single "making" when the CAD file is stored on a server) and lead to nominal damages, if any. But injunctive relief—having the file removed—is often going to be much more desirable to patentees in this situation anyway. For peer-to-peer network providers, the problem is a non-issue because merely providing software that can be used for sharing CAD files would not

118. THINGIVERSE GROUPS , www.thingiverse.com (last visited July 25, 2015).

119. Lemley, *supra* note 87,. at 3, 41–42.

120. Embrex, Inc. v. Serv. Eng'g Corp., 216 F.3d 1343, 1353 (Fed. Cir. 2000) (Rader, J., concurring) ("[T]he statute leaves no leeway to excuse infringement because the infringer only infringed a little. Rather, the statute accommodates concerns about de minimis infringement in damages calculations.").

121. *See* NTP, Inc. v. Research In Motion, Ltd., 418 F.3d 1282, 1317 (Fed. Cir. 2005) (explaining that the "use" of an invention occurs when it is "put into service")

122. *See* Global-Tech Appliances, Inc. v. SEB S.A., 131 S. Ct. 2060, 2065 n.2 (2011).

constitute direct infringement under Section 271(a).[123] Perhaps a claim can be made for active inducement or contributory infringement, but such claims are rarely appropriate due to the requirement that the indirect infringer possess specific intent to cause infringement (which makes such theories undesirable to patentees anyway).

Nonetheless, it should be noted that indirect infringement claims can be made against peer-to-peer networks, user repositories, and individual users now, in the absence of CAD file patent protection, and thus provide a valuable tool for combating infringement with respect to the more egregious and obviously intentional indirect infringement (*a la* Napster). Those who merely host or transmit CAD files representing patented objects, without knowing that the files are infringing, however, should be immunized from indirect infringement liability whether the CAD files are parented *per se* or not. For the same reason, those who inadvertently designed a CAD file similar to a patented object (or CAD file) would not be liable for indirect infringement either.

For the user-generated CAD file repositories like Thingiverse, in addition to the foregoing, another market-based solution is available—make contributors assume the risk and responsibility for their CAD files, including any intellectual property infringement, and reserve the right to remove any infringing content.[124] Similar contractual protections are in place for incidental infringers already, such as when retailers and re-sellers, who would otherwise be responsible for infringement, insist on indemnity from their respective manufacturers and product suppliers.[125]

Finally, should the above limitations on incidental infringement liability prove to be inadequate in deterring harmful litigious patentees, it would be advisable to adopt a statutory safe harbor for those who merely host or relay CAD

123. *See* NTP, Inc. v. Research In Motion, Ltd., 418 F.3d 1282, 1317 (Fed. Cir. 2005) (explaining that the "use" of an invention occurs when it is "put into service"); MGM Studios Inc. v. Grokster, Ltd., 545 U.S. 913, 932 (2005) (explaining that peer-to-peer programs do not directly infringe per se because they have legitimate non-infringing uses).

124. THINGIVERSE GROUPS, http://www.thingiverse.com/legal (last visited July 24, 2015).

125. *See, e.g.,* Speedtrack, Inc. v. Office Depot, Inc., 2015 U.S. App. LEXIS 11169 (Fed. Cir. June 30, 2015) (case involving various online retailers that had been indemnified by their software vendor)

files, much like was implemented with the Digital Millennium Copyright Act ("DMCA"). In the closely analogous context of distributing copyrighted content on the Internet, the DMCA provides that the passive transmission or routing of copyrighted material by an online service provider, as well as the storage of such material at the direction of a user, is not actionable if the service provider lacks knowledge of the infringing nature of the material and agrees to take down the content upon receiving a valid notice from the copyright owner.[126] Similar protections are equally sensible in the patented CAD file context to avoid the potential for harmful incidental infringement assertions.[127]

CONCLUSION

Designers of 3D-printable products are currently at a disadvantage concerning the enforceability of patent rights in their inventions. To combat infringement, it is necessary to have an effective way to extinguish infringement at the source—in this case, where the CAD files are being sold or distributed. The law does not currently provide such designers with patent protection allowing for adequate remedies against such entities. This discourages innovation in the emerging 3D-printing space. Absent a way to patent the printable CAD files per se, the enforceability against 3D-printing infringement will remain severely limited.

Beauregard claims are perhaps the best existing option for patents that might encompass CAD files, but even *Beauregard* claims cannot overcome many of the legal and technical limitations on protection. At best, *Beauregard* claims might provide some small additional scope of enforceability that still

126. 17 U.S.C. § 512(a), (c).

127. In fact, although outside the scope of this paper, at least some expressive and non-utilitarian portions of a CAD file may already be protectable under copyright and subject to the DMCA, thus making it a useful additional layer of protection for patentees to consider. Only actual copying of such non-utilitarian features within the CAD file (e.g., stylistic choices and original designs), and not coincidental similarity, would be actionable under copyright, but such protection is still useful against blatant copying done without any effort to change the file or "design around" it. For a further discussion of the potential use of copyright for protecting CAD files, see my prior article. Brean, *supra* note 1, at 807-813 (explaining that copyright protection may be feasible for CAD files, but that important limitations may render the protection useful only "to the extent that the value of a product stems from its form, not from its function").

does not come close to putting 3D-printable inventions on the same footing with other kinds of inventions.

But it should be remembered that *Beauregard* was a "test case." *Beauregard* changed the law because IBM pushed for broader protection with a form of claiming that the law did not currently recognize, and the USPTO was ultimately convinced to change its policy to allow such claiming. That policy shift considerably expanded the scope of protection available for software.

A similar test case for CAD files using a claim of the form proposed herein could have the same effect. But whether through a USPTO policy shift, a doctrinal development in the courts, or a statutory amendment, the future of patent protection for 3D-printable products hinges on stakeholders pushing for patent claims that are commensurate in scope with their inventions. 3D printing is the next big step into the digital millennium, and the patent system should jettison the obsolete notion that all product inventions are physical.