

Article

A Maker or an Infringer? 3D Printing Technology and Patent Infringing Liability: Taiwan Perspectives

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ABSTRACT

This article focuses on patent infringement issues associated with 3D printing, and conducts an analysis on the potential conflict between protection of patent rights and non-commercial private use in the context of 3D printing technology.

Two characteristics of 3D printing are bringing challenges to patent law. First, 3D printing enables “digital manufacturing” and distribution of “virtual objects” via the Internet. Computer-Aided Design (CAD) files of existing patented products or key parts of existing patented products can be delivered instantly through the internet, and anyone having these files can “print out” the patented products or key parts with a 3D printer. This process thus increases the possibility for users to intentionally or negligently infringe existing patent rights. Second, 3D printing technology promotes “personal manufacturing”. Small 3D printers with reasonable prices are available for individuals, and there are many online platforms available to those who want to share designs of objects that can be manufactured with a 3D printer. Benefiting from these characteristics, end users are expected to perform a

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more decisive role in patent disputes than ever.

Based on these characteristics, this article provides a comprehensive study of the Taiwan Patent Act, addressing the issues of 3D printing and patent infringement. Specifically, Part I explains the background of the issues. Part II explains the manufacturing process of 3D printing. Part III examines potential patent infringement liabilities in each step of the 3D printing process explained in the Part II, especially those related to digital manufacturing. Part IV describes the rising of end-user infringement, and explores its impacts on patent law.

Keywords: *3D Printing, Additive Manufacturing, Computer-aided Design, Patent, Patent Infringement, Joint Infringement*

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I. INTRODUCTION

This article focuses on emerging patent infringement issues relating to 3D printing technology, and examines the intriguing balance between the protection of patent rights and users' private and non-commercial use in the context of 3D printing technology.

3D printing technology, also known as "additive manufacturing",¹ is a general term applied to manufacturing technologies encompassing various manufacturing methodologies.² 3D printing technology provides a new way of manufacturing, and is regarded as a potential tool for enhancing domestic manufacturing competitiveness.³ In recent years, many countries have been paying attention to the rapid development of 3D printing technology. Some Asian countries also announced major investment plans in 3D printing technology. For example, in 2014, a study group established by the Japanese Ministry of Economy, Trade and Industry (METI) published a report on the ideal approaches for Japan to future *Monozukuri* (manufacturing) derived from 3D printers.⁴ The Japanese government also declared that it would allocate 4.5 billion yen (about 44 million US Dollars) in the fiscal year 2014 budget to support research and development of industrial 3D printers that manufacture products from raw metal materials.⁵ A similar trend is observed in Taiwan. The Taiwanese government has been encouraging the metal casting industry to accelerate its modernization and raise its competitiveness by exploiting 3D printing technology. It has announced new measures to

1. According to the ISO/ASTM standard, the term "additive manufacturing" is defined as "process of joining materials to make parts (2.6.1) from 3D model data, usually layer (2.3.10) upon layer, as opposed to subtractive manufacturing and formative manufacturing methodologies.", *ISO/ASTM 52900:2015 Additive Manufacturing--General Principles--Terminology*, INT'L ORG. STANDARDIZATION, <https://www.iso.org/standard/69669.html> (last visited Aug. 23, 2016).

2. See generally CHRIS ANDERSON, *MAKERS: THE NEW INDUSTRIAL REVOLUTION* 81-98 (2013) (explaining the principle of a 3D printer and introducing the basic process of 3D printing).

3. For example, the U.S. President Barack Obama launched a pilot institute in Youngstown Ohio in August 2012 (formerly named "National Additive Manufacturing Innovation Institute, NAMII", now also known as "America Makes"). The institute is comprised of private companies, academic institutions, non-profit organizations and government agencies, and its aim is to accelerate the adoption of additive manufacturing technologies in the U.S. manufacturing sector and to increase domestic manufacturing competitiveness. See e.g., Press Release, The White House, *We Can't Wait: Obama Administration Announces New Public-Private Partnership to Support* (Aug. 16, 2012), <https://www.whitehouse.gov/the-press-office/2012/08/16/we-can-t-wait-obama-administration-announces-new-public-private-partners>.

4. Shin Mono Zukuri Kenkyūkai [Study Group on New Manufacturing], *3D Purinnta ga Umidasu Hukakachi to Hutatsu no Mono Zukuri ~ 「Dēta Tougou Ryoku」 to 「Mono Zukuri Nettowāku」 ~ [Report on the Ideal Approaches to Future Manufacturing Derived from 3D Printers]*, KEIZAISANGYŌSHŌ [JAPANESE MINISTRY ECON., TRADE & INDUS.] (2014), http://www.meti.go.jp/committee/kenkyukai/seisan/new_mono/pdf/report01_02.pdf.

5. *Heisei 26-Nendo Keizaisangyōshō Yosan-an Kanren Jigyō no PR Shiryō* [2014 METI-Related Budget Press Release], KEIZAISANGYŌSHŌ [JAPANESE MINISTRY ECO., TRADE & INDUS.] (Dec. 24, 2013), http://www.meti.go.jp/main/yosan2014/pr/pdf/sangi_01.pdf.

promote introduction of 3D printing technology, such as support of research and development in the field of 3D printing technology.⁶

Notwithstanding the exciting possibilities 3D printing technology offers, diverse legal issues arise with the use of 3D printing technology. Examples include regulation issues relating to 3D printed firearms,⁷ product liability concerns involving 3D printed products,⁸ and ethical and public health issues concerning 3D printed human cells or organs.⁹ Among all the legal issues raised by 3D printing technology, intellectual property right infringement has become a major issue and one that needs to be addressed. For example, in the case that a 3D printed product falls within the scope of a patent claim, or that a trademark is embedded in a 3D printed product or a spare part, or that 3D digital models are created from existing copyrighted works, printing (manufacturing) and selling these products may constitute an intellectual property infringement.¹⁰

This article thus focuses on the patent infringement issue. Part II of this article first explains the manufacturing process of 3D printing and its characteristics. Part III subsequently examines potential patent infringement liabilities that may occur in each step of the 3D printing process explained in the Part II, especially those related to digital manufacturing. Part IV discusses the impact of end-user infringement on the Patent Act and how should the Patent Act respond to it.

6. *Castig Industry to Apply 3D Printing Technology*, ZHONGHUA MINGUO EXECUTIVE YUAN (中華民國行政院) [EXECUTIVE YUAN OF R.O.C.] (Jan. 13, 2015), http://english.ey.gov.tw/News_Content2.aspx?n=8262ED7A25916ABF&sms=DD07AA2ECD4290A6&s=4F8AD8B01554884E.

7. In 2012, a non-profit organization named “Defense Distributed” launched a wiki project to design blueprints for weapons, and released 3D printable CAD files of guns in 2013, see Andy Greenberg, ‘Wiki Weapon Project’ Aims to Create a Gun Anyone Can 3D-Print at Home, FORBES.COM (Aug. 23, 2012, 9:00 AM), <http://www.forbes.com/sites/andygreenberg/2012/08/23/wiki-weapon-project-aims-to-create-a-gun-anyone-can-3d-print-at-home/>. The legal discussion of 3D printed firearms control in the U.S., see e.g., Danton L. Bryans, *Unlocked and Loaded: Government Censorship of 3D-Printed Firearms and a Proposal for More Reasonable Regulation of 3D-Printed Goods*, 90 IND. L.J. 901 (2015).

8. Lucas S. Osborn, *Regulating Three-Dimensional Printing: The Converging Worlds of Bits and Atoms*, 51 SAN DIEGO L. REV. 553 (2014).

9. HOD LIPSON & MELBA KURMAN, *FABRICATED: THE NEW WORLD OF 3D PRINTING* 3, 223 (2013) (discussing the possibility of black markets for 3D-printed organs).

10. Some real cases involving 3D printing and intellectual property have emerged. In 2011, Thingiverse, a U.S. based website for users to share their 3D designs freely received a takedown notice from Games Workshop, a British company producing “Warhammer” series, citing the US Digital Millennium Copyright Act 1998 (DMCA 1998). The Games Workshop alleged that several 3D designs of Warhammer-style figures uploaded to Thingiverse’s website are identical to the “Imperial Guards” figures that form part of the Warhammer series, and these figures infringed their copyright. Thingiverse removed the files finally due to the fear of litigation. Similar disputes between copyright holders and hobbyists have been however emerging one after another. See Clive Thompson, *Clive Thompson on 3D Printing’s Legal Morass*, WIRED (May 30, 2012, 1:43 PM), <http://www.wired.com/design/2012/05/3-d-printing-patent-law/> (discussing the notice-takedown order between Games Workshop and Thingiverse).

II. PROCESS OF 3D PRINTING

As more and more customer-friendly 3D printers are launched to the market, consumer access to 3D printing technology has been dramatically increasing in recent years.¹¹ With the shrinking size and cost of 3D printers, user-friendly interfaces, as well as the expanding availability of raw material, numerous individual hobbyists adopt 3D printing technology as a feasible solution to design and make creative and original products. Possible underlying factors of this phenomenon may include: (1) many critical 3D printing related patent rights have expired recently;¹² (2) several ongoing open source projects provide open source designs of personal 3D printing machines free of charge,¹³ which further facilitate the proliferation of 3D printing. However, when a user creates objects with a 3D printer, she may encounter problems of patent infringement during the manufacturing process. From a patent law perspective, the manufacturing process of 3D printing can be generally divided into the following steps,¹⁴ and patent infringement may take place when a user creates a CAD file through scanning a patented object, or inadvertently creates a 3D design that falls into the scope of one's patent right.

(1) A user creates a Computer-Aided Design (CAD) file by software, scanning or photo-capture from existing objects.¹⁵ A Computer-Aided Design (CAD) file is a virtual 3D model of an object, containing all the necessary information a 3D printer needs to print an identical object.¹⁶ A 3D

11. Global market of personal 3D printers is growing geometrically, see Phoebe Li et al., *Intellectual Property and 3D Printing: A Case Study on 3D Chocolate Printing*, 9 J. INTELL. PROP. L. & PRAC. 322, 323-24, 324 fig.2 (2014).

12. John Hornick & Dan Roland, *Many 3D Printing Patents are Expiring Soon: Here's a Round up & Overview of Them*, 3D PRINTING INDUSTRY (Dec. 29, 2013, 12:04 AM), <http://3dprintingindustry.com/2013/12/29/many-3d-printing-patents-expiring-soon-heres-round-overview/>.

13. For example, one famous open source 3D printer project is "RepRap" project, which was initiated by British engineer Adrian Bowyer in 2004. See James Randerson, *Put Your Feet Up, Santa, the Christmas Machine Has Arrived*, THE GUARDIAN (Nov. 25, 2006, 9:00 AM), <http://www.theguardian.com/science/2006/nov/25/frontpagenews.christmas2006>; REPRAP.ORG, <http://reprap.org/> (last visited Aug. 23, 2016).

14. For a more comprehensive overview of recent development of 3D printers, see e.g., Daniel Harris Breaun, *Asserting Patents to Combat Infringement via 3D Printing: It's No "Use"*, 23 FORDHAM INTELL. PROP., MEDIA & ENT. L.J. 771, 773-781 (2013); ANDERSON, *supra* note 2, at 89-92; Simon Bradshaw et al., *The Intellectual Property Implications of Low-Cost 3D Printing*, 7 SCRIPTED 5, 7-10 (2010).

15. For example, there is a website platform providing a service for users that if a user uploads a photo of her pet, the platform service provider will capture 3D models from the photo and then "print" out the pet's gypsum figure. PETFIG, <http://petfig.com/> (last visited Aug. 23, 2016).

16. Michael Weinberg, *It Will Be Awesome If They Don't Screw It Up: 3D Printing, Intellectual Property, and the Fight over the Next Great Disruptive Technology*, PUBLIC KNOWLEDGE 3 (Nov. 10, 2010), <http://www.publicknowledge.org/files/docs/3DPrintingPaperPublicKnowledge.pdf>; ANDERSON, *supra* note 2, at 92.

printer cannot print any object without an adequate CAD file. Apart from designing original models with a CAD software, users can create a CAD file by 3D scanning an existing object with a 3D scanner. Furthermore, users can edit, modify or customize the scanned 3D model file with a CAD software in order to meet her specific needs. 3D printing technology enables users to create an original 3D design or modify a 3D model of an existing object so that they could print it out with 3D printers.

(2) Distribute CAD files (typically through the internet). Because a CAD file is in digital format, users can effortlessly transfer and distribute a 3D CAD model file through the internet. Countless online platforms provide a highly accessible way for developers and hobbyists to share their creative 3D designs. An impressive example is MakerBot's Thingiverse, which is an open 3D printing platform for designers and hobbyists to communicate and share their designs without charge.¹⁷

(3) Manufacture ("print") objects with a privately owned 3D printer or online 3D printing services. Users may purchase a personal 3D printer and print objects with it. Another available solution for users that do not have 3D printers is to use online 3D printing services. Shapeways, a famous U.S. based online platform for buying and selling 3D printed products, represents this type of business model. Unlike Thingiverse, which is an open community for users to share 3D designs freely, Shapeways is more like a virtual marketplace for 3D printed products. For those who plan to "buy" a 3D printed item, they can either directly design a CAD file for 3D printing by themselves or hire a professional designer to create it, and then upload the CAD file to Shapeways. Shapeways will print the item and deliver it to the buyers. On the other hand, for those who want to "sell" their 3D printed products, they can simply open a virtual store on the Shapeways and display their products online. When customers place an order for a specific product, Shapeways will take charge of producing, shipping, billing, and subsequent customer service.¹⁸

(4) Distribute the 3D printed object. As mentioned in (3), online 3D printing services such as Shapeways deliver the printed physical objects to its customers. In addition, a user who prints objects with its own 3D printer may also send their works to others. It should be noted that this kind of distribution might be for the sole purpose of sharing their hobby with others,

17. All designs uploaded to Thingiverse are encouraged to license under a Creative Commons license (For details, see CREATIVE COMMONS, <http://www.creativecommons.org> (last visited Aug. 23, 2016)). See *MakerBot Terms of Use*, THINGIVERSE, <http://www.thingiverse.com/legal/terms> (last updated Apr. 28, 2016).

18. *How Shapeways 3D Printing Works*, SHAPEWAYS, <http://www.shapeways.com/how-shapeways-works> (last visited Aug. 23, 2016). The benefit of this type of business model is that designers or innovators can avoid significant financial risks in comparison with traditional manufacturing methods.

rather than for commercial purposes.

3D printing technology displays two major characteristics in these four steps of the 3D printing manufacturing process. First, 3D printing enables “digital manufacturing” and distribution of “virtual objects” through the internet.¹⁹ As 3D printing technology becomes accessible and affordable, people are able to design, customize and print products at home, and distribute CAD files through the internet. With the assistance of 3D printing technology, a user with a 3D model data file can print approximately the same object so long as she has a 3D printer at her command or has access to online 3D printing services.

Second, “personal manufacturing” becomes possible with the aid of 3D printing technology. While the main dominant role of the patent system is usually performed by patent right holders together with their competitors, end users are now playing an increasingly conspicuous role in patent law disputes.²⁰ In some countries such as Taiwan, Japan and Germany, the private exploitation of patented invention which is done for non-commercial purposes does not constitute patent infringement under patent law. As mentioned above, low-price, compact-sized, and user-friendly 3D printers are available for personal use, and there are several online platforms where anyone could upload and download designs of a wide variety of objects that can be manufactured with 3D printers.²¹ Limited by the nature of raw materials and the size of 3D printers, personal 3D printers are generally not designed to create objects that require rigidity, heat resistance, or mass scale manufacturing.²² Still, the application of personal 3D printers for making spare parts, craft and hobby items, products for educational uses, unique requirements, and fashion accessories are highly anticipated.²³

Based on the characteristics of 3D printing technology, some patent issues has arisen and need to be addressed. Part III of this article attempts to discuss the related patent issues and concerns.

19. Neil Gershenfeld, *How to Make Almost Anything: The Digital Fabrication Revolution*, 91 FOREIGN AFF. 43, 44 (2012) (“The revolution is not additive versus subtractive manufacturing; it is the ability to turn data into things and things into data.”).

20. See Gaia Bernstein, *The Rise of the End User in Patent Litigation*, 55 B.C. L. REV. 1443, 1446 (2014) (describing that end users are becoming more prevalent in patent litigation as 3D printer becomes popular).

21. For instance, one famous desktop 3D printer maker named “MakerBot” has created a website “Thingiverse”, where anyone can easily upload and download 3D designs for free. THINGIVERSE, <http://www.thingiverse.com/> (last visited Aug. 23, 2016).

22. Bradshaw et al., *supra* note 14, at 11; Ben Depoorter, *Intellectual Property Infringements & 3D Printing: Decentralized Piracy*, 65 HASTINGS L.J. 1483, 1485 (2014).

23. Bradshaw et al., *supra* note 14, at 11-12.

III. 3D PRINTING AND PATENT INFRINGEMENT LIABILITY

This Part discusses potential patent infringement liability stemming from user activities during the 3D printing manufacturing process. As mentioned in the previous Part II, 3D printing enables “digital manufacturing” and distribution of “virtual objects” through the internet. This accordingly leads to two main patent issues that need to be considered: infringement liability for actions involving no tangible assets, and the rising risk of end-user patent infringement. The key point of the former issue, which is analyzed in the following Part III, lies in whether or not users who merely create or distribute a virtual CAD file without actually manufacturing a physical object should be held liable for patent infringement? Another similar question emerges: should online platforms helping or contributing to the creation of a virtual 3D model or the sharing of CAD files be held liable for patent infringement? On the other hand, the subsequent Part IV discusses the latter issue and share some thoughts on how to respond to the rise of end-user infringement.

A. *Will the Creation of CAD Files Constitute Direct Infringement?*

According to Article 58, Paragraph 1 of the Taiwan Patent Act, the patentee of an invention patent can, with certain limitations and conditions, exclude others from exploiting the invention. In the case where the invention is a product, “exploiting of which means the acts of making, offering for sale, selling, using, or importing that product for the aforementioned purposes.” (Art. 58(2) of the Taiwanese Patent Act).²⁴ It is the long standing rule that making, offering for sale, selling, using, and importing are considered to be discrete acts of infringement. Put differently, it constitutes infringement under the Taiwan Patent Act to make a patented product without use or sale.

When it comes to 3D printing, however, a controversial issue arises as to whether or not creating a CAD file of a patented product constitutes “making” of the product under the Taiwan Patent Act. Notwithstanding its crucial role in determining whether infringement has occurred, the Taiwan Patent Act contains no definition of “making”. Generally speaking, according to a court decision ruled by the Taiwan Intellectual Property

24. In the case where the invention is a process, exploiting of which means: (1) using the process; and (2) using, offering for sale, selling or importing for these purposes the product obtained directly by that process (Art. 58(3) of the Taiwan Patent Act). To highlight the impact of digital manufacturing on infringement liability under patent law, this part will only focus on patent claims directed to a physical object. Regarding the discussion of the strategy involving patent claims directed to CAD files, see Daniel Harris Brean, *Patenting Physibles: A Fresh Perspective for Claiming 3D-Printable Products*, 55 SANTA CLARA L. REV. 837, 848-60 (2015).

Court, the wording “making” means to produce products with economic values by means of physical, chemical, or biotechnological measures.²⁵ Pursuant to this definition, a mere creation of a mold or a blueprint of the product does not satisfy the criteria of “making”.²⁶ In addition, from a historical viewpoint, in order to constitute an infringement on a product invention, there must be a physical embodiment of the accused claim.²⁷ It is worthy of note that, with the quality of 3D printer advancing in line with technological developments, the distinction between a CAD file of a product and a physical product is becoming increasingly inconsequential.²⁸ Nevertheless, in the context of patent law, it seems that creating a CAD file of a patented product is not considered to constitute “making” of a physical product claimed in the patent.²⁹ Accordingly, the creation of a patented product’s CAD file alone does not constitute direct infringement of patent claiming a physical product.

B. *Will Distribution of CAD Files of Patented Products Constitute Direct Infringement?*

Another relevant question is whether or not distribution of CAD files of patented products constitutes infringement. For example, will a user sharing a CAD file of patented product on Thingiverse without charge be held liable for infringement? As previously quoted, patentees are entitled to exclude others from “selling” or “offering for sale” patent product. The Intellectual Property Court in Taiwan has also interpreted in its ruling that “selling” means the transfer of property for a price.³⁰ Therefore, if someone transfer the physical product without charge, the conduct itself does not fall within the definition of “selling” or “offering for sale”.³¹ Additionally, as discussed

25. Zhihui Caichan Fayuan (智慧財產法院) [Intellectual Property Court], Minshi (民事) [Civil Division], 98 Min Zhuan Su Zi No. 136 (98民專訴字第136號民事判決) (1999) (Taiwan).

26. YANG CHONG-SEN (楊崇森), *ZHUANLI FA LILUN YU YINGYONG* (專利法理論與應用) [PATENT LAW: THEORIES & PRACTICE] 315 (4th ed. 2014).

27. Timothy R. Holbrook & Lucas S. Osborn, *Digital Patent Infringement in an Era of 3D Printing*, 48 U.C. DAVIS L. REV. 1319, 1322 (2015).

28. *Id.* at 1323; Osborn, *supra* note 8, at 555.

29. *See e.g.*, WEINBERG, *supra* note 16, at 12 (pointing out a difference between copyright infringement and patent infringement liability is that a mere possession or download of a file is insufficient to create patent infringement liability under the US patent law); Brean, *supra* note 14, at 790 (“If a patent claims a physical product, that physical product is what must be sold or offered for sale in order to satisfy direct infringement satisfy § 271(a)” of the Patent Act in the United State). But *see* Holbrook & Osborn, *supra* note 27, at 1324-25 (arguing that, under certain circumstances, digital files that can be directly used to print out operable physical objects might infringe a patent claim directed to the underlying physical object).

30. 98 Min Zhuan Su Zi No. 136.

31. With regard to the meaning of “offering for sale” under Taiwanese Patent Act, *see* Chen Hao-Yun (陳皓芸), *Zhuanli Fa “Fanmai zhi Yaoyueh” zhi Jieding: Yi Kuakuo Shishi Faming Xingwei Wei Zhongxin* (專利法「販賣之要約」之界定—以跨國實施發明行為為中心) [Defining “Offering

above, irrespective of the fact that the boundary between tangible and intangible assets is gradually dissolving, distribution of a CAD file under current patent law still differs from that of a physical product. Distributing a CAD file alone without a fee does not constitute infringement of patent claiming a physical product.

C. *Will the Creation and Distribution of CAD Files of Patented Products Constitute Patent Infringement?*

Under the current Taiwan Patent Act, only a person who directly exploits the invention by committing acts explicitly stipulated in the Art. 58(2) or 58(3) of the Taiwan Patent Act may be liable for patent infringement. The person who induces or contributes to patent infringement will not be held liable under the current Taiwan Patent Act.³²

On the other hand, under the tort law provided in the Taiwan Civil Code, if several people jointly infringe a patent right, they are jointly liable for the injury therefrom.³³ Besides, those who induced or contributed others to infringe are deemed joint tortfeasors as well. (See Art. 185(2) of the Taiwan Civil Code.) Therefore, when a user prints out a patented physical product with a 3D printer, she is liable for patent infringement due to her “making” a patented product without the patentee’s consent. In such case, those who aided or induced her to print the patented product may be held liable for joint infringement. For example, a person uploading a CAD file that is later downloaded and used by an infringer, or a person building and running a website platform that enables and facilitates the sharing of CAD files, may be deemed a joint infringer together with the person printing out the product with the CAD file, provided that the inducer or contributor intends to infringe patent rights as well as the direct infringer does.³⁴

for Sale” in Patent Act: Focusing on Cross-Border Exploitation of Patent], 26 ZHUANLI SHIH (專利師) [TAIWAN PAT. ATT’Y J.] 1, 1-22 (2016).

32. In contrast, in some jurisdictions (such as the United States, Germany, and Japan), these conduct may be held liable under patent law provided that certain conditions were satisfied. For a detailed analysis of the so called “indirect infringement” issues, see Chen Hao-Yun (陳皓芸), *Lun Zhuanli Quan Jianjie Qin Hai Zeren: Yi Fushu Xingweiren Fentan Shishi Zhuanli zhi Qingxing Wei Zhongxin* (論專利權間接侵害責任—以複數行為人分擔實施專利之情形為中心) [*Indirect Patent Infringement Liability: Focusing on Divided Infringement*], 11 KAODA FAXUE LUNCONG (高大法學論叢) [NAT’L U. KAOHSIUNG L.J.] 107, 107-62 (2015).

33. Art. 185 of the Taiwan Civil Code provides that “(1) If several persons have wrongfully damaged the rights of another jointly, they are jointly liable for the injury arising therefrom. The same rule shall be applied even if which one has actually caused the injury cannot be sure. (2) Instigators and accomplices are deemed to be joint tortfeasors.”

34. For a general introduction and discussion of joint torts liability in Taiwan, see e.g., WANG ZE-JIAN (王澤鑑), *QINQUAN XINGWEI FA (侵權行為法)* [TORT LAW] 473-504 (New revised ed. 2015); YAO ZHI-MING (姚志明), *QINQUAN XINGWEI FA (侵權行為法)* [TORT LAW] 145-170 (3d ed. 2014).

It is the long standing rule in Taiwan, however, that joint patent infringement under the Civil Code can exist only when each party involved could be deemed having committed a patent infringement respectively.³⁵ As a result, if the making or selling of patented product is done privately and for non-commercial purposes--for example a user printed a patented product at home as a hobby--the inducer or contributor may not be liable for joint infringement under the Taiwan Civil Code, for there exists no "infringement" of patent to which the user could be affiliated.³⁶ This question is also concerned with the rise of end-user infringement associated with 3D printing, and is further elaborated upon in the subsequent Part IV.

To sum up, creating or distributing a CAD file alone may constitute joint patent infringement and be held liable if the criteria set under Art. 185(2) of the Taiwan Civil Code is satisfied. Yet, owing to the limitations on patent rights and the difficulty in proving the alleged joint infringer's intent to infringe, Civil courts in Taiwan rarely confirm the liability of joint tort in the context of patent infringement.

D. *Will Providing a CAD File Hosting Platform Constitute Patent Infringement?*

Among creators who design and create CAD files, and users who download CAD files in order to print out physical objects, online website platforms act as intermediaries, and has been playing a vital role in the recent development of 3D printing communities. If a patentee wants to discourage the creation and distribution of CAD files of her patented products, an effective way is to sue those who provide online services for hosting CAD files or those who set up online marketplaces for buying and selling CAD files of 3D model, for it is more efficient and feasible to control the infringement through platform service providers than to bring lawsuits against hundreds or even thousands of individual end users who actually printed out the patented products. Another plausible reason may be that such online service providers are more likely to be financially capable of paying compensatory damages once an infringement has been found.

Current CAD file hosting websites can be broadly categorized into several types, including: (1) open source platforms for sharing CAD files for free (e.g., Thingiverse); (2) platforms for users to sell and buy CAD files

35. See e.g., *Zuigao Fayuan* (最高法院) [Supreme Court], *Minhsi* (民事) [Civil Division], 92 Tai Shang Zi No. 1593 (92台上字第1593號民事判決) (2003) (Taiwan). For a detailed analysis of the difficulties arise when joint torts liability is being applied to contributory or inducing patent infringement, see Chen, *supra* note 32, at 107-62.

36. The Patent Act provides certain limitations to exclusive patent rights, such as "acts done privately and for non-commercial purpose(s)" under Art. 59(1)(i) of the Patent Act. For further discussion, see *infra* Part IV.

(e.g. Turbosquid);³⁷ (3) platforms where designers can easily open an online shop to sell their designs, and the products ordered by users will be printed by the platforms and then delivered to customers (e.g. Shapeways). While users only obtain CAD files without physical products on the first two types of platforms, on the last type of platform they can directly receive physical products instead of CAD files.

The third type of platform, which prints out products for their customers, may constitute direct infringement under the Taiwan Patent Act, because the act committed by the platform may be construed that it makes, sells, and offers for sale of the patented products. As to the first two types of platforms, as noted above, merely creating and distributing CAD files do not constitute direct infringement under the current Taiwan Patent Act. Civil liability may arise, though, when there has been a patent infringement (e.g., a user downloads a CAD file from the website platform and prints it out for commercial purposes, knowing that the product is patented or inadvertently not knowing of it) and the platform is found to contribute or induce the patent infringement with the knowledge of it. In such circumstances, the platform service provider may be held liable for joint torts under the Taiwan Civil Code.

It should be noted that, from the standpoint of platform service providers, considerable burden might be imposed on them if they are responsible to check every uploaded file so as to ensure that they do not infringe anyone's patent before printing out any 3D products. Even granted that it is technically possible, it would be prohibitively costly to do so and thus economically infeasible in most cases. If platform service providers were required to undertake responsibility for checking files in advance, or to face a potential risk of infringement liability accompanied by a threat of overwhelming litigation, they would be inclined to refrain from adopting this kind of business model, even though the infringing files might be a slight portion of the total files they host.³⁸ With the diminishing of this kind of business model, further development of non-infringing creative innovation based on 3D printing technology is likely to be hindered, for there would be no more intermediaries providing services for sharing and communicating legitimate designs. To avoid this unwanted consequence, some academic writers suggest that there should be a safe harbor for CAD file platform service providers to be exempted from infringement liability. A feasible proposal, for example, is a "notice and takedown" system in the patent law context that might serve the purposes.³⁹ On the other hand, it should not be

37. TURBOSQUID, <http://www.turbosquid.com/> (last visited Aug. 23, 2016).

38. See Holbrook & Osborn, *supra* note 27, at 1377-78 (describing effects on intermediaries if admitting additional liability for digital infringement).

39. See e.g., Davis Doherty, *Downloading Infringement: Patent Law as a Roadblock to the 3D*

neglected that notice and takedown provisions in the patent law context might have similar negative effects as in the copyright law context. The notice and takedown system might be abused, for instance, by creator's competitors, and lead to an unfavorable result of which non-infringing works are removed from hosting websites.⁴⁰

IV. RISE OF END-USER INFRINGEMENT AND ITS IMPACT ON THE PATENT ACT

Another serious issue emerging from the dissemination of 3D printing technology is the rise of end-user infringement. As analyzed in Part II., "personal manufacturing" is realized by virtue of 3D printing technology. With a personal 3D printer, consumers or amateur hobbyists can easily manufacture (print) almost anything at home, which provokes more patent law disputes that involve end users. With respect to this movement, according to Article 59(1)(i) of the Taiwan Patent Act,⁴¹ the exploitation of patented invention done privately and for non-commercial purposes does not constitute patent infringement. To be concrete, patent infringing liability may differ in the following situations: (1) stores or online platforms provide 3D printing services; (2) a user prints a patented product at home using its own 3D printer for commercial purposes, such as supporting her business; (3) a user prints a patented product at home with a personal 3D printer for personal use or as a hobby. In the case (1) and (2), the stores, online platforms, and user will be held liable for infringement. In contrast, the user in the case (3) may not constitute an infringement of the patent right under the current Taiwan Patent Act.

The original justification for the requirement of "private and non-commercial" use is based on:⁴² (1) concerns for transaction costs; (2)

Printing Revolution, 26 HARV. J.L. & TECH. 353, 365-68 (2012) (proposing a structure for DMCA style notice and takedown in the patent law context in the United States to solve the digital infringement issues arising from 3D printing); Deven R. Desai & Gerard N. Magliocca, *Patents, Meet Napster: 3D Printing and the Digitization of Things*, 102 GEO. L.J. 1691, 1718-19 (2014).

40. See Holbrook & Osborn, *supra* note 27, at 1378; *but cf.* Doherty, *id.* at 367-68 (contending that a patent-oriented version of notice and takedown is likely to function without the DMCA's weaknesses).

41. There are no such requirements or limitations imposed by the TRIPS Agreement (TRIPS: Agreement on Trade-Related Aspects of Intellectual Property Rights, Apr. 15, 1994, Marrakesh Agreement Establishing the World Trade Organization, Annex 1C, THE LEGAL TEXTS: THE RESULTS OF THE URUGUAY ROUND OF MULTILATERAL TRADE NEGOTIATIONS 320 (1999), 1869 U.N.T.S. 299, 33 I.L.M. 1197 (1994) [hereinafter TRIPS Agreement]). But the "private and non-commercial" limitation is within the scope of Article 30 of the TRIPS Agreement. Similar provisions on limitations of patent exclusive effects can be found in patent laws in Japan, Germany, England and France. By contrast, there are no infringement exemptions for private or non-commercial purpose in the United States. Some commentators recommends the U.S. Congress to create some infringement exemption for personal 3D printing. See *e.g.*, Desai & Magliocca, *supra* note 39, at 1713; Doherty, *supra* note 39, at 368-69.

42. Masabumi Suzuki, *Dai 68 Jō (Tokkyo-Ken No Kōryoku)* [Article 68: The Effect of Patent

considerations of the scale and economic effects of the situation where patented invention is worked by individual or within the family, the cost of negotiating for a license may be disproportionately high; (3) refraining from intervening in private individual activities; (4) lack of necessity of regulating the conduct of little economic value to patent holders under patent law. Nevertheless, with the rise of personal manufacturing, the case (3) is likely to mushroom in the near future, and patent holders may have a great risk of suffering a significant cumulative economic loss resulting from the very private use. The justification for the private use exemption therefore seems not necessarily adequate in terms of 3D printing, and might need to be adjusted after a thorough consideration on the “private and non-commercial” use involving 3D printing technology under the Patent Act.

When considering the impact of end user infringement on the Patent Act, it would be illuminating to conduct a comparative study on the limitation of reproduction for private use under copyright law. Specifically, the background of the private use exemption under the Patent Act bears a strong resemblance to that of the need to reconsider the limitation of reproduction for private use under copyright law.⁴³ With the advent of the digital era, an individual user can conveniently copy almost exactly the same copyrighted work at home at extremely low costs compared to the original one. It is observed that, in many cases, a strict enforcement of copyright protection limited the scope of personal activity in private to a large extent.⁴⁴ A comprehensive discussion is therefore essential to justify the enforcement or further expansion of copyright protection.⁴⁵

A noteworthy difference between copyright law and patent law in establishing infringement should be taken into consideration when discussing the impact of end-user infringement on the Patent Act. Under copyright law, a plaintiff is required to prove that the alleged infringing work is derived from the plaintiff’s work. In contrast to copyright law, patent law does not tolerate independent, accidental or unintentional exploitation of other’s patented invention. For example, the following two kinds of

Rights], in SHIN CHŪKAI TOKKYO-HŌ JŌKAN [NEW ANNOTATION OF PATENT ACT (1)] 1004, 1013-18 (Nobuhiro Nakayama & Naoki Koizumi eds., 2011).

43. For example, Zhezuoquan Fa (著作權法) [Taiwan Copyright Act] § 51 (promulgated and effective May 14, 1928, as amended Nov. 30, 2016) (Taiwan) provides: “Within a reasonable scope, where for nonprofit use by an individual or a family, a work that has been publicly released may be reproduced by a machine that is either located in a library or is not provided for public use.” This provision exempts the individual user to reproduce copyrighted works under some conditions (such as “withing a reasonable scope”, or the purpose of the reproduction shall be for nonprofit use).

44. Yoshiyuki Tamura, *Rethinking Copyright Institution for the Digital Age*, 1 W.I.P.O.J. 63, 68 (2009) (describing that since the emergence and dissemination of digital technologies and internet, copyright laws have been influencing many activities of private individuals that was once considered lawful in the analog era).

45. *Id.* at 68 (suggesting a more cautious approach to address controversies brought by digital reproduction and telecommunications technologies in the copyright law context).

scenarios could be envisaged. First, a user coincidentally designed a device that falls into the scope of other's patented claim, and made some prototypes of the device with a personal 3D printer. Second, following the first scenario, the user distributed the CAD file of her device through an online hosting platform, and a hobbyist surfed the website, downloaded the CAD file, and printed it out at home. In these two hypothetical scenarios imagined based on daily lives related to copyright, none of the parties involved have knowledge of the existence of the relevant patent, but the act of making product falling into the scope of the patent still constitutes patent infringement, and the court may grant injunctive relief to cease such an infringement under the Taiwan Patent Act, unless statutory limitations to patent rights are applicable.⁴⁶ Therefore, if the provision of "private and non-commercial" limitation was removed, inadvertent independent inventors or 3D printer users would be likely to be held liable for infringement without knowing they were infringing.⁴⁷

In response to the prevalent end user infringement resulting from the mature of 3D printing technology, some may argue that there is an urgent need to narrow down the scope of the "private and non-commercial" limitation in order to maintain patent holders' incentives to innovate. However, in the light of the above-mentioned difference in copyright and patent infringement, we should be even more prudent to expand patent exclusivity to cover private conduct than what we have done in the field of copyright law. Considering that the knowledge or intention of defendant is not relevant in establishing a patent infringement, expansion of patent right to include private and non-commercial activities might put innocent designers or hobbyists at the risk of patent infringement litigation. This would bring about a chilling effect on 3D printing communities, and stunt the creation and sharing of legitimate 3D designs and products as an unintended consequence.⁴⁸

46. See Zhuanli Fa (專利法) [Patent Act] § 96, para. 1 (promulgated May 29, 1944, as amended Jan. 18, 2017) (Taiwan). However, only in case an infringement of invention patent occurs due to intentional act or negligence, the patentee may claim for damages suffered therefrom.

47. Doherty, *supra* note 39, at 368-69 (proposing a novel defense in patent law in the United States for innocent independent inventor who (1) had no actual knowledge of the patent at issue, and (2) was not making commercial use of the patented invention). The background of this proposal is that there is no private and non-commercial exemption in the current U.S. patent law.

48. Nari Lee, *Revisiting the Principle of Technological Neutrality in Patent Protection in the Age of 3D Printing Technology and Cloud Computing*, in TRIPS PLUS 20: FROM TRADE RULES TO MARKET PRINCIPLES 361, 386 (Hanns Ullrich et al. eds., 2016), http://dx.doi.org/10.1007/978-3-662-48107-3_11 ("Overinclusiveness in the exclusive rights of patents based on unsubstantiated fear of vast infringement may hinder innovation."); Sklyer R. Peacock, *Why Manufacturing Matters: 3D Printing, Computer-Aided Designs, and the Rise of End-User Patent Infringement*, 55 WM. & MARY L. REV. 1933, 1960 (2014) ("To insist on the artificial suppression of 3D printing would needlessly lead to market inefficiencies and waste.").

V. CONCLUSION

With the challenges posed by 3D printing technology, patent law is currently confronted with a policy dilemma: how should patent law respond to these emerging issues, such as making a patented product from its digital format? And how to tackle the issue of private and non-commercial exploitation of patents? Legislators need to ensure the effectiveness of patent law to provide incentives for innovation and disclosure of invention. On the other hand, an overbroad expansion of patent protection might leave insufficient room for private and non-commercial use, and accordingly stifle legitimate development of 3D printing technology.

It is clearly observed that the main focus of 3D printing industry has been shifting from low-end, consumer-oriented 3D printers to high-end printers for business purposes.⁴⁹ Although the dream of every household having a 3D printer might not come true in the coming years, the flourishing business of 3D printing technology presents a timely opportunity to reflect on the role and scope of patent protection. The main purpose of granting exclusive patent right is to incentivize innovation. In the case of 3D printing technology, it seems that the expiration of essential patents, along with the various open source projects, is the primary reason that 3D printing technology has been boosted in the first place. In view of this point, expansion of exclusive patent protection against 3D printing technology requires strong justification and should be dealt with caution. In order to acknowledge the influence of the 3D printing technology on innovation and the related industries, more empirical studies are needed.

A patent holder can embrace 3D printing technology as a chance to develop and dominate a brand-new niche market, or she can consider this as a crisis and aggressively lobby for reinforcement of patent protection, as many copyright holders have done so far. In light of the copyright holders' experience of struggling with prevalent internet piracy, it might be a more viable strategy for patent holders to compete with private manufacturers in a market, rather than to employ every means to curb private activities beforehand.

49. Arvind Dilawar, *The 3-D Printing Bubble May Have Burst*, NEWSWEEK (June 13, 2016, 10:35 AM), <http://www.newsweek.com/2016/06/24/3d-printing-makerbot-stratasys-469704.html> (stating that the 3D printing industry peaked on January 3, 2014, then declined dramatically afterward, and the problems with lowcost printers have led 3D printing industry to refocus on more expensive models designed for business).

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自造者或侵權人？ 3D列印技術與專利侵權責任： 以臺灣法為中心

陳 皓 芸

摘 要

本文探討涉及3D列印之專利侵權相關爭議，並嘗試分析專利權保護與專利法第59條第1項第1款非商業目的之未公開行為的豁免規定間的潛在衝突。

3D列印所具備之下列二點特徵，已在專利法制中引起波瀾。首先，3D列印實現了「數位製造」與「虛擬物體」的傳輸；其次，3D列印機的普及，促進「個人製造」的勃興。「數位製造」與「虛擬物體」的傳輸，使得專利權侵害更易於使用者社群中發生；而「個人製造」則是得力於3D列印機的小型化以及網上3D列印檔案分享平台的興起，則於專利權侵害發生之際，相關使用者及平台管理者的責任為何，即值探究。

本文立基於3D列印的前述特徵，以臺灣專利法為背景，分析涉及3D列印的相關侵權議題。於簡述3D列印的法律爭議以及3D列印的製造流程後，本文試圖釐清於涉及3D列印的情形下，利害關係人於行為各階段牽涉的法律責任，並就數位時代下，終端消費者易構成專利侵權此一趨勢及其因應，略抒己見。

關鍵詞：3D列印、積層製造、電腦輔助設計、專利、專利侵權、共同侵權