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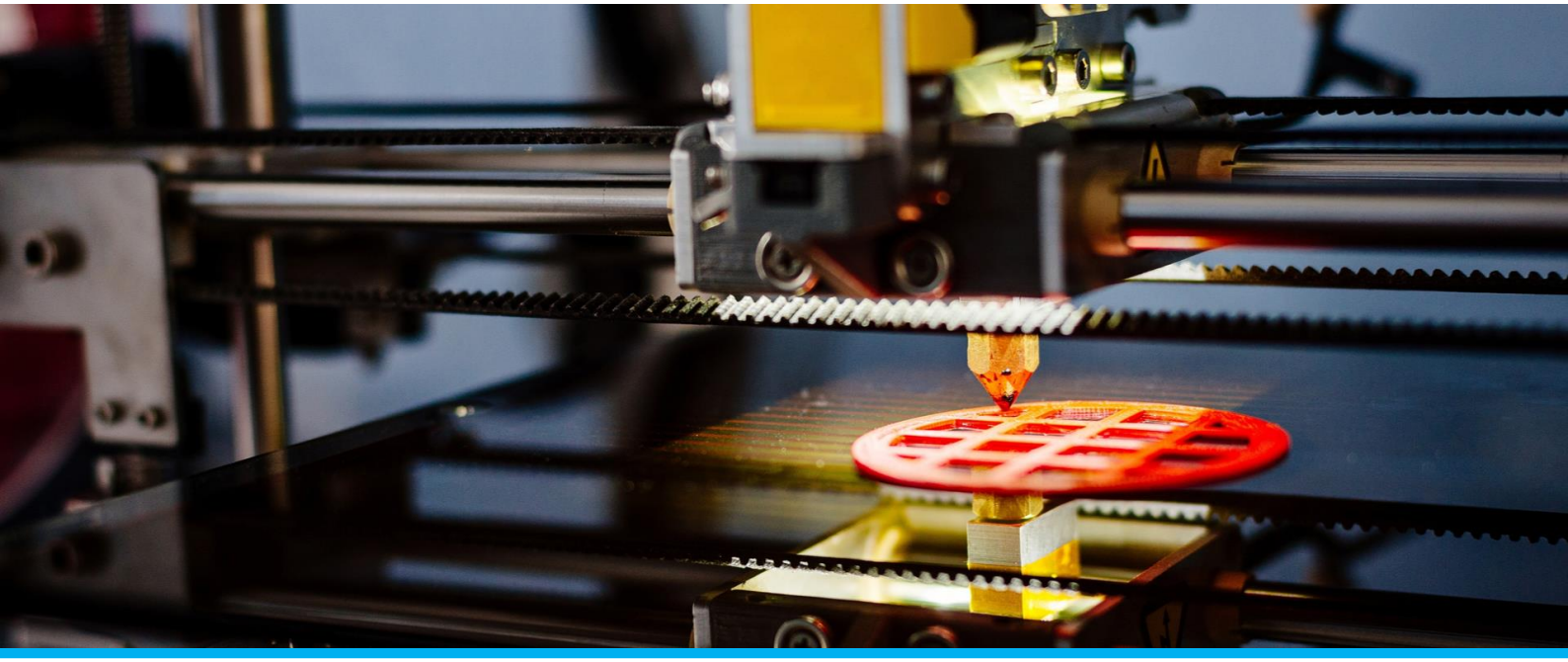

Additive Manufacturing – Shaping our future

The role of IP and challenges for the IP system

The growth of 3D printing

Since its inception in the 1980s, 3D printing, or additive manufacturing (AM), has had the potential to be revolutionary. However, it is only recently that many of the obstacles inhibiting the wide-scale uptake of this technology have been overcome. In particular, reductions in equipment and material costs, developments of new 3D-printable materials, improvements in precision and speed, and the demonstrable use of the technology to manufacture at scale and in a broad range of applications, mean that the full potential of this technology could be realised.

AM technology was initially developed using UV-curable photopolymers in the *stereolithography* process invented by Charles Hull. In this process, a 3D object is formed by sequentially printing and curing layers of a photopolymer resin, using a UV laser to draw a pre-programmed design or shape. The technology makes use of a computer-aided design (CAD) file that stores the information associated with the 3D object and instructs the printer. Initially the technology was used in the manufacture of spare parts, medical and surgical items, such as prosthetics, and prototypes.

On this foundation, new 3D printing materials and techniques were developed. Recent improvements in multi-material 3D printers have allowed complex and heterogeneous structures to be fabricated. The ability to print with a variety and combination of materials and the evolution of 3D printing techniques have led to new applications in areas such as clothing and textiles, food, bio-printing of tissues and bio-digital interfaces, and the manufacture of pharmaceutical formulations.

AM is applicable to many conventional manufacturing processes and could be used to decentralise some manufacturing away from large, traditional hubs. Such a transition could allow many countries to manufacture what they need, when they need it, without significant investment in infrastructure, thus improving supply resilience, reducing the reliance on other countries, and reducing transportation and storage costs. The potential benefits of a decentralised system have been highlighted during the COVID crisis, where many countries struggled to obtain adequate supplies of PPE due to global demand

Indeed, the altruism of one Italian engineer, who provided a free CAD file of a 3D printable valve that could be used to re-engineer a snorkel mask for use as a ventilator, demonstrated the potential of this technology in enabling rapid and widespread product manufacture.

The role of IP

IP is an effective tool for protecting ideas, whether through preventing the infringement of a patented invention or registered design, or stopping the copying of an artistic creation. It is often the foundation upon which industry is built, helping to fund research and the development of ideas. This is particularly true for AM, where securing investment, especially for small and medium-sized enterprises (SMEs), can prove challenging due to a combination of long development cycles, high risk of failure, and high expenditure at an early developmental stage. A strong IP portfolio is therefore important for attracting potential investors.

Patents have played an important role in the development of this area of technology ever since the first applications were filed in the 1980s. However, owing to the nature of the technology, robust protection is likely to be found through a combination of patents, design rights, copyright and trademarks. For example, where replication of the image or appearance of a 3D-printed article is key, registered design rights provide useful protection. Designs can be registered for "the appearance of whole of part of a product" provided that the design is new and has "individual character". Registered designs can offer a cheaper and more easily obtainable form of protection, particularly for non-technical subject matter. Interestingly, whilst a computer programme *per se* (e.g. a CAD file) is not considered a 'product' and therefore cannot be protected under EU design law, the product of running a computer programme (e.g. a graphical display of a CAD file) is protectable, and without the requirement that the product is actually put into physical form. [1]

Additionally, the CAD file which contains instructions for the printing of the article may benefit from copyright protection as a literary work and/or as an artistic work. Trademarks which are directed to words, symbols or shapes associated with the printed product can also be registered and are becoming increasingly important to protect brands in our digital world.

The EPO has characterised AM as being part of the fourth industrial revolution[2] and the growth in interest in AM is reflected in the number of patent applications filed. There has been a 36% average annual growth of AM applications filed at the EPO from 2015-2018, with over 4000 total applications in 2018; a rate of increase ten times that seen for total EPO applications. The applications cover everything from the use of AM in industries including health, energy, transportation, electronics, construction, consumer goods, and food, as well as the digital technologies, materials and printing equipment utilised in AM. Whilst the majority of applications are filed by large companies, a significant proportion are filed by SMEs and universities, demonstrating the important role that smaller entities play in this field.

Challenges for the IP system

AM poses new challenges for patent drafting and, in particular, the need to ensure that claims cover products made by both AM and non-AM processes. For example, a traditional product claim may describe two components being connected together if, in conventional manufacturing, the components tend to be made separately and assembled. However, the same article produced by an AM process may instead be formed from a single piece of material, and thus would not fall within the scope of such a claim. For products which may feasibly be produced by AM, claims should be drafted accordingly to cover such an eventuality.

[1] See, EU Commission's study: "*The Intellectual Property implications of the development of industrial 3D printing*", section 2.4.

[2] At the EPO and EUIPO digital conference "Shaping Tomorrow: 3D printing and its effect on IP".

Applicants might also want to include claims to AM processes in new applications, as well as claims to traditional methods of manufacture. The difficulty will be determining whether a product that cannot currently be made using AM could be made using this technology within the lifetime of the patent.

AM also raises questions concerning the assessment of patentability. For example, under what circumstances can a process claim to the additive manufacturing of a product be considered patentable if both the product and its traditional manufacturing method are known in the art? The EPO has recognised these challenges, for example, through the development of a set of internal guidelines for assessing the inventive step of claims to 3D-printed products and processes, and it's important to bear these in mind when drafting and prosecuting new European applications.

The potential for the decentralisation of manufacturing also poses significant challenges for applicants looking to enforce their IP. In a traditional manufacturing supply chain, countries with significant manufacturing capacity are readily identifiable and IP protection obtained in these jurisdictions as well as the key markets for distribution and sale of the product. In a world of decentralised manufacturing, however, patentees may require protection in a larger number of jurisdictions in order to provide adequate protection. As technology develops, an increasing number of end-users will be able to manufacture products themselves, changing the position of end-users in the value chain. Pursuing a significant number of consumers themselves, each of whom may have made only one infringing product, is impractical and expensive. As internet piracy has shown, it is also unlikely to be effective.

Furthermore, statutory exemptions to patent and design infringement may apply to end-users, such that it could become increasingly difficult to enforce some IP rights . If AM results in significant decentralisation of manufacturing, these exemptions may require careful consideration. For example, should an end-user qualify under the private, non-commercial use exemption if they print a protected AM product and provide it to a third party? Further analysis of the intention of the end-user may be required in such scenarios.

Possible solutions could involve strengthening IP protection for the CAD file itself. There may be copyright and (unregistered) design rights associated with the CAD file. This is an area of law with little precedent in the UK, but it is likely that a CAD file can benefit from copyright protection provided it is "original" in that it is the author's "own intellectual creation". Copyright infringement will occur when a third party directly copies such a CAD file without the copyright holder's permission. Copyright infringement may also occur when a third party uses the CAD file to create a 3D object: however, this is likely to be the case only if the 3D object is a copyright protectable "artistic" work, which is limited to a sculpture, work of artistic craftsmanship, or a work of architecture. Design rights may also arise where the CAD file is "original" in the slightly different sense that the design is a product of the creator's "labour, skill and judgment" and is not commonplace in the design field. Design rights will be infringed by making the corresponding 3D object, and also by replicating the CAD file itself for the purpose of creating the corresponding 3D object, regardless of whether the object is an artistic work or not. Challenges will exist in determining whether or not the CAD file and/or corresponding 3D object qualifies as a literary work and/or an artistic work.

Another option may be to draft a patent claim to the CAD file itself. Such claims might take the form of "computer instructions that when executed cause a 3D printer to produce the (new and inventive) product of claim 1". The EPO does not yet have a consistent practice for such claims in an AM context, for instance in terms of the requirements of clarity and support in the description. In this regard, a technical description of at least one method of 3D printing the product will likely be necessary. Given that added subject matter restrictions in the EPO,prevent adding such claims after the filing of the application, claims in this format should be included when drafting new AM applications.

With the possibility of sending a CAD file globally within seconds, and then rapidly printing the article, obtaining and enforcing IP rights must keep pace. Many national and regional patent offices, as well as the EUIPO[3], already provide options for accelerated prosecution which can significantly reduce the time between filing and grant.

[3]EUIPO *Guidelines* for design registration.

Summary

It's clear that the speed of technological development in this area demands creativity and flexibility on the part of innovators in this field in order to obtain and enforce their IP rights. Current awareness of trends and perspectives in the way IP offices are viewing AM-related inventions in this rapidly evolving technology is vital and, in order to properly protect their innovation, IP rights holders will need to adapt their strategies accordingly. Please get in touch to find out more about the issues discussed above and for advice in protecting AM-related innovation.

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Need advice?

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