

Chapter Five

3D printing and patent law – a UK perspective: apt and ready?

Marc D Mimler

(ORCID: 0000-0002-9457-2506)

Abstract:

The impact of 3D printing on business models that are based on protection by design rights and copyright has been widely acknowledged. Since the technology is rapidly developing, its effects may also be felt within industries that rely on patent protection. This chapter traces how the law of patent infringement in the United Kingdom applies to 3D printing scenarios. It analyses the different stages of 3D printing and whether these may lead to direct and indirect infringement. It also sheds light on how exceptions to patent infringement currently apply to 3D printing. The chapter concludes that the law of patents in the UK is currently better equipped to deal with impact of 3D printing technology than other intellectual property right but argues for interpretive clarifications by the courts as well as possible legislative action in the near future.

Keywords:

3D printing, patent law, United Kingdom, patent infringement, CAD file, exceptions to patent infringement

1. Introduction

Intuitively, one might assume that cases where 3D printing technology could conflict with intellectual property rights would generally occur in the fields of copyright, designs and trade marks.¹ This may be caused by the fact that the objects currently produced by 3D

¹ Marc Mimler, '3D printing, the Internet and Patent Law – A History repeating?' [2013] *Rivista di Diritto Industriale* 352, 357; Rosa Maria Ballardini and others, 'Enforcing patents in the era of 3D

printers are more of a decorative nature. Conversely, patented products are generally perceived to receive protection because of their functional properties.² Therefore, one could believe that patent holders will only marginally be affected by this emerging technology. But it has been argued that 3D printing could already affect patent protection. Patented products, such as the 'Anyway-Up' cup³ or the Croc shoe⁴ could potentially be reproduced by using 3D printing technology. Furthermore, it needs to be borne in mind that 3D printing is a rapidly developing technology. As 3D printing continues to expand, the ability to replicate patented functions of a product will also increase.⁵

The aim of this chapter is to shed some light on the possible ramifications that 3D printing has on the law of patents in the United Kingdom (UK). While UK patent law is genuinely national, it owes its current form very much to efforts to harmonise patent law in Europe. Hence, careful analogies to other European patent jurisdictions and the future patent with unitary effect may be drawn from the following analysis. The focus of this chapter will be on how the law of direct and indirect patent infringement may be affected by 3D printing and the different acts that are applicable in the context of 3D printing will be analysed with respect to their potential liability for patent infringement. Additionally, the important issue of whether exceptions to patent infringement may apply when a patented product is replicated by 3D printers will be discussed.

2. UK patent law

The UK Patents Act 1977 is the primary piece of legislation in the UK in relation to patent law. As is the case with many other national patent acts in Europe, much of its substantive provisions derive from European and international initiatives within the field of patent law.⁶ The substantive provisions in relation to patentability derive from the European

printing' [2015] *Journal of Intellectual Property Law and Practice* 850, 851; Iona Silverman, 'Optimising Protection: IP Rights in 3D Printing' [2016] *European Intellectual Property Review* 5, 6

² Christopher Buccafusco and Mark A. Lemley, "Functionality Screens" (December 20, 2016). Stanford Public Law Working Paper No. 2888094; Cardozo Legal Studies Research Paper No. 509, 1-2. <<https://ssrn.com/abstract=2888094> or <http://dx.doi.org/10.2139/ssrn.2888094>>

³ Simon Bradshaw and others, 'The Intellectual Property Implications of Low-Cost 3D Printing' [2010] *Script-ed* 5, 26

⁴ Mimler (n 1) 357

⁵ *ibid* 357; Ballardini and others (n 1) 851

⁶ Colin Birss and others, *Terrell on the Law of Patents* (18th edn, Sweet & Maxwell 2016) para 1-32

Patent Convention (EPC) 1973.⁷ Since the EPC did not govern the post-grant phase of patents, national legislators applied the templates of the Luxembourg Convention 1975 more commonly referred to as the Community Patent Convention 1975 (hereinafter CPC 1975) with regards to patent infringement and exceptions thereto.⁸ British patent law embraces the international heritage of many of its substantive provisions because of section 130(7) of the UK Patents Act 1977. This provision mandates that certain provisions with regards to patentability, infringement and exceptions thereof are to be 'framed as to have, as nearly as practicable, the same effects in the United Kingdom as the corresponding provisions of the European Patent Convention, the Community Patent Convention and the Patent Co-operation Treaty have in the territories to which those Conventions apply.'

The UK has expressed its wish to take part in the *Unitary Patent Package*.⁹ This initiative was launched by most EU Member States and envisaged to establish a unitary patent right within the participating states along with a system of common adjudication. This would mean that protection by so-called patents with unitary effect would be available for applicants after examination by the European Patent Office.¹⁰ Such patents, along with the current bundle patents¹¹ would then be enforced by a new court system, i.e., the Unified Patent Court (UPC).¹² The implementation of this system is currently stalled due to a constitutional complaint before the German Federal Constitutional Court¹³ and the political ramifications of the referendum on leaving the European Union of 23 June 2016, though the

⁷ 'Resolution on the Adjustment of National Patent Law Records of the Luxembourg Conference on the Community patent 1975' in Records of the Luxembourg Conference on the Community patent 1975 (Office for Official Publications of the European Communities 1982) 332

⁸ *ibid* 332

⁹ See Luke McDonagh, *European Patent Litigation in the Shadow of the Unified Patent Court* (Edward Elgar 2016) 79-119; Justine Pila, 'An Historical Perspective: The Unitary Patent Package' in Justine Pila & Christopher Wadlow (ed), *Perspectives on the Unitary (EU) Patent System* (Hart Publishing 2015) 9. The so-called patent package includes three legislative measures: 2 Regulations (Regulation (EU) No 1257/2012 of the European Parliament and of the Council of 17 December 2012 implementing enhanced cooperation in the area of the creation of unitary patent protection, OJ L361/1 (31 December 2012)- hereafter: UPR; 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 arrangements, OJ L361/89 (32 December 2012) and an international agreement between the participating Member States with regards of establishing a Unified Patent Court (Agreement on a Unified Patent Court (2013/C 175/01), hereafter (UPCA))

¹⁰ UPR, art 4(1)

¹¹ The European Patent Office provides a centralised application procedure. However, rather than obtaining a unitary European patent right, applicants currently obtain a bundle of individual national patent rights designated by them within Contracting States of the European Patent Convention (EPC)

¹² UPCA, art 1

¹³ <<http://kluwerpatentblog.com/2017/06/13/breaking-news-germanys-federal-constitutional-court-pulls-emergency-break-upc-agreement/>> accessed 5 December 2017

UK Government has recently ratified the Agreement on the Unified Patent Court to participate even as non EU Member.¹⁴

3. Patent infringement

Direct and indirect patent infringement are regulated by sections 60 (1) & (2) of the UK Patents Act 1977. However, before embarking on an analysis of the individual provisions, it is useful to first differentiate the potentially infringing acts that may occur by using 3D printing technology. The following acts are relevant: (1) scanning and digitisation of the patented object, (2) uploading such a 3DPDF¹⁵ to an online platform, (3) hosting and disseminating such 3DPDFs online, (4) the actual printing of a patented product and (5) the distribution of such a product.

The significant challenge that arises with 3D printing in this context is the fact that it pushes the discussion of mass digitisation into the ambit of industrial property rights. Copyright law, on the other hand, has had to address this phenomenon for quite some time now and has addressed it by either interpreting existing law to cover such issues as online file sharing,¹⁶ as well as by introducing new legislative measures.¹⁷ Similarly to the effect that digitisation has had on copyright law, 3D printing could represent a disruptive technology for patent law. The potential mass distribution that the internet enables could have a serious impact on the business models of right holders, especially when mass domestic use of 3D printing arrives.¹⁸ The digital representation of a patented invention – the 3DPDF - can easily be created by scanning a product¹⁹ and can then 'be easily modified, distributed, and printed out via a 3D printer.'²⁰ This could mean that 'people can print the physical object in the privacy of their office or home without the need to purchase the physical device from a

¹⁴ <<https://www.gov.uk/government/news/uk-ratifies-the-unified-patent-court-agreement>> accessed 23 May 2018

¹⁵ Bradshaw et al use the term "3DPDF" for the file that is used to instruct the 3D printer – Bradshaw and others (n 3) 24. They are also commonly referred to as CAD files

¹⁶ *Twentieth Century Fox Film Corp v Newzbin Ltd* [2010] EWHC 608 (Ch)

¹⁷ See, for instance, the regulations on technical protection measures as legislated by Sec 297ZA –ZF CDPA 1988 that are based on Article 6 Directive 2001/29/EC of the European Parliament and of the Council of 22 May 2001 on the harmonisation of certain aspects of copyright and related rights in the information society [2001] OJ L 167/2001

¹⁸ Pedro Malaquias, 'Consumer 3D Printing: Is the UK Copyright and Design Law framework fit for purpose?' [2016] 6 Queen Mary Journal of Intellectual Property 321, 323-324

¹⁹ *ibid* 322

²⁰ Ballardini and others (n 1) 855

mass-produced source.²¹ Right holders may then be placed in a position where they cannot effectively enforce their intellectual property (IP) rights where mass-scale infringement by end consumers takes place.²²

3.1 Direct patent infringement

Section 60 (1)(a) of the UK Patents Act 1977 states:

“Subject to the provisions of this section, a person infringes a patent for an invention if, but only if, while the patent is in force, he does any of the following things in the United Kingdom in relation to the invention without the consent of the proprietor of the patent, that is to say—

- (a) where the invention is a product, he makes, disposes of, offers to dispose of, uses or imports the product or keeps it whether for disposal or otherwise...”

The provision derives from Article 29 of the CPC 1975.²³ Many national patent acts of EU Member States use Article 29 CPC as a template for their rules on patent infringement. With regards to a patented product, the acts triggering infringement are (1) making, (2) disposing of, (3) offering to dispose of, (4) using, (5) importing or (6) keeping the patented product whether for disposal or otherwise. The exclusive right is infringed when one of these acts is conducted by a third party without the authorisation of the right holder. Importantly, the right is infringed even where the alleged infringer had no knowledge that his or her actions would constitute infringement.²⁴ Additionally, direct patent infringement generally only arises when the infringing acts have taken place within the UK.²⁵ This could pose a

²¹ Timothy R. Holbrook and Lucas S. Osborn, ‘Digital Patent Infringement in an Era of 3D Printing’ [2015] UC Davies Law Review 1319, 1323. Similarly – Silverman (n 1) 6

²² Stefan Bechtold, ‘3D Printing, Intellectual Property and Innovation Policy’ [2016] 47 International Review of Intellectual Property and Competition Law 517, 530; Maximilian Haedicke and Herbert Zech, ‘Technische Erfindungen in einer vernetzten Welt’ [2014] GRUR-Beilage 52, 55

²³ See the corresponding provisions in CPC 1989, art 25 and within the UPCA, art 26 - see Birss and others (n 5) para 1-71; Paul G. Cole and Stephen F. Jones (ed), *CIPA Guide to the Patent Act 1977* (8th edn, Sweet & Maxwell 2016) para 60.03

²⁴ “The right of the patentee does not depend on the defendant having notice that what he is doing is an infringement” - *Proctor v Bennis* (1887) 4 RPC 333, 356 (Court of Chancery of the County Palatine of Lancaster). See also Phil Reeves and Dinusha Mendis, *The Current Status and Impact of 3D Printing Within the Industrial Sector: An Analysis of Six Case Studies* (United Kingdom Intellectual Property Office, 2015) 32

²⁵ UK Patents Act 1977, s 60(1)

problem with regards to 3D printing because some of the various stages it involves²⁶ may be conducted outside the UK.²⁷

Additionally, the acts that the alleged infringer commits, must fall within the scope of protection of the patent. This, for instance, means that the replica made by an alleged infringer must be covered by the exclusive right of the patent holder. Pursuant to section 125 (1) of the UK Patents Act 1997,²⁸ the scope of protection provided by a patent is defined by its claims. According to this provision, the scope of protection shall be determined as 'specified in a claim of the specification of the application or patent, as the case may be, as interpreted by the description and any drawings contained in that specification.' While this description provides a general statement on how to delineate the extent of patent protection, patent claims are laid out verbally and therefore leave scope for interpretation. Until recently, the UK's practice has been to provide a rather purposive interpretation of patent claims²⁹ in contrast to the doctrine of equivalents that applies in the United States.³⁰ The latter approach would enable the right holder to extend the scope of protection beyond the wording of the claims.³¹

These considerations were important for reproductions produced by 3D printing technology under UK patent law. The 3DPDF that instructs the printer can be manipulated and hence changed in appearance.³² Using such a manipulated 3DPDF would then result in the printed end-product having a physically different appearance. The altered shape may create technically different results in contrast to the originally patented product. Hence, such alterations of the 3DPDF may then result in the printed object falling outside of the scope of protection of the patented invention. The Court of Appeal provided some guidance when such an alteration may still be within the scope of protection of the patent: '[A] technically trivial or minor difference between an element of a claim and the corresponding element of the alleged infringement nonetheless falls within the meaning of the element when read

²⁶ For example, scanning, uploading of a 3DPDF to the internet, hosting a 3DPDF on a website, downloading the 3DPDF, printing and commercialisation of the printed object.

²⁷ With regards to the situation under German Patent Law – Haedicke and Zech (n 22) 54

²⁸ corresponds to Article 69 EPC

²⁹ *Catnic v Hill & Smith* [1982] RPC 183, 243 (UKHL); *Kirin-Amgen v Hoechst Marion Roussel* [2005] RPC 9, para 48 (UKHL); *Virgin Atlantic Airways Ltd v Premium Aircraft Interiors UK Ltd* [2009] EWCA Civ 1062; [2010] RPC 8, para 5 (EWCA)

³⁰ *Graver Tank & Mfg. Co. v. Linde Air Products Co.* 339 U.S. 605 (1950)

³¹ Cole and Jones (n 23) para 125.10

³² Dinusha Mendis, "The clone wars": episode 1 - the rise of 3D printing and its implications for intellectual property law - learning lessons from the past?' [2013] European Intellectual Property Review 155, 160

purposively. This is not because there is a doctrine of equivalents: it is because that is the fair way to read the claim in context.³³

This approach was arguably altered by the Supreme Court of the United Kingdom in its recent decision of *Eli Lilly v Actavis*³⁴ where it held that equivalents may need to be considered in constructing patents. By this, the Supreme Court seems to have re-introduced the doctrine of equivalents which may be beneficial for patent holders.³⁵ This raises interesting questions as to what would be considered as equivalents when using 3D printing technology to infringe a patent. But ultimately, the question of whether an allegedly infringing product would fall within the scope of the protected patent depends largely on the particular factual scenario.

3.1.1 From the physical to the digital: Scanning of the patented object

An interesting question arises as to whether scanning a patented product and creating a 3DPDF would amount to patent infringement. In other words, would the scan of a patented product, such as the digital representation of the product, be considered as *making* the invention? This marks largely uncharted territory for patent infringement which traditionally focussed on physical copies of the patented invention.³⁶ In contrast, copyright law considers digital reproductions as potentially infringing copies: the Copyright, Designs and Patents Act 1988 (CDPA 1988) regards the reproduction of a literary, dramatic, artistic and musical work *in any material form* (emphasis added) as falling within the exclusive right of the right holder.³⁷ The provision specifically states that this would include ‘storing the work in any medium by electronic means.’³⁸

Commentators have argued that a similar approach is warranted within patent law and to consider the creation of 3DPDFs as *making* the patented invention.³⁹ Such considerations are based on a purposive interpretation of patent infringement in order to

³³ *Virgin Atlantic Airways Ltd v Premium Aircraft Interiors UK Ltd* [2009] EWCA Civ 1062; [2010] RPC 8, para 5 (EWCA)

³⁴ *Actavis UK Limited and others v Eli Lilly and Company* [2017] UKSC 48.

³⁵ Tanvi Shah, Jason Raeburn, Hiroshi Sheraton, “Actavis v Eli Lilly: English Supreme Court shakes up approach to patent infringement by equivalents “ (2017) EIPR 778, 782

³⁶ Holbrook and Osborn (n 21) 1322-1323

³⁷ CDPA 1988, s 17(2)

³⁸ *ibid*

³⁹ With regards to the law in the United States - Holbrook and Osborn (n 21) 1367

avoid a gap in protection that may arise by 3D printing technology.⁴⁰ However, this approach would require a ‘creative and effort taking solution....’ according to Ballardini, Minssen and Norrgård.⁴¹ They oppose such interpretation of direct infringement: ‘Considering CAD files as same as physical objects and, this way, equating the making of a CAD file on a protected object to direct patent infringement, appears ... improper and inaccurate at the least.’⁴² They argue that 3DPDFs would only amount to mere technical representations on how to produce the patented product.⁴³ As such, 3DPDFs are not embedded in the physical device and the file continues to exist once the product has been printed.⁴⁴ Additionally, patent law was always linked to physicality whereas the CAD/3DPDFs of a patented product would only amount to a description of the patented product. Hence, it was argued that direct patent infringement could not occur by ‘making a scan of the patented object.’⁴⁵

Based on these considerations, it appears difficult to regard the making of a 3DPDF as amounting to direct patent infringement *de lege lata*. It however needs to be borne in mind that the challenges that digitisation posed for copyright law were addressed mainly through copyright’s reliance on the right of reproduction extending to copies *in any material form*,⁴⁶ which covers the digitisation of authorial works.⁴⁷ However, it has been said that the reproduction needs to represent ‘the work in some real sense.’⁴⁸ This means, for instance, that the literary copyright of a knitting guide is not infringed by making the garment.⁴⁹ Applying this rationale to the 3D printing scenario and the question of patent infringement, the scan of a patented product, the 3DPDF for instance, is merely an instruction to make the product but not a real representation of it. Hence, the analogy from copyright might not be suitable in this context for patent law.

Design law, however, may be able to provide some elements that could be considered in the context of patent law. In relation to unregistered designs, section 226(1) CDPA 1988 states that a design right is not only infringed by making articles according to the design for commercial purposes; infringement also occurs where a design document

⁴⁰ “...the mere creation of the CAD file could, and perhaps should, constitute an infringing “making” of the patented item.” – *ibid* 1367

⁴¹ Ballardini and others (n 1) 856

⁴² *ibid* 856

⁴³ *ibid* 863; similarly with respect to the discussion in copyright law - Malaquias (n 18) 326

⁴⁴ Ballardini, and others (n 1) 863

⁴⁵ Mimler (n 1) 357

⁴⁶ This notion has been part of UK copyright law since the Copyright Act 1911 – Mary Vitoria and others, *Laddie, Prescott and Vitoria: The Modern Law of Copyright and Designs* (4th edn, Lexis Nexis 2011) para 14.8

⁴⁷ “[S]toring the work in any medium by electronic means” was added with the CDPA 1988 – *ibid* para 14.10

⁴⁸ Nicholas Caddick and others, *Copinger & Skone James on Copyright* (17th edn, Sweet & Maxwell 2016) para 7.62

⁴⁹ *Brigid Foley Ltd v Elliott* [1982] RPC 433

recording the design is made by the infringer for the purposes of reproducing articles based on the design. This form of infringement aims at stages anterior to the actual physical reproduction of the design.⁵⁰ 3DPDFs could be considered as design documents in the meaning of section 261 CDPA 1988⁵¹ and its creation for commercial purposes as an infringement of the design.⁵² The nature of designs as an industrial property right might make such considerations easier to “transplant” into patent law than considerations from copyright.

In sum, it appears that some clarification with regards to the availability of direct patent infringement in the 3D printing context may become necessary, *de lege ferenda*. However, this may not be desirable. First, it would pose a doctrinal challenge for patent law based on the considerations mentioned. Secondly, an expansion might lead to serious ramifications as it would widen the scope of direct infringement substantially. Patent protection is absolute and even the innocent infringer can be held liable.⁵³ Anyone who scans a patented product without being aware of the patent may then be a potential infringer. What might, however, alleviate the situation is that some potentially infringing, but innocent uses could fall within the private and non-commercial use exception within section 60(5)(a) UK Patents Act 1977.⁵⁴

3.1.2. *Uploading, hosting and disseminating of 3DPDFs*

A connected question is whether uploading a 3DPDF to an online file repository would affect the patent right. In contrast to copyright law, where the making available of a work may infringe the communication right of the copyright holder,⁵⁵ patent law appears indifferent to such action. However, an uploaded 3DPDF could be regarded as another reproduction of the patented object. This then leads back to the query whether the creation of a digital representation of a patented object would constitute direct infringement.⁵⁶ As mentioned, this does not seem possible under the current legal framework.

⁵⁰ Martin Howe and others, *Russell-Clarke and Howe on Industrial Designs* (9th edn) (Sweet & Maxwell 2016) para 4-076

⁵¹ “design document” means any record of a design, whether in the form of a drawing, a written description, a photograph, data stored in a computer or otherwise;

⁵² Malaquias (18) 332

⁵³ See above 3.1

⁵⁴ See below 4.1

⁵⁵ CDPA 1988, s 20

⁵⁶ See above 3.1.1

Hosting and disseminating 3DPDFs online may also trigger patent infringement. Hosting a 3DPDF on a website could, for instance, be considered as *offering the patented product for disposal* (emphasis added). Both actions, i.e. the offering to dispose and the disposal, are closely related acts. A disposal of a product generally occurs where products are sold but disposing of products may have a wider meaning than mere vending.⁵⁷ Offering for disposal is then the preceding action before the sale, usually consisting of an offer for sale.⁵⁸ This may also include advertising the products.⁵⁹ Liability in this context could potentially be applied against file repositories, such as *Thingiverse*, that host 3DPDFs for downloads. Such liability is, however, only possible where a 3DPDF is regarded as the *patented product* as already discussed above. This is because liability is triggered by disposing of, or offering to dispose of *the patented invention* as the provision states. As mentioned above, such interpretation is rather doubtful.

In this context, and particularly in relation to hosting of 3PDFs, it is interesting to note the overlap with the law of *direct* and *indirect* patent infringement.⁶⁰ Such overlap may however not be desirable. This is because the requirements of both infringement frameworks differ.⁶¹ While indirect infringers have to possess actual or constructive knowledge that their actions may be used to put the invention into effect, direct infringement is absolute and does not require knowledge.⁶² Allowing both frameworks to be applicable could lead to contradictory outcomes for essentially the same action which may not be in the interest of legislators.

One other issue needs to be discussed here. Rather than seeing a 3DPDF as an infringing copy of the patent, it could be seen as part of a kit. Once downloaded, it could in combination with the other parts of a kit, such as the printer and the printing material, be used to reproduce the patented product.⁶³ But merely providing the 3DPDF would not be considered as a direct infringement according to current case law. A 3DPDF would only be regarded as a part of an incomplete kit. According to the High Court, direct infringement, however, would require 'to make, dispose of, offer to dispose of or keep a complete kit of parts for assembly into the claimed product.'⁶⁴ The Court added that 'an incomplete kit of parts would not be infringement under section 60(1)(a) even if the only missing part was a

⁵⁷ Cole and Jones (n 23) para 60.05

⁵⁸ Birss and others (n 6) para 14-58

⁵⁹ *ibid.* para 14-59

⁶⁰ See below 3.2

⁶¹ Similarly, with regards to the situation under German patent law - Haedicke and Zech (n 20) 54

⁶² See above 3.1

⁶³ Mendis (n. 32), 160-161

⁶⁴ *Virgin Atlantic Airways Ltd v Delta Airways Inc* [2011] RPC 8, para 132 (EWHC)

minor one which could easily be obtained in the destination country.⁶⁵ This means that simply offering a 3DPDF for download will be considered as offering to provide, or providing an incomplete kit to make the invention, since the 3D printer and the printing material cannot be considered as minor elements to make the patented product.

3.1.3 From the digital to the physical: The printing and distributing of a patented product

The reproduction of a patented object from a 3DPDF using a 3D printer would constitute making the patented invention and, hence, would constitute an infringing product.⁶⁶ As mentioned, the reproduction can only be considered infringing where the replica would fall within the scope of protection, that is to say fall under the patented claims.⁶⁷ Patent infringement is also established where the replica is being used by the alleged infringer. Patent law in the UK however distinguishes between *making* and *repairing* a patented product. Repairing an article protected by a patent does not amount to making it and hence would not constitute infringement.⁶⁸ In this respect, Lord Hoffmann has held in the House of Lords that:

“I therefore agree with the Court of Appeal that in an action for infringement by making, the notion of an implied licence to repair is superfluous and possibly even confusing. As a matter of ordinary language, the notions of making and repair may well overlap. But for the purposes of the statute, they are mutually exclusive. The owner’s right to repair is not an independent right conferred upon him by licence, express or implied. It is a residual right, forming part of the right to do whatever does not amount to making the product.”⁶⁹

This distinction is relevant in a 3D printing scenario, as the production of spare parts for domestic appliances may become an area where 3D printing becomes increasingly

⁶⁵ *Virgin Atlantic Airways Ltd v Delta Airways Inc* [2011] RPC 8, para 105 (EWHC)

⁶⁶ *Ballardini and others* (n 1) 855; *Haedicke and Zech* (n 22) 56

⁶⁷ See above 3.1

⁶⁸ *Bechtold* (n 22) 528

⁶⁹ *United Wire Ltd v Screen Repair Services (Scotland) Ltd*, [2001] FSR 24, para 19 (UKHL)

relevant.⁷⁰ As already mentioned, the 3DPDF can be modified in various ways to change the ultimate object that is printed. Therefore, Mendis holds that ‘it is possible to view the *modification* as a new *make* or *version* of the product as opposed to a *repair*’, thereby leading to patent infringement.⁷¹ What can be said here is that 3D printing will pose some difficulties for the distinction between repairing and reconstructing.⁷²

With regards to *distribution*, a product made with a 3D printer which falls within the scope of protection of a patent could constitute patent infringement where the product is offered for sale or sold. This would amount to offering for disposal or disposal of a patented product which is sanctioned by section 60(1)(a) UK Patents Act 1977. This has important ramifications for 3D printing shops or companies that offer 3D printed objects over the internet such as *Shapeways*. Such entities could then be held liable for patent infringement. This is particularly so, as their business model will be considered as ‘commercial’ which in turn will mean that such companies will be unable to rely on the private and non-commercial use exception.⁷³

3.2 Indirect patent infringement

Patent law in the UK provides protection for the right holder against indirect patent infringement under section 60(2):

“Subject to the following provisions of this section, a person (other than the proprietor of the patent) also infringes a patent for an invention if, while the patent is in force and without the consent of the proprietor, he supplies or offers to supply in the United Kingdom a person other than a licensee or other person entitled to work the invention with any of the means, relating to an essential element of the invention, for putting the invention into effect when he knows, or it is obvious to a reasonable person in the circumstances, that those means are suitable for putting, and are intended to put, the invention into effect in the United Kingdom.”

⁷⁰ Bradshaw and others (n 3) 11

⁷¹ Mendis (n 32) 160; Reeves and Mendis (n 24) 32

⁷² Bechtold (n 22) 528

⁷³ UK Patents Act 1977, s 60(5)(a). See the discussion on the private and non-commercial use exception in within section 4.1 of this chapter

The essence of the above section can be broken down into the following elements, as follows: (1) supply or offer to supply, (2) on the national territory (where the patent has effect), (3) to any person other than the party entitled to exploit the patented invention, (4) with means related to, (5) an essential element of that invention (6) for putting it into effect in the national territory. Of these, (1), (4), (5) and (6) are most relevant to the present discussion and have been considered in detail below.

Supply or offer to supply: firstly, the alleged infringer must supply or offer to supply means relating to an essential element of the invention. Such supply or offer to supply generally occurs when a transfer has taken place or is about to take place.⁷⁴ 3DPDFs, which are hosted and downloaded from a website, could be considered as being an offer to supply. Furthermore, when the 3DPDF is downloaded then this could be seen as a supply.

Means related to an essential element of that invention: means relating to an essential element of the invention have generally been considered to be of tangible or physical nature.⁷⁵ However, while mere instructions have been held not to constitute *means*⁷⁶, the UK Court of Appeal has held that software may constitute 'means' within indirect patent infringement.⁷⁷ Whether 3DPDFs can be considered as software is, however, disputed.⁷⁸ At the same time, it has been suggested by Bradshaw *et al* and Mendis⁷⁹ that a 3DPDF could be regarded as part of a kit in the 3D printing scenario. The 3D printer, along with the material used for the replica and the 3DPDF, would form part of a kit needed for putting the invention into effect. From the above reasoning, it can then be deduced that a 3DPDF would qualify as an essential element to put the invention into effect. This question is crucial with regards to the liability for indirect infringement for the dissemination of 3DPDFs.⁸⁰ A literal interpretation of the term *means* can extend to encompass 3DPDFs.⁸¹

⁷⁴ Birss and others (n 6) para 14.96

⁷⁵ Cole and Jones (n 23) para 60.09

⁷⁶ Ashley Roughton and others, *The Modern Law of Patents* (3rd edn, Lexis Nexis 2014) para 7.60

⁷⁷ *Menashe Business Mercantile Ltd v William Hill Organization Ltd* [2003] RPC 31(EWCA)

⁷⁸ Ballardini and others (n 1) 863

⁷⁹ Bradshaw and others (n 3) 27; Mendis (n 32)

⁸⁰ Reeves and Mendis (n 24) 33

⁸¹ Mimler (n 1) 366

Furthermore, there are good arguments to consider 3DPDFs as *means* in this context,⁸² while some commentators remain doubtful.⁸³ The courts will need to clarify this issue.

Furthermore, 3DPDFs would have to constitute means that relate to *an essential element* of the invention. Two factual scenarios need to be distinguished in this context: The first scenario relates to a patented product which has been devised by traditional ways of manufacture, for instance, not using a CAD modelling and 3D printing in the production phase. In such a scenario, a 3DPDF will not exist and will not form part of an essential element of that invention and therefore will not constitute a part of the final and infringing product.⁸⁴ The term *element*, is however broad enough to encompass such 3DPDFs generated through scanning a patented product, which was created through traditional manufacture.⁸⁵ However, further judicial or legislative clarification would be useful in this context. A second scenario focusses on such manufacturing where 3D modelling (resulting in a 3DPDF) is part of the production process of the patented product. In such a scenario, it can be argued that the 3DPDF is indeed an essential element of the invention⁸⁶ even though it has not been specifically mentioned in the patent claims by the patent owner.⁸⁷

For putting into effect in the national territory: in accordance with the final part of section 60(2), the essential element must enable the invention to be put into effect in the UK. The Court of Appeal has held that this would be the case where an invention is put into an infringing state in the context of section 60(1) UK Patents Act 1977.⁸⁸ This would mean that such means ‘must make the invention work.’⁸⁹ Ballardini *et al* hold that this would be unlikely under the current state of technology.⁹⁰ Additionally, they argue that further information, such as related technical drawings, would be required to put the invention into effect by using 3D printing technology.⁹¹ However, Bradshaw *et al* stipulate that simpler inventions, such as the

⁸² Haedicke and Zech argue that a CAD/3DPDF goes beyond mere verbal description. The latter descriptions would still require human action to be executed. A CAD/3DPDF, on the other hand, would already instruct the printer without requiring human intervention. See Haedicke and Zech (n 20) 56

⁸³ Ballardini *et al* argue that in the current stage of 3D printing a 3DPDF as such cannot be such “means”. Other elements such as related technical drawings, i.e. 2D CAD drawings would be required to print the object properly. See Ballardini and others (n 1) 864

⁸⁴ Haedicke and Zech (n 22) 56

⁸⁵ *ibid.* 56

⁸⁶ Mimler (n 1) 365

⁸⁷ Ballardini, Norrgård and Minssen (n 1) 864

⁸⁸ *Menashe Business Mercantile Ltd v William Hill Organization Ltd* [2003] RPC 31, para 24, para 27 (EWCA)

⁸⁹ Mendis (n 32) 161

⁹⁰ Ballardini and others (n 1) 864

⁹¹ “Even though the technology will develop to the extent that printing will be possible just by clicking a button, it should be stressed that CAD files are usually shared over the internet without the related technical drawings 2D CAD drawings, i.e. modern blueprints). It is in these drawings, not in the CAD file, that contain the relevant information (like information related to the required process, part orientation, process parameters, support structure, and even the machine and the material) needed in

'Anyway-Up Cup' which was central to the patent dispute in *Haberman v Jackel*,⁹² could be reproduced by 3D printing. Furthermore, it appears that this rapidly expanding technology will soon have the ability to reproduce more complex patented products in the future.

On the point of national territory, for it to be relevant to the UK, the law of indirect infringement requires two acts, known as the *double territorial requirement*. First, the supply or offer for supply of the 'means relating to an essential element of the invention' must take place in the UK. Secondly, the means must be 'suitable for putting, and intended to put, the invention into effect' in the UK. The *invention*, for the purposes of this section, must form part of the patent claim. Where the invention is an apparatus, 'the apparatus must be intended to be put into an infringing state in the UK.'⁹³ These criteria could be fulfilled where the 3DPDF was accessed, downloaded and used for 3D printing within the UK to reproduce the patented object, thereby putting the patented invention into effect within the UK.⁹⁴

Finally, indirect infringement requires actual or constructive knowledge by the alleged infringer that the means are suitable and intended to be put the invention into effect. Aside from positive knowledge, infringement can also be found where it is obvious to a reasonable person that the means would be used in an infringing way in the given circumstances. This widens the scope for indirect infringement considerably. In the 3D printing context, this means that the supplier of the 3DPDF knew or should have known under the circumstances, that the file would be used in an infringing way by the person downloading it.⁹⁵ Often, a positive finding will depend on the facts of the case as 3DPDFs may also be used in their digital format and not be used for printing the object in question.⁹⁶

4. Exceptions to patent infringement

Even after patent infringement has been established, the infringing use may be exempted if it is covered by an exception. Industrial property laws tend to exclude private and non-commercial uses from infringement. Patent laws in many jurisdictions have introduced exception provisions that exempt uses from patent infringement where these

order to be able to print out the object properly. Without such technical drawings, the printing process is difficult and imprecise and so would be even if the printing process were simplified." – Ballardini and others (n 1) 864

⁹² *Haberman and Anor v Jackel International Ltd* [1999] FSR 683 (EWHC)

⁹³ *Virgin Atlantic Airways Ltd v Delta Airways Inc* [2011] RPC 8, para 89 (EWHC)

⁹⁴ *Mimler* (n 1) 367

⁹⁵ *Ballardini and others* (n 1) 865

⁹⁶ *ibid.* 365

were conducted privately and for non-commercial purposes.⁹⁷ In the UK, such an exception can be found within section 60(5) of the UK Patents Act 1977. Again, these provisions derive from the CPC, outlined above.⁹⁸ According to the current UK law, printing a replica of a patented product based on a 3DPDF by a private person at his or her home could be considered as non-infringing.⁹⁹ Additionally, a use may be exempted from infringement where the use was conducted for experimental purposes.

4.1 Private and non-commercial use

The current statutory private and non-commercial use exception in UK patent law also results from the harmonising efforts of the Luxembourg Convention. The Unitary Patent Court Agreement provides for a similar provision in Article 27 (a).

The relevant provision in section 60(5)(a) reads:

“(5) An act which, apart from this subsection, would constitute an infringement of a patent for an invention shall not do so if—

(a) it is done privately and for purposes which are not commercial...”

Prior to a statutory provision being introduced to exempt private and non-commercial use from patent infringement, case law had set a precedent in this area, in the case of *Jones v Pearce*.¹⁰⁰ In this case it was held that to ‘make a thing merely for the defendant’s amusement or as a model was not an infringement’. Exempting private and non-commercial use from patent infringement can be explained on two premises. First, patents are considered to be tools of commerce and should therefore not encroach onto the private sphere.¹⁰¹ In this regard, the German scholar Joseph Kohler stated that private rights should

⁹⁷ Lionel Bently and others, ‘Exclusions from Patentability and Exceptions and Limitations to Patentees’ Rights’, WIPO Standing Committee on the Law of Patents, SCP/15/3 Annex I (2010) 30

⁹⁸ Article 31(a) of the Community Patent Convention 1975. Resolution on the Adjustment of National Patent Law Records of the Luxembourg Conference on the Community patent 1975, 332

⁹⁹ Bechtold (n 22) 528; Haedicke and Zech (n 22) 55

¹⁰⁰ *Jones v Pearce* [1832] 1 WPC 122

¹⁰¹ Benkard, *Patentgesetz* (10th ed C.H. Beck 2006) §11 [2]

'not encroach upon the sanctuary of the family'.¹⁰² Secondly, private and non-commercial use is not expected to substantially affect the commercial interest of the right holder.

Aldous J provided an analysis of section 60(5) UK Patents Act 1977 in the High Court judgement *Smith Kline & French Laboratories v Evans Medical*.¹⁰³ With regard to the first requirement that the act needs to be conducted *privately*, Aldous J held that this 'includes commercial and non-commercial situations.'¹⁰⁴ *Privately* would not be 'synonymous with *secret* or *confidential* and would include acts which were secret or confidential or were not. This word appears to be used in the opposite sense of *publicly* and is used to denote that the act was done for the person's own use.'¹⁰⁵ The second criterion of the provision, that the use should be non-commercial, does not focus on the use as such but rather on its purpose.¹⁰⁶ The definition of what could be commercial appears to be straightforward and the High Court suggested a subjective test to establish a non-commercial purpose.¹⁰⁷ Importantly, the exception would still apply when the purpose of the use was non-commercial while entailing some commercial benefit.¹⁰⁸

However, in the case of a dual purpose of the use, the exception would not apply where one of them was commercially orientated.¹⁰⁹ This has important ramifications on the applicability of the exception. Roughton *et al* provide an example of dual purpose. They state that: 'the use of a patented vacuum cleaner in a private house would be non-commercial use but the use of the same vacuum cleaner by a commercial cleaner to clean the same house would be commercial.'¹¹⁰ Applying this consideration to a 3D printing scenario, one could conclude that reproducing a *Croc* shoe by a pool attendant for use at home in his leisure time would fall within the ambit of the exception provision, while doing so for use at work, would be infringing.

4.1.1 Private and non-commercial use in the context of direct and indirect infringement

¹⁰² Josef Kohler, *Handbuch des deutschen Patentrechts in rechtsvergleichender Darstellung* (Bensheimer 1900) 432

¹⁰³ [1989] 1 FSR 513 (EWHC)

¹⁰⁴ *ibid.* 517

¹⁰⁵ *Smith Kline & French Laboratories v Evans Medical* [1989] 1 FSR 513, 517 (EWHC)

¹⁰⁶ Roughton and others (n 76) para 7.113

¹⁰⁷ *Smith Kline & French Laboratories v Evans Medical* [1989] 1 FSR 513, 518 (EWHC)

¹⁰⁸ *ibid.* 518

¹⁰⁹ Birss and others (n 6) para 14-178

¹¹⁰ Roughton and others (n 6) para 7.114

The private and non-commercial use exception can be applied against claims of direct and indirect patent infringement. The latter would, for instance, be relevant where the alleged indirect infringer hosts 3DPDFs on a website. In this scenario it could be argued that a private individual who uploads 3DPDFs to a file-sharing website could potentially be able to benefit from this exception. On the other hand, commercially operating websites, however, would not be able to rely on this exception. The crucial question, then, is whether such internet use could still be considered as private. With regards to the corresponding provision¹¹¹ to section 60(5)(a) UK Patents Act 1977 in Germany, Haedicke and Zech argue that private use would not protect an alleged infringer who operates in a manner to satisfy the needs of others by uploading 3DPDFs.¹¹² This could not be considered as an action aimed at satisfying one's own needs or that of a close person (for example, a family member or close friend).¹¹³

With regards to direct infringement, it can be concluded that many reproductions by individuals could be subsumed under the private and non-commercial use exception.¹¹⁴ The problem for a patent holder arises when 3D printing technology continues to develop rapidly. The applications of 3D printers will widen¹¹⁵ and the potential for patent infringement could increase as printers are able to reproduce more complex shapes and functions. Furthermore, the domestic applications of 3D printers could increase when technology gets more affordable as the price decreases.¹¹⁶ These challenges could be addressed by the current law, as it stands, by applying indirect patent infringement against the person commercially hosting or uploading a 3DPDF onto a website.¹¹⁷ However, it is important to point out that indirect patent infringement may become a blunt sword when end-users are able to scan objects themselves and reproduce the patented object with a domestic 3D printer for private use.

A recent report on the design law *acquis* in the European Union discussed the issue of exempting private and non-commercial use from design infringement.¹¹⁸ Similar to patent law, design law also provides an exemption from infringement for private and non-

¹¹¹ § 11 Nr. 1 PatG. This provision is also based on the provisions of the Community Patent Convention 1975 - Gesetz über das Gemeinschaftspatent und zur Änderung patentrechtlicher Vorschriften vom 25. Juli 1979, BGBl. I, S. 1269

¹¹² Haedicke and Zech (n 22) 57

¹¹³ *ibid*

¹¹⁴ *ibid*

¹¹⁵ Dinusha Mendis, Davide Secchi and Phil Reeves, A Legal and Empirical Study into the Intellectual Property Implications of 3D Printing (United Kingdom Intellectual Property Office, 2015) 6

¹¹⁶ Mendis (n 32) 158

¹¹⁷ See above 3.2

¹¹⁸ European Commission, 'Legal review on industrial design protection in Europe - Under the contract with the Directorate General Internal Market, Industry, Entrepreneurship and SMEs' (MARKT2014/083/D) 131-134

commercial purposes.¹¹⁹ However, conversely to the situation in patent law, design law in Europe does not contain protection for indirect infringement. The report suggests an amendment to the private and non-commercial use exception by stipulating a restriction on the scope of the *private and non-commercial* use exception by adding a proviso that would limit permissible 3D printing to ‘acts which do not unduly prejudice the normal exploitation of the design’ or a similar wording which is derived from the three-step test under the TRIPs Agreement.¹²⁰ This would provide courts with the sufficient flexibility to interpret the law in order to address domestic 3D printing. The design law provisions, in this context, derive from patent law¹²¹ and therefore the same could be applied in patent law thereby making the suggested amendment transferrable to patent law. Then again, it needs to be borne in mind that enforcing patent rights against individual consumers may not be an adequate remedy due to the transaction costs involved, such as gathering evidence and enforcement¹²² nor would it be desirable for the patent holder.¹²³

4.2 Experimental uses

One of the most important exceptions within patent laws worldwide exempts experimental uses from patent infringement. Section 60(5)(a) of the UK Patents Act 1977 reads:

“(5) An act which, apart from this subsection, would constitute an infringement of a patent for an invention shall not do so if—

(b) it is done for experimental purposes relating to the subject-matter of the invention...”

The Court of Appeal has held that experimental use could be found in relation to trials that ‘aim at discovering something unknown or to test a hypothesis.’¹²⁴ It would not be

¹¹⁹ The relevant provisions in European Design Law, i.e. Article 13(1)(a) of the Design Directive and Article 20(1)(a) of the Design Regulation actually derive from the Community Patent Convention

¹²⁰ European Commission, ‘Legal review on industrial design protection in Europe - Under the contract with the Directorate General Internal Market, Industry, Entrepreneurship and SMEs’ (MARKT2014/083/D) 133

¹²¹ *ibid.* 129

¹²² *Ballardini and others* (n 1) 855; *Bechtold* (n 22) 530

¹²³ *Haedicke and Zech* (n 22) 55, 57

¹²⁴ *Monsanto v Stauffer Chemical* [1985] RPC 515, 542 (EWHC)

harmful for the experimental use to have 'a commercial end in view.'¹²⁵ Additionally, the experimental use would need to relate to the subject matter of the invention. Put simply, it means that the experimental use cannot be exempted from patent infringement where it is aimed 'to test or evaluate *some other* product or process'¹²⁶ (emphasis added). This would safeguard the patented invention from being used as a research tool. Bradshaw *et al* suggest that the exception could, for instance, apply to 'cover testing the capability of a 3D printer to reproduce a complex, patented invention.'¹²⁷ Therefore, depending on the facts of the case, section 60(5)(b) of the UK Patents Act 1977 could be brought forward as a defence against a claim of patent infringement.

5. Conclusion

UK Patent law, as it currently stands, does not appear to be adapted to address the challenges that 3D printing technology poses. The law of indirect infringement can provide a useful remedy to address a gap in protection for patent holders whose inventions have been infringed by 3D printing. The individual terms of section 60(2) of the UK Patents Act 1977 do provide enough interpretive scope to subsume 3D printing under its scope. What may however be necessary is clarification on this issue by the courts or legislator.¹²⁸ The application of indirect infringement however should be conducted diligently. Bechtold rightly states that intermediaries are generally beneficial to society and that increasing their liability would 'risk stifling innovation in distribution and manufacturing technologies.'¹²⁹ The copyright discourse with regards to intermediary liability may serve to exemplify best practices as well as approaches which should be avoided within patent law.¹³⁰

Currently, direct patent infringement cannot be established by producing a 3DPDF. Doctrinally such an approach does not appear sound and the issues with expanding liability are also considerable. An interesting approach is, however, provided by section 261(1)(b) of the CDPA 1988 which sanctions the reproduction of design documents for the purposes of reproducing articles based on the design. A similar approach could be envisaged for patent protection in relation to the creation of 3DPDFs of patented products. In such a scenario, a

¹²⁵ *ibid.* 538

¹²⁶ *ibid.* 522

¹²⁷ Bradshaw and others (n 3) 27

¹²⁸ Bradshaw and others (n 3) 27; Haedicke and Zech (n 22) 56; Mimler (n 1) 369

¹²⁹ Bechtold (n 22) 530

¹³⁰ Mendis (n 32) 168-169

3DPDF envisaged to reproduce the patent product with 3D printers would be found liable, while *innocent scans* would not.

Finally, direct patent infringement by users of 3D printing technologies may apply where these users make replicas of the patented invention. However, such use may often be covered by the private and non-commercial use exception. An amendment to this provision to provide a remedy against mass patent infringement by domestic 3D printing may appear to be not feasible in the near future. Then again, lessons from copyright law could be drawn up when enforcing patent rights in the 3D printing context. Lessons from the media and entertainment sector reveal that enforcing copyright against private users is not only impermissibly expensive but also counter-productive. Additionally, Haedicke and Zech's assertion that patent rights should not encroach on the private sphere should be borne in mind when enforcing patents relating to 3D printing technologies in the future.¹³¹

¹³¹ Haedicke and Zech (n 22) 57