Patent Law in the Era of 3D Printing: The Practitioner's Perspective

Constantin Blanke-Roeser

1 Introduction

3D printing is a technology which may change the traditional structure of production and distribution chains in the future (Bechtold, 2016). But as the costs not only for the printers but also for the materials to be used have been fallen drastically in the recent past, it can be expected that an increasing number of private users will be able to use 3D printing technologies (Benkard, 2015). This may be relevant regarding patented products, as well as Intellectual Property law including patent law in general (Schulze & Staudenmeier, 2015), since a growing number of private users will be able to produce patent protected products at home or order them at local printing services or shops in their neighborhood (Nordemann, Rüberg, & Schaefer, 2015). On the other hand, 3D printing is a useful device for *FabLabs*, allowing to produce prototypes or end products, as the result of creative collaborations.

This paper focuses on patent law as the IP law most particularly affected by 3D printing. The first section of this paper introduces the basics of the technical background as well as of the current patent legal framework in Germany. It also gives an overview on how and where patents can be received and on the requirements for patentability. The second section concretely examines possible infringements of existing patents in the context of 3D printing, which should be avoided. As this article addresses practitioners, it provides examples in order to demonstrate the practical relevance.

C. Blanke-Roeser (✉)
Bucerius Law School: Center for Transnational IP, Media and Technology Law and Policy, Hamburg, Germany
e-mail: constantin.blanke-roeser@law-school.de

© Springer Nature Switzerland AG 2019

T. Redlich et al. (eds.), *Co-Creation*, Management for Professionals,
https://doi.org/10.1007/978-3-319-97788-1_13

2 Basics

2.1 3D Printing

The term 3D printing summarizes several technologies which produce three-dimensional objects. 3D printers use various materials, which are, after a melting process, applied to a platform, with a solid end object consisting of multiple layers (Zukas & Zukas, 2015). The technology is described more precisely by the term *additive manufacturing* (Nordemann et al., 2015).

The printing process functions on the ground of a template comprising the necessary information, the so-called *Computer-aided design* (CAD) file. These files may be produced in different ways. First, they may be newly designed by means of specific software or a 3D scanner which scans existing objects (Nordemann et al., 2015). Second, CAD files can be downloaded online, mainly from specialized online platforms (Schmoll, Ballestrem, Hellenbrand, & Soppe, 2015). The 3D printers which are used in private households are still comparably simple. However, in the near future, more versatile and even cheaper machines will be developed (Bechtold, 2016). Another option for consumers is to have the products printed by professional 3D printing services that can afford more complex technologies.

2.2 Patent Law and Legal Framework in Germany

General Principles of Patent Law
Patents are exclusive rights which protect technical inventions. They are granted by national authorities and provide their owners with legal monopolies, allowing them to use the invention exclusively—themselves or by e.g. granting a license—, as well as to exclude others from using it within the territorial scope of the patent (Kraßer & Ann, 2016) for a limited period of time (20 years for German and European patents). This is essential because inventions, as immaterial ideas, are intangible goods which—in contrast to tangible goods—are ubiquitous and non-rival, meaning that multiple users could use them simultaneously at different places without reducing their amount. The legal monopoly artificially makes the invention scarce, transforming it into a marketable good (Haedicke, 2013). Patent law aims at fostering innovation, as the legal monopoly is an incentive for inventors, as it allows them to amortize the time and money invested in the research.

Legal Framework in Germany
Currently, the legal framework in Germany provides two types of patents: the *national patent* on the basis of the German Patent Act (Patentgesetz, PatG) and the *European patent* on the ground of the European Patent Convention (EPC). Counterintuitively, European patents grant protection only for several particular states to be chosen by the applicants (therefore, they are often called *bundle* of national patents) (Fitzner, Lutz, & Bodewig, 2012, PatG, Einl.).

The German patent is granted by the German Patent and Trademark Office (Deutsches Patent- und Markenamt, DPMA), based in Munich. First, the DPMA examines whether the requirements for patentability are given: Patents shall be granted for any inventions, in all fields of technology, provided that they are new, involve an inventive step and are susceptible of industrial application. After a patent has been granted, a declaration is entered in the German register for patents, as well as published in the Patent Gazette. At that very moment, it comes into force, with all its legal effects.

The European patent is granted by the European Patent Office (EPO), also based in Munich, with the procedures and requirements for patentability being equivalent to those for German patents for most steps.

Soon, inventors will be able to opt for a further type of patent, the so-called European patent with Unitary effect (*Unitary patent*), see also Table 1. These patents will cover the entire territory of the participating EU Member States (so far, not all member states are willing to join the new system). Unitary patents will also be granted by the EPO, with the procedure being equivalent to that for European patents for the most part. For Unitary patents, a specific legal framework has been designed: the *patent package*. It comprises two EU regulations[1] and the international Agreement on a Unified Patent Court (UPCA). The UPCA still lacks ratification by more Member States, before the whole package will be set into force (Grabinski, 2013).

Despite the ongoing "Brexit" preparations, the United Kingdom will probably participate in the system, which will require some minor legal exceptions allowing for a (future) non-EU member state to remain in it (see Haberl & Schallmoser, 2017). Germany has not yet ratified the UPCA because the national laws designed to implement it into national law are currently object of a constitutional complaint before the German Federal Constitutional Court. If the Court rejects the complaint—which is likely—, Germany is probably going to ratify the UPCA in the course of 2018, as the last mandatory ratifying participating Member state. This would be the starting point for the entry into force of the whole patent package. The UPCA will then, as national law, apply to classic European patents as well.

Table 1 Three types of patents in Europe (future)

National patent	European patent	Unitary patent
• Legal basis: national law (e.g. PatG in Germany) • Granted by the DPMA	• Legal basis: EPC, national law ("bundle of national patents") • Granted by the EPO	• Legal basis: Patent package, EPC • Granted by the EPO

[1] "Regulation (EU) No 1257/2012 of 17 December 2012 implementing enhanced cooperation in the area of the creation of Unitary patent protection" (EPUE-Reg) and "Regulation (EU) No 1260/2012 of 17 December 2012 implementing enhanced cooperation in the area of the creation of Unitary patent protection with regard to the applicable translation agreements" (EPUET-Reg).

2.3 Interim Result

Technical inventions can be protected by patents if they fulfill the requirements for patentability. In that case, an application for a patent should be submitted with the help of a patent attorney at the patent office (e.g. the DPMA for German patents) or the EPO (for European and Unitary patents). Patent infringements can be pursued in the relevant national courts, respectively in the upcoming *Unified Patent Court* (UPC) in case of European and Unitary patents.

3 Possible Infringements in the Context of 3D Printing

This section focuses on possible infringements of *existing* patents of other rights owners. Therefore, it examines the infringing potential of the most relevant actions in the context of 3D printing. For that purpose, the three types of patents (German patent, European patent and Unitary patent) are differentiated.

As a basic recommendation, in a first step, a research in the relevant registers, which are accessible online on the websites of DPMA[2] and EPO[3], on whether a specific technical invention is patented, is recommendable. However, this offers only insufficient security, given how many patents exist, even cumulatively in many (complex) products.

3.1 German Patents

The PatG differentiates between patents on objects and procedures, with objects being more relevant in the given context. According to sec. 9 s. 2 no. 1 PatG, third parties are not allowed to manufacture, offer, or use a product that falls under the subject-matter of a patent, nor to place it onto the market, nor to import or possess such a product for one of these purposes (so-called *direct* infringement). Moreover, there is *indirect* infringement (sec. 10 PatG, see III.1.b) for details). In the context of 3D printing, there are numerous actions happening which are possibly relevant for patent law (see Fig. 1). The most important ones are going to be discussed in the following sections.

Manufacturing and Distribution of Objects
Reproducing objects which fall into the subject-matter of patents by producing them via a 3D printer would constitute manufacturing in the sense of direct use of the patent (sec. 9 s. 2 no. 1 PatG), unless the technological features of the end product significantly differ from those of the original one (Nordemann et al., 2015). Without the rights owner's permission, this would constitute direct patent infringement.

[2] See https://register.dpma.de/DPMAregister/Uebersicht?lang=en

[3] See https://register.epo.org/regviewer?lng=en

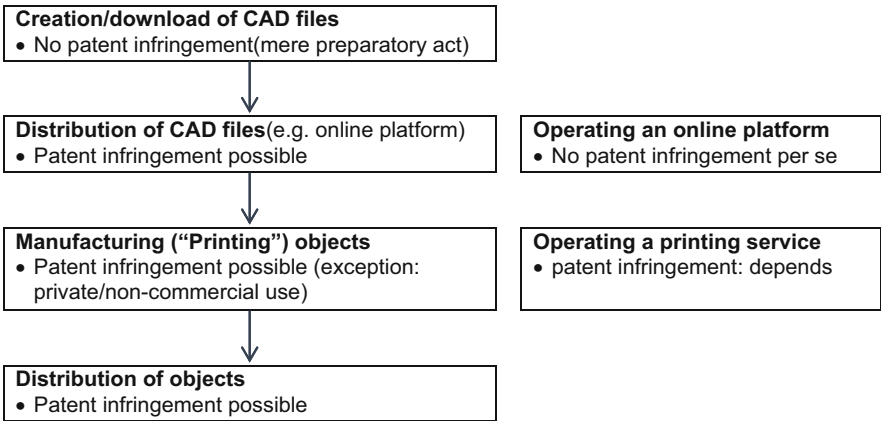

Fig. 1 Actions and potential infringements related to 3D printing (German law) (author's own illustration)

Example

A Berlin-based start-up produces a patented small engine that had originally been invented for model railways, after they had downloaded the CAD file for it from an online platform. They reproduce it several times (manufacturing) and integrate it into an enthusiast app-controlled model car whose design can be shaped individually by customers online. Afterwards, they have the cars shipped to the latter (putting into the market).

Exceptionally, the use is legal (no patent infringement), if it occurs in private environment and for non-commercial use (sec. 11 no. 1 PatG). This exception is not limited quantitatively (Schmoll et al., 2015), which is relevant especially for wear parts. Furthermore, this also applies to the production by third parties (e.g. print services), if this serves the private user in the end (Schmoll et al., 2015). However, the two prerequisites constitute a relevant obstacle (Benkard, 2015, § 10). First, the *private area* is restricted to the personal environment and needs of the persons acting or at least to those related to them (Haedicke & Zech, 2014), e.g. for home settings or leisure activities (Schmoll et al., 2015). Second, the term *non-commercial use* means that nothing can be earned in return (Schmoll et al., 2015).

By contrast, handing a product to somebody else without any consideration after having the product used privately for a certain amount of time would still be non-commercial. A controverted question is whether selling a product to a third person after a period of private use is still non-commercial use. Some scholars deny that. However, as the product becomes a used one after the period of private use, the transfer should be classified as non-commercial in the absence of additional circumstances in the individual case (for all, cf. also Blanke-Roeser, 2017), e.g. if such actions do not happen repeatedly by the same person in a similar manner (for the whole section, see Benkard, 2015, § 10).

Example

Two members of a social project reproduce a patented water filter repeatedly with the best intention and send the new filters gratuitously to people in need. This does not fall under the exception of sec. 11 no. 1 PatG because it leaves the private area.

In contrast, *professional printing services* which manufacture products for private customers ("manufacturing on demand") do not fall under sec. 11 no. 1 PatG (direct infringement, cf. Düsseldorf Higher Regional Court, InstGE 7, 258—Loom-Möbel), as from their perspective the invention is neither used privately nor non-commercially.

Actions Related to CAD Files

The first relevant action in the context of CAD files is creating and distributing them. The second main action is downloading CAD files which already exist.

Distributing a CAD—e.g. uploading it to a relevant online platform or re-sending it to individual persons by email—is no direct infringement, as patent law generally aims at fostering innovation, not at hampering the spread of information (Haedicke & Zech, 2014). However, the distribution of CAD files may *indirectly* infringe patents in the sense of sec. 10(1) PatG (Schmoll et al., 2015). According to the latter, patents shall further have the effect that any third party shall be prohibited, in the absence of the consent of the proprietor of the patent, from supplying or offering to supply, within the territorial scope of the PatG, persons other than those entitled to exploit the patented invention with means relating to an essential element of the invention for use within the territorial scope of the PatG if the third party knows or if it is obvious from the circumstances that those means are suitable and intended for using that invention. The upload of a CAD file constitutes *offering to supply* (Nordemann et al., 2015). Directly forwarding it to certain recipients constitutes more than merely offering, it constitutes *supplying*. Although traditionally, the term "means" was understood merely in a material way, covering e.g. hard copies of construction plans (Schmoll et al., 2015), it should cover immaterial (CAD) files in a contemporary interpretation (Mes, 2015, § 10).

A teleological view urges a broad interpretation which generally covers digital files. In most business and private contexts today, documents are likely to be forwarded digitally. Furthermore, forwarding digital files is more dangerous to rights owners, as it allows multiple patent infringements at the same time (Haedicke & Zech, 2014). Moreover, the other prerequisites of sec. 10(1) PatG are satisfied when CAD files are uploaded or forwarded. A CAD file *relates to an essential element of the invention*. In a modern understanding of "means", it is not required that the means is bodily integrated into the new product itself nor that it has or could have a technical function (Haedicke & Zech, 2014). It should be sufficient that a CAD file not only contains information on every parameter of the particular product, technically forming the basis and necessary condition for its production (Schmoll et al., 2015). Lastly, the third party also *knows* in the sense of Art. 10(1) PatG that the

particular CAD file is suitable and intended for using that invention if he displays that in an advertisement (Schmoll et al., 2015), e.g. by naming the file accordingly. At least, the file's suitability for such a use is *obvious from the circumstances*. To sum it up, uploading or forwarding CAD files that contain the information ready to print a patented product indirectly infringes that patent.

However, forwarding a CAD file gratuitously and only to related persons may be allowed under the above-mentioned exception of sec. 11 no. 1 PatG, too (Nordemann et al., 2015). By contrast, uploading files to online platforms always exceeds the private area, and is therefore always illegal (Haedicke & Zech, 2014).

On the other hand, *creating* a CAD file is a mere preparation for a possible later infringing use, and is irrelevant under patent law (Mengden, 2014). The same applies to *downloading* an existing CAD file. However, further spreading the CAD file would be an indirect infringement—equivalent to spreading self-made CAD-files (see above) [disagreeing Mengden, 2014].

Example

It is legal to design a CAD file that contains the exact sketch of a patented water pump and all information for its production by means of 3D printing. However, uploading this file to the website or blog of a co-creation project without the rights owner's permission is illegal, even if it happens in the course of a social project.

Providing an online platform where CAD files can be downloaded does not even fall under sec. 10(1) PatG [disagreeing Mengden, 2014]. Platforms cannot be subsumed under the term "means", even given the above-mentioned contemporary interpretation. Furthermore, platforms do not relate to an essential element of the *invention* [disagreeing Mengden, 2014]. Third, the subjective side (knowledge or obviousness from the circumstances) could only be assumed if the relevant platform is limited to CAD files on products covered by the subject matter of patents. This will probably remain an exception.

3.2 European Patents

The EPC contains only few substantive rules. For most substantive questions, it refers to the specific national laws of those Member states of the European Patent Organization (EPO) which were selected in the application for the particular patent (Art. 2(2) EPC) (Fitzner et al., 2012, EPÜ, Art. 2). Therefore, in case of the German part of a European patent, the same German national rules apply. Thus, the above-mentioned results for German patents can be transferred to European Patents. Consistently, however, for the other national parts of the European patent bundle, the other particular national laws apply, resulting in differences in some aspects.

For example, some national patent laws lack exclusions comparable to the German sec. 11 no. 1 PatG (for details, see Bechtold, 2016) which can lead to different results to German law so far. However, in the near future, the UPCA will

apply to European patents as well, becoming part of national laws after its implementation by the Member states participating in the Unitary patent system (see Art. 84(2) UPCA) (Haedicke, 2013). The UPCA contains rules very similar to those under German law, including an exception for private and non-commercial use (see next section) which is comparable to sec. 11 no. 1 PatG. Therefore, the mandatory implementation of the UPCA into the national laws of the participating member states will lead to a further harmonization, making the differences in crucial questions marginal.

3.3 European Patents with Unitary Effect (Unitary Patents)

Art. 5(3) EPUE-Reg (to be read in accordance with Art. 7 EPUE-Reg) defines the law applicable for the scope of protection of Unitary patents and their exceptions. The reference includes Art. 25 et seq. UPCA (Haedicke, 2013). Art. 25 UPCA contains regulations on direct use, Art. 26 on indirect use of patented inventions. Art. 27 UPCA determines exceptions for the protection. Art. 25 to 27 UPCA correspond to their German counterparts in sec. 9–11 PatG (Romandini, Hilty, & Lamping, 2016). E.g., Art. 27 lit. a UPCA has almost the same wording as sec. 11 no. 1 PatG. At first sight, the results for German national patents would also apply to Unitary patents.

However, the UPCA will be interpreted by the UPC, a court common to the Contracting Member States (Art. 1 UPCA). This court will comprise multinational instances (cf. Art. 8 et seq. UPCA), aiming to elaborate autonomous interpretations independent from particular national legal traditions. In addition, the material law of UPCA must be interpreted according to EU law although, in a strict sense, it is a mere international treaty. This is because Art. 5(3) EPUE-Reg constitutes an incorporating referral (Haedicke, 2013). Therefore, the past and future jurisdiction of the European Court of Justice (CJEU) must be respected, the UPC will even be allowed to start preliminary rulings with the CJEU (see Haedicke, 2013, for the whole section). Thus, it is not clear whether Art. 25 et seq. UPCA will be interpreted in the way elaborated above for German law or whether the UPC's interpretation will differ in specific questions (cf. Romandini et al., 2016).

4 Limits of the Current Legal Framework

The distribution of 3D printing technologies, especially in private households, challenges patent law and displays its limits (similar Bechtold, 2016). Firstly, as many inventions are not protected under patent law, the legal framework is limited, either because the inventions fail to fulfil the prerequisites for patentability or because the term of the patent has already expired. This is no specific problem of 3D printing. But as examined above, even the use of a patented invention does not infringe the relevant patent in many cases. The underlying cause is that the possibly

infringing acts are split up into partial acts which do not constitute a use of the patent and thus not an infringement (Haedicke & Zech, 2014).

The 3D printing "society" is complex and comprises many participants, such as creators of CAD files, providers of online platforms, or private households. But even enforcing existing legal claims (cf. § 139 PatG, resp. Art. 63(1) and Art. 68 (1) UPCA) is difficult due to *practical* factors (Bechtold, 2016): Firstly, tracing direct infringers is difficult and expensive in the digital environment where CAD files are rapidly distributed (Doherty, 2012). Secondly, many actions happen in private households which are not observable (Haedicke & Zech, 2014). Thirdly, lawsuits are risky, especially for European patents, where various parallel lawsuits in different participating states may be necessary (Bechtold, 2016).

To improve the rights owners' position, various approaches to tighten the patent law framework have been discussed. However, at least in near future, concrete changes are improbable and not recommendable under German or European law, as the current legal framework balances the conflicting interests appropriately.

5 Summary

3D printing is an important technology which will impose relevant changes to traditional production and distribution chains in future. It constitutes a great opportunity for new value creation strategies, especially in a setting of co-creation, as it allows for bridging the digital to the material world. However, creators should be aware that they have to respect existing patents, as patent infringements may lead to significantly detrimental legal consequences. While the design of CAD files or the 3D scan of an existing object are irrelevant preparatory acts, spreading or uploading such files may constitute indirect infringements. 3D printing objects even constitutes a direct infringement. On the other hand, new technical inventions can be protected by own patents. In the future, three types of patents will available: national patents, classical European patents and Unitary patents.

This paper is based on a more recent and longer contribution published in the Journal Gewerblicher Rechtsschutz und Urheberrecht (GRUR), 2017, pp. 467–475 (for details, see list of references). It is introductory and reflects personal legal opinions which can vary from those of future jurisdiction. Reading the paper does not replace individual legal advice by a specialized lawyer in every single case.

References

Bechtold, S. (2016). 3D printing, intellectual property and innovation policy. *International Review of Intellectual Property and Competition Law, 47*(5), 517–536.

Benkard, G. (2015). Patentgesetz: PatG, Gebrauchsmustergesetz, Patentkostengesetz (11). Munich: C.H. Beck.

Blanke-Roeser, C. (2017). 3D-Druck und das Patentrecht in Europa. Die Grenzen des geltenden Rechts und des zukünftigen Einheitspatents sowie alternative Lösungsansätze. *Gewerblicher Rechtsschutz und Urheberrecht, 119*(5), 467–475.

Doherty, D. (2012). Downloading infringement: Patent law as a roadblock to the 3D printing revolution. *Harvard Journal of Law and Technology, 26*, 353–373.

Fitzner, U., Lutz, R., & Bodewig, T. (2012). *Patentrechtskommentar. PatG, GebrMG, IntPatÜG, PCT und EPÜ mit Nebenvorschriften* (4th ed.). Munich: C.H. Beck.

Grabinski, K. (2013). Der Entwurf der Verfahrensordnung für das Einheitliche Patentgericht im Überblick. *Gewerblicher Rechtsschutz und Urheberrecht Internationaler Teil, 62*(4), 310–321.

Haberl, A., & Schallmoser, K. (2017). Einheitliches Patentgericht startet im Dezember 2017 – Vorläufige Anwendung ab Mai 2017 geplant. *Gewerblicher Rechtsschutz und Urheberrecht Praxis im Immaterialgüter- und Wettbewerbsrecht, 9*, 70–71.

Haedicke, M. (2013). Rechtsfindung, Rechtsfortbildung und Rechtskontrolle im Einheitlichen Patentsystem. *Gewerblicher Rechtsschutz und Urheberrecht Internationaler Teil, 62*(7), 609–617.

Haedicke, M., & Zech, H. (2014). Technische Erfindungen in einer vernetzten Welt. Das Internet als Herausforderung für das Patentrecht. *Gewerblicher Rechtsschutz und Urheberrecht-Beilage, 116*(1), 52–57.

Kraßer, R., & Ann, C. (2016). *Patentrecht. Lehrbuch zum deutschen und europäischen Patentrecht und Gebrauchsmusterrecht* (7th ed.). Munich: C.H. Beck.

Mengden, M. (2014). 3D-Druck – Droht eine "Urheberrechtskrise 2.0"? Schutzumfang und drohende Rechtsverletzungen auf dem Prüfstand. *MultiMedia und Recht, 17*(2), 79–85.

Mes, P. (2015). *Patentgesetz, Gebrauchsmustergesetz: PatG, GebrMG. Kommentar* (4th ed.). Munich: C.H. Beck.

Nordemann, J. B., Rüberg, M., & Schaefer, M. (2015). 3D-Druck als Herausforderung für die Immaterialgüterrechte. *Neue Juristische Wochenschrift, 68*(18), 1265–1271.

Romandini, R., Hilty, R., & Lamping, M. (2016). Stellungnahme zum Referentenentwurf eines Gesetzes zur Anpassung patentrechtlicher Vorschriften auf Grund der europäischen Patentreform. *Gewerblicher Rechtsschutz und Urheberrecht Internationaler Teil, 65*(6), 554–560.

Schmoll, A., Ballestrem, J., Hellenbrand, J., & Soppe, M. (2015). Dreidimensionales Drucken und die vier Dimensionen des Immaterialgüterrechts. Ein Überblick über Fragestellungen des Urheber-, Design-, Patent- und Markenrechts beim 3D-Druck. *Gewerblicher Rechtsschutz und Urheberrecht, 117*(11), 1041–1050.

Schulze, R., & Staudenmeier, D. (2015). Digital revolution: Challenges for contract law in practice. *Journal of European Consumer and Market Law, 4*(6), 215–216.

Zukas, V., & Zukas, J. A. (2015). *An introduction to 3D printing*. Sarasota, FL: First Edition Design Publishing.

Constantin Blanke-Roeser is a trainee lawyer at the Hanseatic Higher Regional Court in Hamburg. He studied law at Bucerius Law School, Hamburg (Germany), and Stellenbosch University, South Africa, as well as medicine at the University of Hamburg and the Universidade Federal do Ceará (Fortaleza, Brazil). His research is focused on IP law, and on medical law.