Patents In A 3D World: The Challenge of the Second File-Sharing Revolution

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INTRODUCTION

Amidst the commotion of the recently-enacted America Invents Act (which resulted in the most substantial overhaul of our patent laws since the Patent Act of 1952), and the flurry of patent legislation directed to the problem of patent troll litigation—issues that have all but consumed patent litigators, judges, agencies, Congress, and even the White House in recent months—there is lurking in the background the beginnings of a change that may have far greater consequences for our patent system. This change began in the garages of hobbyists, and is now slowly, but steadily, creeping into businesses and homes around the world. We may now be at the precipice of a technological shift with far greater reach than the procedural and judicial process changes that are today being explored in Congress; rather, these changes may have fundamental impacts not only on patent enforcement in district courts, but also on patent prosecution, patent licensing and counseling, and on the very foundations of our patent system.

The development of technology has always pushed the boundaries of the law, often forcing the application of existing laws to scenarios never before contemplated. The proliferation of the personal computer brought on such a period in intellectual property law (raising questions regarding the patent and copyright eligibility of software inventions); the internet extended that period of change in even more dramatic fashion.

As one example, in the late 1990's, the digitization and widespread sharing of copyrighted material turned copyright law and enforcement on its head, resulting in wide-ranging challenges, and then changes, in the enforcement of copyrights. Now a new technological explosion—the development of three-dimensional (3D) printer technology—could have similarly striking or even more profound impacts on patent law.

MEET GEORGE JETSON: IN-HOME 3D PRINTING BECOMES REALITY

3D printing (also known as "additive manufacturing") can be explained, at a high level, in a fairly straightforward and familiar manner. In the way that a traditional printer creates an image—by placing small drops of ink at predetermined locations on a surface, ultimately creating, for example, a picture or document—3D printers can create objects, by placing small drops of material at predetermined locations and building up the object layer by layer. The predetermined locations are provided to the printer in a digital file format—in a sense, a digital blueprint. The blueprints are digital files in formats that are commonly used in conjunction with rapid prototyping and computer-aided design (CAD) and manufacturing (including, for example, in the STL (stereolithography) file format). Blueprints for a given object—a coffee mug, for example—can be created by scanning an existing object using a 3D scanning device, designing the object from scratch using CAD development software tools, or, through some combination of the two.

This technology has come a long way since the mid 1980's, when Charles Hull first conceptualized 3D printing, created the first working 3D printer, and was awarded U.S. Patent No. 4,575,330 directed to an "Apparatus for Production of Three-Dimensional Objects by Stereolithography."[2] Although Hull's 3D printing technique was limited to the printing of objects using certain polymers, today 3D printing is regularly done using all sorts of materials, including plastics, metals, and even food substances (just like the Jetsons' Food-A-Rac-A-Cycle!).[3] The possibilities are endless; today nearly anything can be created in a 3D printer, from something as mundane as a children's toy or a slice of pizza, to something as provacative as a handgun (prompting action from the State Department).[4]

Perhaps the most meaningful recent development in 3D printing is that the 3D printers have become more diminutive, in both size and cost (a trend not all that unlike the trend in computers: first expensive and room-sized machines that later became sufficiently small and inexpensive personal computers with a place in the homes of consumers).

Companies like Makerbot and Cubify are now selling desktop-sized 3D printers.[5] Some are predicting an "explosion" in 3D printing technology as early as 2014, as certain supposed "key patents" are set to expire in February.[6] It may not be long before 3D printers join telephones, televisions, and computers as standard in-home appliances. Once that happens, consumers will have the ability to print all sorts of objects, and the universe of possibilities continues to expand (pizza, toys, handguns, or more mundane useful articles of the everyday, like replacement parts for a broken dishwasher or auto interior—the likes of which could be far more costly if purchased from manufacturers).

Online retailers allow the purchase of items any time of day, but they are constrained in their services by the time it takes to ship goods to the consumer. That model may eventually be streamlined. Just as new books can be downloaded instantly on an e-reader or music on a music player or smart phone, the same may apply to real world objects in the not-too-distant future; the 3D blueprints could be purchased and downloaded instantly, allowing the consumers to print purchased items immediately and in the comfort of their homes.[7] Some of those physical items will surely be protected by intellectual property rights, including patents, and therein lies the problem. What was once only an issue for copyright law (i.e., the widespread digital sharing of copyrighted music and books), may soon be an issue for patent law, as 3D printing similarly allows the digitization, sharing, and copying of things themselves. The net result may be a scenario that our current patent system may not be equipped to address.

THE PROBLEM OF THE DECENTRALIZATION OF MANUFACTURING

Our current regime of patent enforcement allows a patent holder to exclude others from the making, using, offering for sale, selling, or importing of a patented invention.[8] Because patent infringement

lawsuits tend to be relatively expensive and complex, in practice, patent owners typically look to enforce patents against the manufacturing or distributing companies responsible for widespread infringement (as opposed to the end users). A manufacturer producing larger numbers of infringing widgets, distributed to consumers across the country, makes a far more practical target of patent enforcement than the consumers themselves (who are typically left undisturbed in these lawsuits). This sort of enforcement is often economically justified, given the business benefit of stopping widespread infringement at the source with injunctive relief, and the potential for large damages awards from deep-pocketed manufacturers who may have infringed thousands or millions of times over.

The advent of 3D printing, however, leads us down a path towards a decentralization in manufacturing—*i.e.*, a shifting of manufacturing from companies to consumers. That decentralization raises serious questions about the practical ability to enforce patent rights under our current system. With the manufacturing operations moved away from a central hub, and out along the spokes towards individuals in their homes, manufacturing companies no longer need to make a product or use a patented method for manufacturing, and the infringing activities of making and using can instead all occur within the home. To stop this infringement, a patent holder in some circumstances might be forced to bring hundreds, thousands, or millions of patent infringement lawsuits against the consumers, the ones actually making the infringing product in a 3D-printing world. This is in many respects the same challenge encountered by the music industry in the 1990s, when any member of the public could suddenly reproduce, and share instantly with millions of other consumers, content that was protected by intellectual property.

LEARNING FROM COPYRIGHT'S LOOK UPSTREAM

During most of the 20th century, music was recorded on physical media, like eight-tracks, records, tapes, and CDs. These were typically produced by record companies and not generally reproduced by the public. However, in the late 1990s, internet-based peer-to-peer sharing services created enormous new challenges for copyright law, and specifically the enforcement of copyright. The new technology allowed widespread access to, and distribution of, unlimited digital content, anytime, from anywhere.

Faced with the challenge of pursuing individual users, copyright holders looked to stop the companies facilitating the trading of digital information. One such early file-sharing service, and perhaps the most widely known, was Napster. An important feature of Napster was that the company's computers never carried the copyrighted material; Napster simply provided software that allowed users to search other users' computers for available files, and then exchange directly. The 7th Circuit eventually held that once Napster was on notice that infringing files were being traded, it could be held contributorily liable for infringing those copyrights.[9] The court also ruled that Napster could be held vicariously liable for infringement, because it received a direct financial benefit from its users' infringement.[10]

Other peer-to-peer networks popped up in the wake of Napster, seeking to learn from Napster's experience and avoid infringement. One alternative service, Aimster, failed because the 7th Circuit found that its approach, which did not create central directories of files offered for sharing, simply amounted to willful blindness.[11]Grokster and StreamCast failed because, although their approaches may have been legal, their advertising materials made their illegal intentions clear.[12]

Despite the courtroom victories, pirated and illegally downloaded copyright material is still widely available throughout the internet, and in fact some copyright owners have come to accept that as the new normal.[13] The fact that so much copyrighted material is freely available on the internet changed the music and media industries in a variety of ways. For example, in 2001, Apple released iTunes, which would eventually grow into a widely used digital music and video marketplace.[14] The success of these online marketplaces proved that consumers would be willing to pay for copyright protected content if offered simple and streamlined mechanisms for doing so.

In much the same way that it has become nearly impossible to police the downloaders of copyrighted content, enforcing patents against 3D printer owners would be a practical impossibility. One way to resolve the problem might be to look upstream, as the copyright owners did, to those aiding the infringement at the source. Unfortunately, those providing the 3D blueprints to the public are not likely direct infringers of many of today's patents; they are not making, using, offering for sale, selling, or importing the patented products.

Indirect patent infringement is probably a next best alternative. Title 35 U.S.C. § 271(b) provides that "whoever actively induces infringement of a patent shall be liable as an infringer." In fact, the doctrine of indirect infringement was designed for just this scenario:

> "[It] exists to protect patent rights from subversion by those who, without directly infringing the patent themselves, engage in acts designed to facilitate infringement by others. This protection is of particular importance in situations . . . where enforcement against direct infringers would be difficult, and where the technicalities of patent law make it relatively easy to profit from another's invention without risk of charge of direct infringement."[15]

Unfortunately, to prove either contributory infringement or induced infringement, a plaintiff must show actual infringement.[16] Proving an act of infringement in this situation is much more difficult for patent owners than copyright owners. As soon as a copyrighted file is downloaded, it is copied onto the end-user's hard drive, and infringement has occurred. That much can often be proven by pulling information from an internet service provider which may have records of a specific file being downloaded at a specific time to a specific computer.

In contrast, an end-user may download 3D printing blueprints and yet never use them and therefore never infringe the patent. The infringement would be the making of the patented article, as opposed to the downloading of the file. To prove each instance of infringement, a patent owner would have to take discovery and prove the manufacture of the patented article by each and every end-user—a staggeringly difficult task at a minimum, and an impossible one at worst. Indeed, the cost of taking that discovery of each instance of infringement could ultimately outweigh the per-infringement damages.[17]

Additionally, a plaintiff in an induced infringement case must show that the indirect infringer knew of the patent at issue and had specific intent for the end user to infringe the patent. Absent those proofs, there can be no pre-suit damages. An opinion in the hands of the alleged inducer can

also shield the alleged inducer from pre-suit damages even in instances in which they were aware of the patent at issue (because the opinion could give the alleged inducer the reasonable belief that the activities would not result in infringement of a valid patent). The bottom line is that the standard for inducement can be difficult to meet, the lack of pre-notice damages renders an induced infringement theory less powerful than direct infringement, and, in any event, it may be impossible to prove up the quantum of infringement in any practically sound way where that infringement can only be proven inside the homes of end users.[18]

A LITTLE HELP FROM MY FRIENDS: CAN COPYRIGHT PROTECTION HELP?

It may be that copyright can be part of the solution, but it probably cannot be the whole solution. To the extent companies seek to sell and distribute blueprints for their wares, copyright law may be useful to protect those digital blueprints. For instance, those files may be protectable as works under 17 U.S.C. § 101, like other computer programs.[19]

However, certain questions may be raised regarding copyright eligibility for these files -- for instance, regarding originality. In *Meshwerks, Inc. v. Toyota Motor Sales U.S.A., Inc.*, Meshwerks sued Toyota for using a digital model of a Toyota car that was only authorized for one-time use.[20] The court found that the digital models were "insufficiently original to warrant copyright protection."[21] Additionally the court observed,

> "[d]igital modeling can be, surely is being, and no doubt increasingly will be used to create copyrightable expressions. Yet, just as photographs can be, but are not per se, copyrightable, the same holds true for digital models. There's little question that digital models can be devised of Toyota cars with copyrightable features, whether by virtue of unique shading, lighting, angle, background scene, or other choices. The problem for Meshwerks in this particular case is simply that the uncontested facts reveal that it wasn't involved in any such process."[22]

Even if protection is available, copyright is in some ways less powerful than patent law. For example, patent law protects against reverse engineering and independent creation; copyright law does not. If one were to independently generate a blueprint for an item, there could be no copyright liability for creating that blueprint, even if it can effectively be used to print the same object. Additionally, there could be a fair-use argument—which is not available under patent law—in using the blueprint to make a product. Further still, in the example in which an end user performs a 3D scan of a patented article and creates a new digital blueprint file through that scanning process, the end user would be the creator of that file, and therefore could presumably disseminate it without concern for any copyrights held by the original designer and manufacturer of the scanned article. Lastly, although copyright might protect the transferring and copying of the blueprint files, it is not sufficient to restrict the ultimate printing of the articles themselves. And of course, as noted earlier, copyright holders have faced difficult challenges in enforcing copyrights in the music and media context, and these same challenges would apply in this context.

Accordingly, the alternatives to direct patent infringement causes of action (*i.e.*, indirect infringement and copyright infringement) are probably not sufficiently robust or practical replacements for direct patent infringement claims. Until such time that the proliferation of 3D printers becomes sufficiently widespread such that changes in our patent or copyright laws are implemented to address these issues, patent holders will be forced to cope with these less effective solutions. In parallel, innovators can also now begin considering these issues at the time of filing of their patent applications, to obtain patent protection that is more 3D-ready.

THE IMPACT OF 3D PRINTING ON PATENT PROSECUTION STRATEGY

Every good patent prosecutor thinks about the drafting of patent claims—the part of the patent that defines the scope of the patent rights—from the perspective of the infringer. Claims are useless if, as a practical matter, they are ineffective at stopping infringement (either because they are not worded to cover the activities of the most important parties in the distribution chain, or worse, because they do not cover any party in the chain at all). Moving forward, patent prosecutors, particularly those working in certain technology areas, can think critically about how best to draft patent claims to address 3D printing issues that may arise during the 20 year-from-filing term of those patents.

Until now, it made sense to draft claims covering the methods for making an inventive widget, and of course, claims covering the widget itself. But that conventional approach may be futile in the face of 3D printing. Upstream patent enforcement targets may not handle the widget at all; they simply may have, and distribute, digital blueprints. And, as noted above, the economic and practical challenges associated with assertion against end users in this context are just too significant. The old modes of claim drafting could, at least to some degree, become less effective or wholly ineffective.

Similar problems can arise in connection with design patents as well. Today, a design patent is sufficient to protect the ornamental design of, for example, a coffee mug, because the manufacture of the coffee mug could be the target of an infringement action (and could be forced to pay damages for the infringement, and possibly be enjoined from continued infringing activities).

In a world of ubiquitous 3D printing, the analysis of the likely infringers and enforcement of the patent rights changes. In such a world, it may be useful when drafting patent claims to also include a set of claims drawn to the digital file (the "blueprint") that provides the plans for making the inventive article. In fact, these claims might not look all that different from the *In re Beauregard* claims commonly used today to protect software distributed on computer readable mediums.[23] With such a claim set in an issued patent, the patent holder could then pursue an infringement action against the upstream distributor of those protected files.

Accordingly, to the extent that current patent and copyright enforcement regimes do not sufficiently address the problem of widespread dissemination of these 3D blueprints, patent agents and attorneys can begin to think about claim drafting practices as at least an interim solution, if not a long-term fallback.

DIGITAL PROTECTION AND ENCRYPTION STRATEGIES

A last alternative, in the form of digital protection and encryption strategies, is one method used by copyright owners that may be similarly applicable to the digital blueprints used in 3D printing. Efforts have already been undertaken to implement digital encryption or watermarking schemes (digital rights management, or "DRM") that would restrict the unauthorized distribution of 3D printing blueprints.[24] Digital encryp-

tion's role in protecting 3D printing's digital blueprints, and the headaches that DRM might bring, remain to be seen. Encryption also raises the problem of standard-setting in a technology area that is still in its relative infancy. On the whole, until these encryption strategies become sufficiently developed, tested, and widely adopted and deployed, the effects will be difficult to evaluate.

CONCLUSION

The future in this technology is swiftly approaching. Given the rapid proliferation that has already begun in the desktop 3D printing market, what was previously a gadget for hobbyists is now starting to become a useful home tool. It may still be some years before 3D printers are commonplace in the home; but, given that patent protection lasts 20 years from the patent application date, patents applied for today may still be in force when 3D printing becomes more prevalent.

The bottom line: these are things patent lawyers should be considering today. Aspects of patent prosecution and enforcement that are considered standard approaches today may be less effective, or in some instances wholly ineffective, in an advanced 3D-printing technology environment. Patent practitioners, inventors and companies seeking to protect rights in their inventions should begin to do more, think more critically and creatively, and begin planning today for the intellectual property challenges that will be posed by this burgeoning technology tomorrow. IPT

ENDNOTES

1. Rob Maier is an intellectual property partner in the New York office of Baker Botts L.L.P. The views expressed here are those of the author and do not necessarily represent or reflect the views of Baker Botts L.L.P. The author would like to thank Michael Ritter, a law clerk also in the New York office of Baker Botts who is awaiting admission to the Bar, for his invaluable assistance with the preparation of this article.
2. Tony Hoffman, *3D Printing: What you Need to Know*, PCMAG.com (October 17, 2011), http://www.pcmag.com/article2/0,2817,2394722,00.asp.
3. A. J. Jacobs, *Dinner is Printed*, N.Y. TIMES, Sept. 21, 2013, http://www.nytimes.com/2013/09/22/opinion/sunday/dinner-is-printed.html.
4. A. Greenberg, *3D-Printed Gun's Blueprints Downloaded 100,000 Times In Two Days (With Some Help From Kim Dotcom)*, FORBES, May 8, 2013, http://www.forbes.com/sites/andygreenberg/2013/05/08/3d-printed-guns-blueprints-downloaded-100000-times-in-two-days-with-some-help-from-kim-dotcom/.
5. Makerbot, http://www.makerbot.com/ (last visited Nov. 24, 2013); Cubify 3D Systems, http://cubify.com/ (last visited Nov. 24, 2013).
6. C. Mims, *3D Printing Will Explode in 2014 Thanks to the Expiration of Key Patents*, QUARTZ, July, 21, 2013, http://qz.com/106483/3d-printing-will-explode-in-2014-thanks-to-the-expiration-of-key-patents/.
7. Even delivery by drone might be slower. See David Streitfeld, *Amazon Delivers Some Pie in the Sky*, N.Y. Times, Dec. 2, 2003, http://www.nytimes.com/2013/12/03/technology/amazon-delivers-some-pie-in-the-sky.html.
8. 35 U.S.C. § 271.
9. *A&M Records, Inc. v. Napster, Inc.*, 239 F.3d 1004, 1021-22 (9th Cir. 2001).
10. *Id.* at 1023-24.
11. *In re Aimster Copyright Litigation*, 334 F.3d 643, 651 (7th Cir. 2003), *cert. denied*, 540 U.S. 1107 (2004).
12. *Metro-Goldwyn-Mayer Studios Inc. v. Grokster, Ltd.*, 545 U.S. 913, 924 (2005) ("Internal company documents indicate that StreamCast hoped to attract large numbers of former Napster users if that company was shut down by court order or otherwise . . . . [I]t introduced itself to some potential advertisers as a company 'which is similar to what Napster was,' . . . .").
13. Brad Reed, *Time Warner Cable CEO Admits Game of Thrones Piracy is Good for HBO*, YAHOO! NEWS, August 8, 2013, http://news.yahoo.com/time-warner-cable-ceo-admits-game-thrones-piracy-020019753.html.
14. Michael Simon, *The Complete iTunes History - SoundJam MP to iTunes 9*, MAC LIFE, Sept. 11, 2009, http://www.maclife.com/article/feature/complete_itunes_history_soundjam_mp_itunes_9.
15. *Dawson Chemical Co. v. Rohm & Haas Co.*, 448 F.3d 176, 188 (1980).
16. *Lucent Technologies, Inc. v. Gateway, Inc.*, 580 F.3d 1301, 1320, 1322 (Fed. Cir. 2009).
17. One solution to this problem might be to modify patent damages law such that there is a statutory damages feature, as there is in copyright law, to act as both a deterrent to infringement as well as a justification to pursue wide-ranging discovery from end-user infringers.
18. Further still, even if there were some inclination to stop the sale and distribution of the 3D printers themselves, there is not likely any way to do that either (nor would anyone necessarily want to so curb the proliferation of such a transformative technology). When VCRs were first introduced, they were met with some opposition from the television industry. In *Sony Corporation of America v. Universal City Studio, Inc.*, the Supreme Court addressed the question of whether VCRs, sold by Sony and capable of copying copyrighted material, violated the rights of the copyright owners. The Court, borrowing a concept from patent law, asked whether the device was "capable of commercially significant non-infringing uses." Because there were such non-infringing uses, the sale of the devices was found not to be infringing. Certainly 3D printers, although they can be used to infringe, have "commercially significant non-infringing uses."
19. 17 U.S.C. § 101 ("A 'computer program' is a set of statements or instructions to be used directly or indirectly in a computer in order to bring about a certain result.").
20. 528 F.3d 1258 (10th Cir. 2008).
21. *Id.*
22. *Id.* at 1269-70.
23. *In re Beauregard*, 53 F.3d 1583 (Fed. Cir. 1995).
24. A. Regalado, *Nathan Myhrvold's Cunning Plan to Prevent 3-D Printer Piracy*, MIT TECHNOLOGY REVIEW, Oct. 11, 2012, http://www.technologyreview.com/view/429566/nathan-myhrvolds-cunning-plan-to-prevent-3-d-printer-piracy/.