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The Significance of Provisional Patent Applications in Protecting Early-Stage Inventions: A Legal and Empirical Analysis

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Abstract This article critically examines the role of Provisional Patent Applications (PPAs) as strategic tools within the intellectual property framework, particularly highlighting their significance in safeguarding early-stage inventions. By allowing inventors to secure a priority date while still developing their inventions, PPAs provide a time frame when additional funding can be sought and further development can be pursued without losing the claim to the original invention date. This is especially important in industries like information and communication technology and the life sciences, where development timelines are lengthy and investment-intensive. PPAs serve not only as a cost-effective initial step in patent filing but also as a protective mechanism against premature disclosure, safeguarding the novelty of the invention. PPAs do not undergo formal examination and do not result in a granted patent unless followed by a standard patent application. However, they establish a legal placeholder that can be crucial for securing further patent rights. This study explores the legal framework of PPAs across various jurisdictions. The analysis also delves into the specific benefits and strategic considerations associated with drafting and filing PPAs, including their role in facilitating

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additional research and refinement of the invention. In addition, it presents novel empirical evidence on the growth of PPAs in the United States and their use as priorities in regular USPTO and EPO patent applications. Despite their advantages, PPAs come with limitations, such as the limited time available to convert them into standard patent applications (typically one year) to benefit from their priority date and the precise requirements for subsequent standard patent applications, which this article addresses. Through a detailed exploration of both the theoretical framework and practical applications of PPAs, the article contributes to a deeper understanding of their role in broader patent strategies, advocating for their careful and informed use in the innovation process.

Keywords Patents · Provisional patent application · Grace period · Empirical analysis · Internal priorities

1 Introduction

This article explores the strategic role of Provisional Patent Applications (PPAs) and their significance in protecting the inventor's interests in the initial stages of invention development. PPAs, an important tool in the overall patent strategy, provide a means to secure a priority date for inventions that are still under development.

A PPA, often referred to as a "provisional", is a form of simplified patent application designed to provide inventors with the ability to establish an early effective priority date for their invention while it is still in the developmental phase. This type of application is characterised by much fewer formal requirements compared to standard patent applications, allowing for the establishment of an early priority date. PPAs typically do not require claims and in some jurisdictions they may be filed in any language of choice of the applicant. Drafting a PPA typically incurs lower costs than drafting a standard application. Provisionals are not subject to examination by patent offices and primarily serve as placeholders to reserve the inventor's priority filing date.

The primary purpose of a PPA is to offer independent inventors, researchers and small companies additional time to seek investment and further develop their inventions. However, in practice, applicants of all sizes seem to utilise provisionals. Unlike a standard patent application, which remains active until the patent is denied, expired or abandoned, a PPA has a maximum duration of one year.[1] If a standard patent application is submitted within one year, using the PPA's filing date as the priority date, the full patent application is considered as having been filed on the same date as the PPA. However, if a PPA is filed but not followed by a standard application, it expires automatically after one year without any action needed by the applicant and does not provide any form of legal protection. In addition, since PPAs are generally not published, if a standard patent application claiming a PPA as priority is not filed, the invention described in the PPA does not become the state of

[1] Michaud (2004), pp. 245–246.

the art and, therefore, retains its novelty. The applicant still has the option to either file a standard application for the same invention or to submit a new PPA. However, in such a case, the applicant will not be able to claim priority from the first, expired, PPA.

In the life sciences industry, where the patent system significantly influences the rewards for innovation, the advantages offered by patent law, including those provided by PPAs, are crucial. The high costs and long duration of investments in biotechnology and drug development make them a popular option in the pharmaceutical industry. PPAs offer a relatively quick and cost-effective way to secure early priority for an invention, which can be pivotal to the commercial success of a given pharmaceutical or biotechnological innovation. The development of life science innovations is particularly challenging due to the unpredictability of scientific results and regulatory approvals. Applying for a PPA allows an inventor to broadly define the scope of an invention, giving flexibility to later refine the full patent claims more specifically in light of future scientific developments. This approach helps inventors to more accurately determine the scope of protection their patent will provide.

Furthermore, PPAs enable inventors to test their inventions or present them to potential investors without committing to full disclosure. This is particularly beneficial for biotechnology and drug discovery startups, but also in other areas such as information and communication technology (ICT), where inventors seek funding or partnerships to advance their inventions and pursue patent protection. PPAs also offer security for inventors who intend to disclose their inventions to potential purchasers, including large pharmaceutical companies that frequently acquire biopharmaceutical companies with substantial intellectual property assets.[2]

For larger companies that are not looking for financial assistance, the one-year period provided by a PPA offers valuable time to develop the invention and define the patent claims more precisely for the most commercially viable version of the invention.[3]

On the negative side, PPAs reduce transparency and increase uncertainty in the patent system, especially for competitors who may only discover that a PPA has been used as priority in a standard application when the latter is published and its priority date becomes that of the PPA.

Taking these arguments as our starting point, our aim is to explore the pros and cons of PPAs and their expansion within and across jurisdictions in recent years.

The article is organised as follows. Section 2 begins with an overview of the PPA mechanism, contrasting it with other patent law institutions having a similar *ratio legis*. Section 3 analyses the rules of filing PPAs and their consequences within various national legal frameworks, exploring why PPAs might be a preferred choice among early-stage inventors. Section 4 presents findings from empirical studies, shedding light on the actual usage of PPAs in the United States and as priorities for

[2] For example, a company press release noted that AstraZeneca "has entered into a definitive agreement to acquire CinCor Pharma, Inc. (CinCor), a US-based clinical-stage biopharmaceutical company, focused on developing novel treatments for resistant and uncontrolled hypertension as well as chronic kidney disease", AstraZeneca (2023).

[3] Barney (1999), p. 1.

standard patent applications at the European Patent Office (EPO). Additionally, we investigate in Sect. 5 the main issues and concerns regarding the use of PPAs, where we particularly refer to the significance of PPAs in the life sciences industry. Prompt intellectual property (IP) protection in this sector is critical due to the costly nature of biotechnology and pharmaceutical development projects. Our study delves into the concept of PPAs as strategic tools, facilitating early priority claims and protecting innovations in their nascent stages. In the final, concluding Sect. 6, we discuss the practical impact of using PPAs and the challenges and opportunities they offer to various parties across different technology fields, including individual inventors and large corporations.

2 Priority Claims and Similar Patent Law Institutions

Priority claims and similar institutions in patent law are crucial for establishing the filing dates and protecting priority to the invention in the first-to-file system. This section explores the details and significance of these concepts.

2.1 Priority System Under the 1883 Paris Convention and Its Relation to PPAs[4]

The importance of establishing the institution of priority was understood by the signatories of the 1883 Paris Convention for the Protection of Industrial Property ("Paris Convention").[5] Initially, the convention had two main objectives: to strengthen national IP regimes and to harmonise IP legislation across borders.[6] The second objective was achieved, *inter alia*, by establishing the institution of priority rights in all the Convention's signatory states, which meant equal treatment of inventors under the jurisdiction of the contracting states in the same manner as domestic inventors.

The Paris Convention established a framework where foreign inventors are granted a one-year period following their initial domestic filing to seek patent protection in other contracting states. This provision enables an inventor to file a corresponding patent application in other member countries within 12 months of the first filing, thereby maintaining priority to the invention across multiple jurisdictions. The term has a preclusive nature, which means that after it expires it is no longer possible to claim the first filing date.

Article 4(1) of the Paris Convention states that:

> Any person who has duly filed an application for a patent, or for the registration of a utility model, or of an industrial design, or of a trademark, in one of the countries of the Union, or his successor in title, shall enjoy, for the purpose of filing in the other countries, a right of priority during the periods hereinafter fixed.[7]

[4] Paris Convention for the Protection of Industrial Property 14 July 1967, Art. 4.

[5] Galvez-Behar (2020), pp. 38–68.

[6] Nakagawa (2011).

[7] Paris Convention for the Protection of Industrial Property 14 July 1967, Art. 4(1).

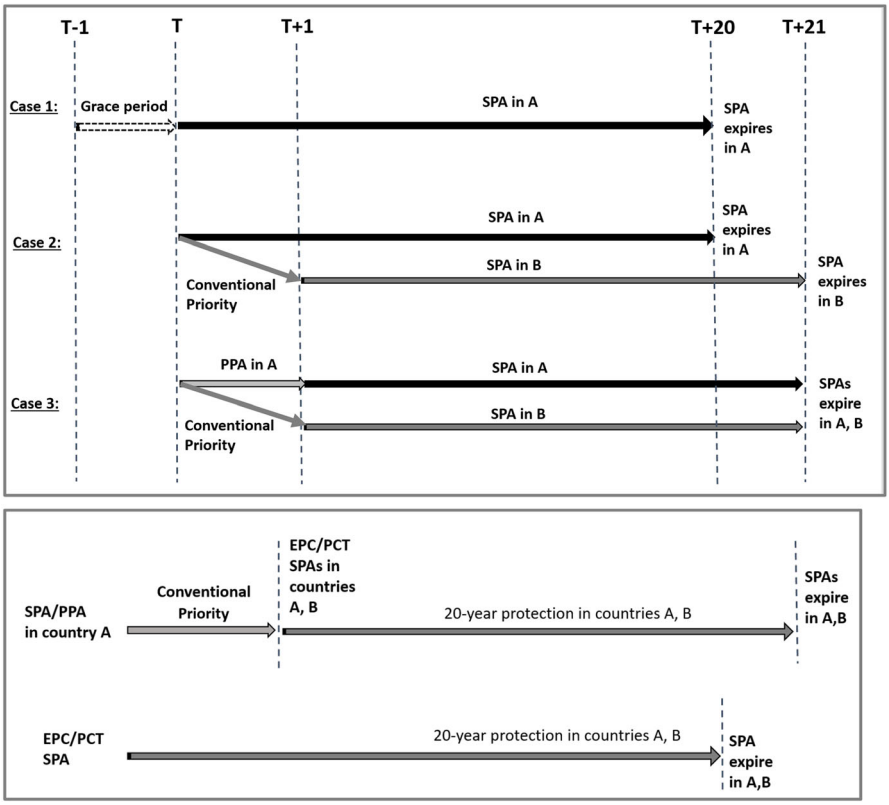

Fig. 1 Implications of different mechanisms related to early patent filings on the length of patent protection in national and regional scenarios *Source*: Authors' own compilation. SPA = standard patent application, PPA = provisional patent application

This allows later applications for the same invention to be treated in the examination procedure as if they were filed on the same date as the initial application, and therefore enables applicants to benefit from the earlier filing date in multiple countries when novelty and inventive step is assessed by the examiner. Consequently, the priority right of the patent applicant can translate to *de facto* longer protection in foreign countries, which can go up to 21 years counting from the filing date abroad, while that of the domestic applicant would be limited to 20 years from the national filing date.[8] This discrepancy can place domestic inventors at a disadvantage compared to their international counterparts.[9] This disadvantage is, however, observable for the usage of conventional priority only within the framework of national filings. When conventional priority is a base for patent protection within the framework of the European Patent Convention (EPC) or Patent

[8] *See* Fig. 1.

[9] Barney (1999).

Cooperation Treaty (PCT), the said disadvantage disappears; the protection from a European patent starts at the standard patent application (SPA) date, which is also effective for the country where the initial file was made for the sake of safeguarding the conventional priority (see Fig. 1, Case 2).

The introduction of PPAs in the United States was initially intended to harmonise the effective term of protection (20 years versus 21 years) for domestic and foreign inventors filing under Art. 4 of the Paris Convention.[10] The PPA effectively establishes a domestic priority period, aligning it with the 12-month time frame granted to foreign applications under the Paris Convention.[11] At the same time, it allows for claiming conventional priority abroad.

A PPA does *not* formally extend the total term of protection beyond the standard term, which is 20 years from the filing date of the non-provisional application. However, it establishes an earlier priority date, blocking others from obtaining patents for the same invention and pushing forward the date when the patent protection starts. This means that in this up-to-12-month window, the applicant is provisionally and conditionally protected (the condition being the grant of the patent based on the standard application), and when the patent is granted, the term begins on the date of the standard patent application. Therefore, the period of provisional priority effectively gives up to an extra year of protection.

During the provisional priority period, the applicant does not yet have enforceable patent rights. A PPA will not become a granted patent without a subsequent non-provisional or standard application. However, already in this period, applicants can send warning letters to potential infringers[12,13] informing them of a provisional patent application pending and caution them against possible infringement.

From its grant, patent rights can usually be enforced backwards from the moment of the patent application's publication. In many countries, however, patent rights can be enforced with regard to an even earlier period. Depending on the national framework of monetary remedies in case of patent infringement, compensation can also be sought for the period after the patent application, be it a standard or provisional patent application, when the infringer was in bad faith. This setup, known, for instance, in the USA, provides a mechanism to somewhat protect the inventor's rights during the vulnerable provisional phase, even though full patent rights are not granted until the patent is officially issued.

Considering the above points, it is important to remember that the concept of patent protection relies on the patent holder's exclusive right to prevent others from using the patented invention without permission. While the 12-month provisional patent application period does not formally establish patent protection, it does create some level of protection beyond merely ensuring a priority filing date. Thus, in certain scenarios, a provisional patent application may *de facto* extend the period of protection for an invention up to 21 years.

[10] Van Horn (1994), pp. 263–264.

[11] Chisum (2010), Chapter 4, Art. 14(2).

[12] Finnegan (2015a).

[13] Naqi (2012), p. 595.

As mentioned before, under the Paris Convention, a PPA filed in one member country can serve as the priority date for subsequent standard patent applications in other member countries. The adequacy of PPAs as a basis for the right of priority under Art. 4 of the Paris Convention has been a topic of debate within the patent community.[14] To address this issue, Bruce A. Lehman, U.S. Assistant Secretary of Commerce and Commissioner of Patents and Trademarks, sought the opinion of Arpad Bogsch, Director General of the World Intellectual Property Organization (WIPO). In their correspondence[15,16] Bogsch confirmed that PPAs do indeed meet the requirements of the Paris Convention. Article 4A(2) states that any filing equivalent to a regular national filing under a member country's domestic legislation grants the right of priority. Additionally, Art. 4A(3) defines a regular national filing as any filing that establishes the application date, regardless of the application's subsequent outcome. Since PPAs establish a filing date under U.S. law, they satisfy this requirement. Therefore, PPAs filed under 35 U.S.C. 111(b) in the United States are sufficient to serve as the basis for the right of priority under Art. 4 of the Paris Convention. This rule holds true even if the original PPA is not converted into a full patent in the country where it was initially filed.[17]

The European Patent Office (EPO) does not accept provisional patent applications; however, the applicant can leverage the priority date of a foreign provisional application when applying for a European patent.[18] To do this, the EPO standard patent application must be submitted within 12 months of the provisional application's filing date. The PPA's filing date in the U.S. or in another country that has formally adopted PPAs will serve as a basis for priority under Art. 4 of the Paris Convention.

In addition to the Paris Convention, conventional priority can arise from other international agreements, such as the Patent Cooperation Treaty (PCT).[19] The PCT stipulates that an international application must be published 18 months after the earliest priority date claimed by the applicant.[20] This rule applies whether the priority date comes from a PPA or a standard patent application.[21] This means that an inventor who has filed a patent application in one of the member countries of the Paris Convention can file an international application under the PCT within 12 months of the date of the first filing and retain the priority date. The international application under the PCT can be based on the first application filed in a member country of the Paris Convention, and the priority rule ensures that the inventor does not lose the priority when seeking patent protection in other countries.

[14] United States Patent and Trademark Office (1995c, d).

[15] United States Patent and Trademark Office (1995b).

[16] United States Patent and Trademark Office (1995a).

[17] Miller (1996), p. 78.

[18] Finnegan (2014).

[19] Żelechowski and Osajda (2022), Art. 14.

[20] World Intellectual Property Organization (2022).

[21] World Intellectual Property Organization (2020).

When an applicant files a PPA, they are granted a 12-month period to file a subsequent standard application, which can claim the priority date of the PPA.[22] For example, if a PCT application claims priority from a PPA filed on 1 January 2020, and a standard application is filed on 31 December 2020, claiming the PPA, the PCT application will be published on 1 July 2021, which is 18 months from the original filing date of the PPA on 1 January 2020.

2.2 Internal Priorities, Also Called "Patent Pending"

In some jurisdictions, like the United Kingdom, the concept of a PPA is not formally recognised but inventors can utilise a similar strategy by submitting a standard patent application and not progressing with it (e.g. not requesting a search) within a one-year window. This approach allows for a subsequent application that claims priority from the earlier one. The initial filing must comprehensively disclose the invention to support any future applications.[23]

In Poland, Art. 33 of the Industrial Property Law (IPL)[24] allows inventors to claim priority from a prior foreign application or recognised international exhibitions. This framework enables inventors to secure early protection for their innovations. The Polish legislation provides a time window – 12 months for inventions and utility models, and six months for industrial designs – to file a subsequent application that claims priority from the initial one. The Industrial Property Law in Poland does not specifically mention the institution of a grace period as it is known in the U.S., but the intent behind this system based on the EPC is to protect inventors against wrongful disclosures that could compromise the novelty of their invention.[25]

For some time, before the 2020 amendment,[26] the priority of an invention could also be claimed internally ("*internal priority*"), i.e. from the earlier domestic standard application,[27] which had an effect similar to the concept of PPAs and conventional priority. The strategic utilisation of initial filing dates to establish priority for a subsequent domestic standard patent application corresponds to the objectives of both PPAs and the grace period.

The specific interpretation of Art. 33 IPL allowing for claiming internal priority is no longer deemed possible. Legislative work commencing in 2020 included the introduction of a system of PPAs. However, as the reform was postponed, PPAs are unlikely to be established in Poland any time soon.

The indicated options of internal priority highlight the global patent system's adaptability in accommodating inventors' needs to protect their inventions in the early development stages.

[22] United States Patent and Trademark Office (1995c).

[23] UK Intellectual Property Office (2018).

[24] Poland, Act of 30 June 2000 on Industrial Property Law 2023, Art. 33 (consolidated text, Poland, Journal of Laws of 2023, item 1170).

[25] Żelechowski and Osajda (2022), Art. 33 (P. Koczorowski).

[26] On 27 February 2020, an amendment to the Industrial Property Law came into effect in Poland.

[27] Żelechowski and Osajda (2022), Art. 33 (P. Koczorowski).

2.3 The Soleau Envelope

The Soleau envelope, named after its French creator Eugène Soleau, is a service offered by the French National Institute of Industrial Property (INPI) since 1910.[28] This service offers the possibility of documenting proof that the applicant was the first to invent.[29] Originally introduced as a physical means for inventors to establish proof of priority, as a sealed and dated envelope containing a description of the invention that the inventor sent to the INPI, it has undergone significant modernisation. The INPI launched the electronic version of the Soleau envelope, known as the "e-Soleau", in 2016.[30] The e-Soleau service enables inventors to submit evidence of their inventions online through the INPI website.[31]

If the envelope meets the formal requirements, then the INPI registers the envelope with the date of its receipt, establishing proof that the inventor created the invention at a certain date.[32] The Soleau envelope does not provide any temporal legal protection or exclusive rights to the inventor and is not a substitute for the formal patent application process. When the envelope is compared to the later patent application, it helps to establish the first person to invent before a patent is granted, especially if multiple people claim rights to the same innovation.

2.4 Grace Period and Provisional Patent Protection

Grace period schemes allow public disclosure before patent filing without affecting novelty.[33] A grace period can be pivotal for inventors, allowing a window when inventions can be disclosed by an inventor without damaging patent eligibility due to the novelty requirement. Although the TRIPs Agreement allows for patents on inventions disclosed before the application, there is no unified grace period rule;[34] grace period provisions vary significantly across jurisdictions.

In the United States[35] and Japan, grace periods are recognised, permitting inventors a period (typically one year) during which their disclosures are not considered prior art in the following patent application.[36]

In other words, if Inventor A discloses an invention in January, they can still file a patent application within the next year without losing novelty. However, if Inventor B independently creates the same invention and files a patent application in March, Inventor B's application could be rejected due to Inventor A's earlier disclosure. Public disclosure generally constitutes prior art, which can be used to reject subsequent patent applications for the same invention on the ground of lack of

[28] Wirten (2021), pp. 241–261.

[29] Ladas (1975), p. 864, note 118.

[30] Reed Smith (2017).

[31] Reed Smith (2017).

[32] INPI (2023).

[33] United States Patent and Trademark Office (2023a).

[34] Königer (2019), pp. 341–342.

[35] U.S.C. 35 U.S.C. § 102(b).

[36] Ozyhar et al. (2022).

novelty. For Inventor B to obtain a patent, their application must claim a novel invention. Since Inventor A's disclosure is now part of the public domain, Inventor B's application can be denied for lack of novelty, as the invention is no longer considered new. On the other hand, if Inventor B discloses their invention before Inventor A's application, the novelty of Inventor A's application is destroyed, since the grace period does not confer priority on Inventor A.

In the EPC system, there is no grace period in the same sense as in the U.S. There are exceptions for pre-filing disclosures but they are strict and limited. Article 55 of the EPC[37] only allows disclosures that do not affect novelty if they occur within six months of filing due to specific situations such as abuse in relation to the inventor or exhibition displays. This restrictive policy is seen as problematic for academia and SMEs, risking patent eligibility for early disclosed inventions.[38]

According to WIPO,[39] many jurisdictions have specific grace period regulations. For example, Argentina allows a one-year grace period for disclosures made by the inventor through any medium of communication or display at a national or international exhibition. On the other hand, countries like the Czech Republic, Denmark, and Finland offer a six-month grace period under particular conditions primarily related to abuse or exhibition displays. The variation in grace period provisions across different countries highlights the lack of harmonisation in global patent law.

On the other hand, a recent EPO study[40] reveals that the existence of grace periods can extend the duration of legal uncertainty, potentially leading to a period of 18 to 30 months during which the novelty of an invention might not be reliably determined by patent offices. A grace period gives applicants more freedom but can also make protection status less clear for other parties.

Importantly for this paper's considerations, the grace period – be it broad or narrow – does not guarantee priority against third parties' applications, but rather a novelty privilege for the disclosing party. In this context, a PPA may serve as a strategic tool for securing an invention's priority date, i.e. protecting the PPA applicant from losing the priority date in light of the patent activity of competitors, while grace period provisions can protect the applicant from losing novelty as a result of the applicant's own intentional or non-intentional activity.

If an inventor publicly discloses a patentable invention, they can still file a standard patent application but only in a country that recognises a grace period. However, the disclosure, wherever it occurs, destroys the invention's novelty in patent systems without the grace period. Filing a PPA during this time allows inventors to take advantage of the grace period while securing the priority date for a later standard patent application.

Therefore, a grace period benefits the disclosing party by safeguarding their ability to patent the disclosed invention and protect them from their own disclosure

[37] European Patent Convention 1973, Art. 55.

[38] Ozyhar et al. (2022).

[39] World Intellectual Property Organization (2023).

[40] European Patent Office (2022).

being used against them if they file a patent application, while others cannot claim novelty for the same disclosed invention.

2.5 Comparison of Instruments

In summary, there are several legal mechanisms available that allow inventors to establish an early priority date and protect their inventions. While these mechanisms do not offer the comprehensive legal protection of a standard patent application, they can be useful tools for securing an early priority date.[41] This gives inventors additional time to develop and refine their inventions before pursuing formal patent protection.

Figure 1 illustrates three possible cases of the relationship between PPAs, standard patent applications (SPAs), and grace period disclosures in terms of the benefits they create for securing a better position for applicants and then respective right holders. Considering the overall timeline of the patent lifecycle, PPAs create the possibility of effectively gaining longer protection in all countries of interest, including the country of domestic application. While doing so, they also provide stronger benefits than a grace period disclosure, safeguarding absolute priority for the final patent application in all member states of the Paris Convention versus the application's novelty, prone to third parties' disclosure and effective only in chosen countries.

In Case 1, an SPA is filed in a given country in year T after benefiting from a grace period up to T-1 and the patent term lasts up to T+20. In Case 2, an SPA is filed in country A in year T and international protection is sought by filing another SPA directly in country B in T+1 claiming a Paris Convention priority from the SPA filed in country A. The patent term in country A lasts up to T+20 and in country B it lasts effectively up to T+21. In case 3, a PPA is filed in year T in country A, followed by an SPA in T+1 based on the PPA's priority, and international protection is sought by filing an SPA directly in B in T+1, also claiming a conventional priority from the first PPA filed in T in country A. Under this third scenario, the patent term for the SPA in country A effectively lasts T+21 as explained earlier, and since the extension to country B has been made directly, under the conditions of the Paris Convention, it also lasts up to T+21 in country B. It is worth noting, as shown in the additional diagram at the bottom of the figure, that the effective T+21 patent term in country B in Case 2 and Case 3 accrues when international extensions follow the national route and priorities from country A (SPA and PPA, respectively) are claimed under the Paris Convention. In other words, filing a PPA or SPA in country B for the sake of claiming conventional priority does not translate to the beginning of patent protection, which starts in all designated countries, including country B, at the date of the patent filing via the EPC/PCT route.

[41] Ozyhar et al. (2022).

3 Provisional Patent Applications in Different Jurisdictions

Provisional patent applications have been formally adopted by several countries, but not universally. The concept and implementation of PPAs can vary significantly among countries. In what follows we describe how Australia, Austria, Portugal, France, and the United States have formally adopted the PPA approach. There is also pending legislation in Spain. Other countries may have similar legislation either in place or planned. Poland[42] conceptualised a PPA system in legislation that has not been finalised and, due to the rule of discontinuation, it is not subject to further work.

3.1 The United States

Provisional patent applications were formally adopted in the United States in 1995, as part of the Uruguay Round Agreements Act ("URAA").[43] Some authors (e.g. Barney) argue[44] that the United States offers a model of a provisional patent institution that has been formally adopted.[45] U.S. patent law underwent significant modifications as a result of the URAA. The addition of Title 35 of the U.S. Code, which allowed both domestic and foreign inventors to submit PPAs, was one of the most significant modifications.[46]

According to Title 35 of the U.S. Code, an initial patent application can be filed either as a provisional application or as a nonprovisional (standard) patent application.[47] Article 111 and Art. 112(a) and (b) of Title 35 U.S. Code outline the essential formal requirements for a standard patent application to qualify for the issuance of a patent. To obtain patent protection, the application must contain a comprehensive and clear description of the invention, along with one or more claims that specifically identify and distinctly define the subject matter that the inventor or joint inventors regard as their invention.[48]

The requirements for filing a PPA are more relaxed than those for a standard patent application. Under 35 U.S. Code § 111(b), the PPA must contain a specification and drawings if they are necessary to understand the invention, but claims required in a standard patent application and an oath of inventorship are not required in a PPA. In sum, in order to qualify for a provisional patent in the U.S., the inventor must provide a written description of the invention that is sufficiently detailed to enable a person skilled in the relevant field to understand the invention; however, the inventor does not need to specify the patent claims at this stage.

[42] Project under review since May 2022. As of 10 January 2024, there is no confirmed information available regarding the continuation or discontinuation of the project.

[43] Public Law 103-465 (1994).

[44] Barney (1999).

[45] U.S.C. 35 § 112(a).

[46] Barney (1999).

[47] United States Patent and Trademark Office (2023a).

[48] United States Patent and Trademark Office (2023b).

Amendments to a PPA are not permitted after filing, other than those to make the provisional application comply with the applicable regulations,[49] and PPAs in the United States are not published.[50] This means the inventions covered by these applications do not enter the state of the art, as they remain confidential. The United States Patent and Trademark Office (USPTO) explains[51] that a provisional application is not examined (except to check the formal requirements for submitting a PPA) and does not require "formal patent claims, oaths, or declarations, nor any information disclosure (prior art) statement".

A PPA expires after 12 months and it is not possible to restore this deadline. The priority date from the PPA can be maintained by filing a standard patent application within this 12-month period. The patent claims in that standard patent application should closely match and supplement the description of the invention in the PPA. Failure in this regard might result in the patent office denying the claim of priority based on the PPA.[52,53]

In the U.S. patent system, inventors have two primary options when transitioning from a provisional to a nonprovisional patent application. They can either convert the provisional application directly into a nonprovisional one, which preserves the original filing date but may shorten the patent's term. Alternatively, they can file a new nonprovisional application that claims the benefit of the earlier provisional filing, potentially extending the patent's effective term by up to 12 months.[54]

There are several identified advantages to using the U.S. PPA system, including establishing a priority filing date, having a patent pending status to notify others of the invention, and giving an inventor more time to research and refine the invention.[55] Moreover, by invoking priority based on a PPA, domestic inventors are granted 21 years of effective patent protection,[56] placing them on an equal footing with foreign inventors who claim priority based on the Paris Convention.

It is important to note the difference between the patent term and the filing date, as they are separate concepts under U.S. patent law. According to 35 U.S.C. §154(a)(2), for applications filed on or after 8 June 1995, the term of a patent is set to be 20 years from the earliest effective filing date. The "earliest effective filing date" refers to the filing date of the standard patent application.[57,58] If a complete patent application claims priority based on an earlier provisional application, the filing date of the provisional application is used to establish priority. This allows the inventor to benefit from the priority date, but the 20-year term of the patent is calculated from the filing date of the standard patent application that results in a granted patent.

[49] United States Patent and Trademark Office (2023a).

[50] United States Patent and Trademark Office (2023a).

[51] United States Patent and Trademark Office (2023a).

[52] *Ibidem.*

[53] Mayfield (2016), p. 449.

[54] United States Patent and Trademark Office (2024b)

[55] Ozyhar et al. (2022).

[56] Barney (1999).

[57] United States Patent and Trademark Office (2024a).

[58] Finnegan (2015b).

This means the invention is treated as though it were filed on the earlier date for the purposes of evaluating priority over other inventions. However, this priority claim does not mean the 20-year patent term starts from the provisional application's filing date. The patent term still starts on the filing date of the standard patent application; however, the invention benefits from an extra year of priority protection.

In the U.S. legal system, PPAs have also been called a potential substitute for the "grace period".[59] Some argue, however, that a patent strategy based only on the grace period (that is, without filing a PPA) may be disadvantaged when it comes to establishing a priority filing date compared to those who file a PPA.[60] According to the USPTO, however, a PPA can be filed up to 12 months after an inventor's public disclosure of the invention during the one-year grace period. A public disclosure such as publication, public usage, or an offer for sale made more than one year before the PPA filing date would exclude patenting under the invention rules in the United States.[61] This interpretation allows U.S. inventors to utilise the grace period by making a public disclosure and then filing a PPA within 12 months of that initial disclosure. These two protection regimes combined offer an additional year to the 21 years of protection mentioned above (PPA+SPA).

3.2 Australia

Australia is among the countries offering the PPA as an option for inventors to protect their intellectual property before filing a standard patent application. The legal framework governing the Australian provisional patent application system is primarily found in the Patents Act of 1990 (PA)[62] and administered by the Australian Patent Office.

Filing a provisional application secures an early priority date that can determine the inventor's rights in cases of competing inventions (PA, Sec. 29). The applicant has 12 months from the date of filing the provisional application to file a standard patent application, thereby claiming the priority date established by the provisional application (PA, Sec. 38). Under the Paris Convention, the filing date of an Australian provisional application can be used to establish priority for patent applications filed in other member countries within 12 months.

A provisional application must contain a written description of the invention and any drawings that may help explain the invention. The contents of a provisional application are kept confidential by IP Australia unless the applicant proceeds with a standard application that is eventually published (PA, Sec. 55).

The subsequent standard application must contain a full description of the invention, including any changes or improvements made during the 12-month period. If the standard application is accepted, the inventor will receive full patent

[59] Crouch (2009), p. 28.

[60] Ozyhar et al. (2022).

[61] United States Patent and Trademark Office (2024b).

[62] Australian Patents Act No. 83, 1990, Compilation No. 48, 2021. Compilation date: 18 December 2020, includes amendments up to Act No. 154, 2020.

protection, which lasts for 20 years from the filing date of the standard patent application. That effectively provides inventors with 21 years of patent protection (one extra year of priority protection).

By contrast, in Australia, an applicant can request an International Type Search (ITS) that will analyse claims or subject matter provided by the requester. The ITS provides a report of relevant prior art but does not offer an opinion. Results of the search are typically available within six weeks of a request. This search allows the applicant to assess the patentability of their claims and subject matter during the PPA filing process.[63] It helps to make well-informed decisions about whether to proceed with the more expensive process of filing a standard patent application.

In the United States, a PPA remains confidential unless a standard patent application is filed and claims priority on the basis of the provisional application. In Australia, the invention title and applicant name of a provisional application are published in the Australian Official Journal of Patents upon filing, with the rest of the application remaining confidential unless a subsequent standard patent application is filed.[64,65]

A public database is available that contains information on patent applications filed, including basic PPA details such as the application number, ownership details, and title.[66] However, it is important to note that detailed disclosures contained within the provisional applications are not made public. This is an exception, as it is uncommon for PPA systems to publish the title and applicant name (also referred to as ownership).

3.3 Austria

In Austria, the PPA procedure, known as PRIO (*Die provisorische Patentanmeldung*), is governed by the Austrian Patent Office (Österreichisches Patentamt[67]) within the framework established by the Austrian Patent Act.[68] This legislation outlines the legal framework within which the Austrian Patent Office operates to administer these applications.

A PPA must describe the invention in enough detail to enable someone skilled in the relevant field to understand and implement it. Although not required, the application can include elements such as claims, abstracts, descriptions of known prior art, the objectives and solutions provided by the invention, and illustrative figures if necessary. PPAs filed in Austria are not published, which ensures that the invention details remain confidential during the provisional period.

[63] Supra (2015).

[64] Sperry (2015).

[65] Australian Government, IP Australia (2024), https://www.ipaustralia.gov.au/patents/how-to-apply-for-a-standard-patent/provisional-patent-applications. Accessed 17 May 2024.

[66] AusPat Database (2024).

[67] Austrian Patent Office (2023).

[68] Austrian Patent Law 1970, Federal Law Gazette No. 259.

Once a patent application has been filed, new technical features cannot be added beyond what was disclosed in the initial filing;[69] this is a concept known as "excess of disclosure" and means that, even in the case of an upgrade, any new technical features must be filed in a separate patent application. Should there be new technical developments or improvements, these must be the subject of a separate patent application.

By filing a PPA, an inventor secures an early priority date, which can be leveraged when filing a subsequent standard patent application within 12 months.

It offers a cost-effective solution for startups to secure an internationally valid priority date for their inventions without the need for a formal examination or publication, provided that a subsequent standard patent application is filed within 12 months of filing the PPA.[70]

In terms of the duration of patent protection, the Austrian Patent Law establishes that the maximum term is 20 years from the filing date of the standard patent application. This means that the 20-year period of patent protection will start from the filing date of the standard patent application, not the PPA, which effectively allows for 21 years of patent protection.

3.4 France

France formally adopted a PPA system as part of the PACTE law of 22 May 2019, along with decree No. 2020-15 of 8 January 2020,[71] a legal act "relating to the creation of a PPA and the transformation of a utility certificate application into a patent application" which was published in the Official Journal on 10 January 2020. This legislative change introduced the option for inventors to file a provisional patent application, marking a significant update to the French intellectual property system.

The applicant is allowed, as in the jurisdictions discussed above, to file an application without defining patent claims but with sufficient descriptions and drawings that may be necessary. A French PPA is not published and it is valid for a maximum of 12 months, within which an inventor can file a standard patent application, transform it into an application for a utility certificate, a title valid for 10 years, or waive the application altogether.[72]

Like others, this system was designed to give early-stage inventors more time to refine their patent strategies.

[69] Puchberger & Partner (2023).

[70] Austrian Patent Office (2022).

[71] Republic of France (2020b).

[72] Republic of France (2020a).

3.5 Portugal

A PPA in Portugal contains all the elements that are essential and common elements of such a document: a lower threshold of formal requirements, lower costs, and 12 months to convert a PPA into a standard patent application.[73]

The Portuguese Industrial Property Code[74] allows for the filing of PPAs, which follow the same regulations as standard patent applications, with the exception of certain formal requirements. A PPA in Portugal is not published, and it is also not possible to add new subject matter when converting a PPA into a standard patent application. The Portuguese Patent Office allows priority to be granted to a PPA drafted in Portuguese or English (Art. 62-A of the Industrial Property Code), which distinguishes it from other national patent offices.

When a standard patent application is filed, the Portuguese Patent Office drafts a search report and a written opinion about the patentability of the invention within 10 months of the filing. However, according to Art. 62-A(4) of the Industrial Property Code, a PPA applicant can request, within 12 months of submitting the application, a search on the basis of the description of the invention when it contains searchable technical material. That option might be especially meaningful for inventors who are still working on their innovations or still refining their patent strategies. Ultimately, it can provide a factual basis for the decision on whether to proceed to a standard patent application or abandon the provisional application. This also distinguishes Portugal from all other jurisdictions reviewed, where PPAs are not examined.

3.6 Poland

Poland introduced a draft Industrial Property Law (IPL) in April 2022 which included PPAs and had many similarities to the U.S. version.[75] The assumptions of the Polish PPA framework were as follows.

Pursuant to Art. 31(1) of the IPL Draft, the initial application had to contain the following elements: (i) the identity of the applicant, (ii) the subject matter of the application with a claim of priority to obtain a patent, and (iii) a description of the invention. The application needed to include drawings if they were necessary to understand the invention. The proposed implementation of provisional patents was applicable only to inventions and not to other objects of protection under intellectual property law.

Following the rationale of the IPL draft,[76] the PPA for an invention was not subject to publication and thus would not result in a loss of novelty.

The proponents of the new legislation have suggested a maximum period of 12 months from the date of receipt of the PPA[77] within which a patent application had

[73] Moreira (2022).

[74] Republic of Portugal (2021).

[75] Government of Poland (2022).

[76] Government of Poland (2022), p. 11.

[77] Government of Poland (2022), Art. 35.

to be filed with the Patent Office in order to claim priority on the PPA, namely "an application for invention shall be deemed to have been filed on the date of filing of the provisional application for invention".[78] The 12-month period was not subject to adjustment, and in the event that the applicant failed to file a regular patent application, the initial application would be deemed withdrawn.

It is important to note that a PPA was not planned to extend the total duration of an invention's protection. This is because the commencement of patent protection was foreseen from the filing date of the PPA, not the subsequent standard patent application. Consequently, the period of effective patent protection would not be lengthened, which would potentially reduce the commercial value of the invention and limit inventors' ability to fully capitalise on their intellectual property. This structure diminished the relative significance of a Polish PPA compared to the systems in other countries, where a PPA can postpone the moment when the patent starts and thus prolong the overall period of protection.

In fact, in terms of priority and calculating patent protection periods, PPAs in the Polish legislative initiative were meant to have consequences analogous to standard patent applications. A PPA filed in Poland could be used as a basis for claiming conventional priority abroad. It would not, however, create an additional period of protection within the domestic system.

The IPL draft outlined two reasons for the Patent Office to deny a patent based on the filing date of the provisional application. First, if the standard patent application were filed more than 12 months after the provisional application, the application would be denied. However, the IPL draft stipulated that the provisional application would not have a novelty-destroying effect on any future applications (provisional or standard). Second, if the invention in the standard application exceeded the scope of what was disclosed in the original provisional application, the patent would also be refused. Importantly, the 12-month filing deadline for the standard application was strict and could not be extended.

As mentioned above, legislation work on the IPL amendment, containing PPAs, has been discontinued.

3.7 Spain

In October 2021, the Spanish government presented a proposal to amend the current patent law of 2015, which entered into force in 2017.[79] The proposal, which has not yet been approved at the time of writing in 2024, includes the introduction of PPAs in the Spanish system as part of the changes proposed, but allows only specific applicants to use them: public universities and public research institutions.[80] The proposal also mentions that limiting the PPAs to these applicants is because they are the ones in more need, as the rationale for PPAs is to allow applicants to obtain easy

[78] Government of Poland (2022), Art. 35(3).

[79] Draft Law amending Law 17/2001 of 7 December on Trademarks; Law 20/2003 of 7 July on the Legal Protection of Industrial Design; and Law 24/2015 of 7 July on the Legal Protection of Industrial Design. (Anteproyecto de Ley de modificación de la Ley 17/2001, de 7 de diciembre, de Marcas; la Ley 20/2003, de 7 de julio, de Protección Jurídica del Diseño Industrial; y la Ley 24/2015, de 24 de julio, de Patentes.)

[80] In Art. 51a, b and c of the Draft Spanish Law.

Table 1 Differences in the implementation of PPAs across countries

Country	Legal basis	Is the PPA published?
United States	35 U.S.C. § 111(b), 35 U.S.C. § 119(e)	No[a]
Australia	Patents Act 1990 (Cth) Sections 29, 38	No, but invention title and applicant name are published in the Australian Official Journal of Patents at filing.[b] International type search report possible.[c]
Austria	Austrian Patent Law 1970, Federal Law Gazette No. 259	No
France	PACTE Law of 22 May 2019, and Decree No. 2020-15 of 8 January 2020	No[d]
Portugal	Article 62-A of the Portuguese Industrial Property Code	No, but the Portuguese Patent Office drafts a search report within ten months of a PPA being filed.[e]
Poland	Legislation proposed	No, according to draft legislation.
Spain	Legislation proposed	No, according to draft legislation.

Source: Authors' own compilation

[a]USPTO, 37 CFR § 1.211, Publication of Applications, 20 May 2022. https://www.law.cornell.edu/cfr/text/37/1.211#:~:text=(d)%20The%20Office%20may%20refuse,contains%20offensive%20or%20disparaging%20material

[b]Sperry (2015): "A provisional application's invention title and applicant name are published in the Australian Official Journal of Patents at filing. A remainder of the provisional application is secret unless an application is later filed claiming priority to the provisional application. Additionally, if an ITS was requested, the search results are secret unless an application is later filed claiming priority to the provisional application"

[c]Australian Patent Office (2023): "This report can give you an idea about the uniqueness of your invention and its chance of gaining patent protection, help you to make an informed decision about your next steps, and whether filing a PCT application is the right option. It takes us around six weeks to compile the report. It will list inventions similar to yours, as well as an explanation of the relevance"

[d]Pochart, Bardon and Martin (2020)

[e]Moreira (2022)

protection for early-stage inventions, not yet developed or perfected, at relatively low cost.

3.8 Summary

As a summary, Table 1 below sets out the seven countries for which PPAs are already implemented or have been proposed as reviewed earlier in this section. It includes a reference to the specific legislation ruling the PPA in the country, and informs whether the PPA is published or not, to highlight their heterogeneity. The information is current as of January 2024 and may not reflect any changes in legislation or practice that occur after this date.

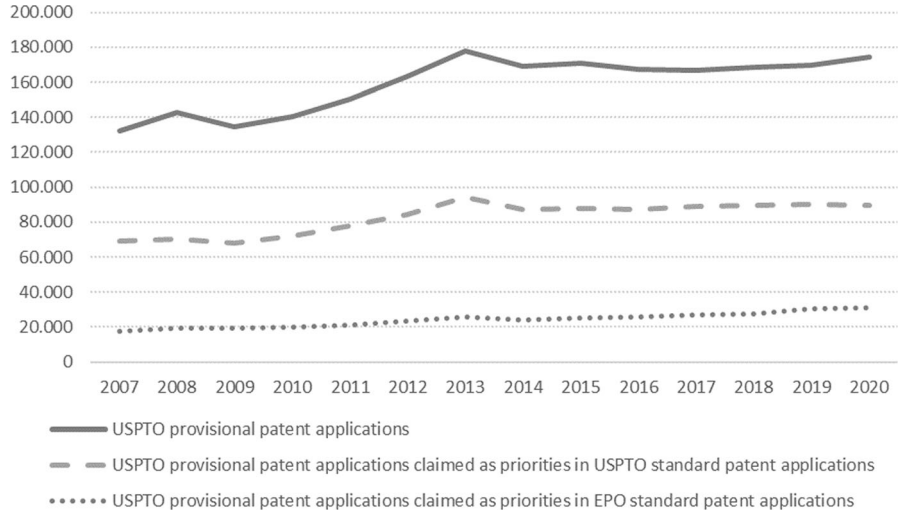

Fig. 2 Total number of U.S. provisional patent applications filed and claimed as priority in USPTO and EPO standard patent applications. Ordered by PPA filing dates per fiscal year: 2007–2020 *Source*: Authors' own compilation. 1) Number of provisional patent applications filed obtained from published USPTO summary of patent examining activities by fiscal year (1 October to 30 September), FY2022 workload tables at: https://www.uspto.gov/about-us/performance-and-planning/uspto-annual-reports (February 2023); 2) Number of provisional patent applications claimed as priorities calculated from the EPO worldwide database on patent statistics (PATSTAT) Autumn 2023 edition (published patent documents up to 31 July 2023)

4 Empirical Research

Against the background of the legal framework of PPAs in several jurisdictions, this section presents empirical evidence on the significance of the use of PPAs. The analysis concentrates on PPAs filed with the USPTO, given the long-standing history of PPA usage in the U.S. patent system. This focus was selected to provide a deeper insight into the functionality and significance of PPAs, leveraging the USPTO's prominent role in the global patent landscape. We first describe PPA filing trends and report the growth in the filings of U.S. PPAs and their rate of use as earliest priorities in the U.S. and EPO, and then look at the shares of all USPTO and EPO applications that have claimed U.S. PPAs as priorities in the past years.

Only a few empirical studies focus on the analysis of USPTO PPAs. The first one, to our knowledge, was made by Dennis Crouch in 2008,[81] who examined a small sample of 15,000 USPTO patents granted in April–May 2008 and found that 21% claimed priority from a PPA. He also observed that a large majority of patents claiming PPA priority had been filed by applicants from the United States, mostly in the area of drugs and chemicals.

More recently, in 2016, Chi-Tung Chen and Dar-Zen Chen[82] published a detailed analysis of the information published by the USPTO on the aggregate number of

[81] Crouch (2008).

[82] Chen and Chen (2016), pp. 555–568.

PPAs filed in the fiscal years 2005–2014 and combined it with information from the USPTO Patent Application Database on regular U.S. patent applications claiming PPA priority. They observe that in the period 2005–2013, more than 4.29 million regular applications and 1.27 million PPAs were filed at the USPTO and, among the latter, about 56% were converted to regular applications. The number of PPAs grew steadily over those years and an increasing number were abandoned. They estimate that the "use rate of provisional applications", defined as the share of all PPAs used for claiming priority by standard patent applications, was between 52% and 60% in 2005–2013. In other words, between 40% and 48% of the PPAs were abandoned without being converted to nonprovisional applications during those years. Their analysis shows that applicants from the fields of Computers and Communications and Drugs and Medical are more likely to use PPAs as priorities in standard patent applications than applicants from other fields. They argue that this is so for two different reasons: filing date sensitivity in the case of the former and patent term sensitivity for the latter. PPAs would be used by applicants for Computers and Communications patents because obtaining an early filing date is essential for them given their short product lifecycles and dynamic market competition. In contrast, PPAs would be used by applicants for Drugs and Medical patents because the length of the patent term is critical for them given their long R&D cycles, technology risks, uncertainty about regulatory approvals and time to market.

We follow a strategy similar to Chen and Chen in 2016, by looking at the USPTO aggregate figures on PPA filings, and identifying the ones claimed as priorities in USPTO and EPO standard patent applications. Our aim is to answer the following questions: (i) how many U.S. PPAs progress to SPAs in the USPTO and EPO; (ii) how many SPAs in the USPTO and EPO claim SPAs filed at the USPTO as their earliest priority.

With that aim, we first extract the number of PPAs filed per fiscal year (1 October to 30 September) in the period 2007–2020 from the workload tables published by the USPTO for fiscal year 2022 and then compare them with the number of PPAs claimed as priorities in all the published U.S. and EPO standard patent applications filed in the months corresponding to each fiscal year, from the EPO worldwide patent statistics database (PATSTAT) Autumn 2023. As shown in Fig. 2, we find that on average 52% of all PPAs progress as regular filings at the USPTO, a rate that has remained more or less stable over the years (52% in 2007, 54% in 2020) and indicates that about half of all PPAs may be abandoned, consistently with previous studies. We go one step beyond and show that about 15% of all the U.S. PPAs filed every year are claimed as earliest priorities in EPO filings, and this share has increased from 14% in 2007 to 18% in 2020.

Now, from the perspective of the SPAs, we look at the technology fields of the USPTO and EPO SPAs where U.S. PPAs are claimed as priorities. Using the WIPO-Tech broad classification in five sectors,[83] we observe a general increase in the share of U.S. SPAs using U.S. PPAs as priorities across all five technology sectors, with Chemistry on top (growing from 30% in 2005 to 45% in 2020), followed by

[83] Schmoch (2008).

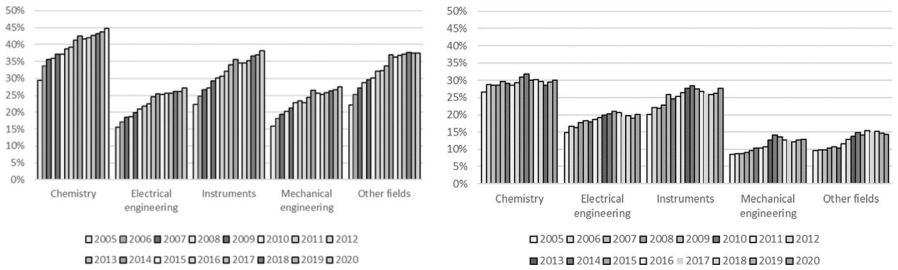

Fig. 3 USPTO patent applications claiming U.S. PPAs as priority: share of all USPTO and EPO SPAs. Ordered by PPAs' filing calendar years 2005–2020, by technology sector. *Note*: Technology sectors from the WIPO-Tech classification and correspondence with International Patent Codes, as available in PATSTAT. Data by calendar year (1 January to 31 December) *Source*: Authors' own compilation. EPO worldwide database on patent statistics (PATSTAT), Autumn 2023 edition

Instruments and Other Fields (from 22% to 38%) and Electrical and Electronic Engineering (from 16% to 27%), as shown in Fig. 3.[84]

At the EPO, Chemistry is also the top field in terms of the share of EPO SPAs using U.S. PPAs as priorities, but it has remained more or less stable over time, with 27% in 2005 and 30% in 2020. In general, the shares have increased across fields in the EPO, but not as much as in the USPTO.

Tables A1 and A2 in the Appendix provide more detail, at the level of the technology fields.

Non-U.S. applicants are not as familiar with the option of using U.S. PPAs to establish priority abroad as their U.S. counterparts are, and further analysis shows that most SPAs claiming U.S. PPAs have U.S. applicants. More than 80% in the case of USPTO applications and more than 70% for EPO applications, followed by Canada with around 4% and a long queue of different countries with less than 2% each.[85]

As regards institutional types,[86] companies represent more than 75% for USPTO filings and more than 85% for EPO filings. Universities and public research organisations file most of the remaining share in both offices at present, but we observe a striking difference as regards filings by individual inventors over time across the two offices. Whereas the number of EPO filings claiming U.S. PPAs as priorities has always been low, at the USPTO the relevance of individual inventors

[84] Since the USPTO only publishes aggregate numbers on total PPA filings with no breakdown by technology field, we cannot assess whether PPAs in health-related fields dominate but are abandoned at a higher rate than PPA filings in computer and communications fields, as we can only observe in PATSTAT those U.S. PPAs that are used as priorities in published patent applications.

[85] The applicant countries with the highest number of U.S. filings claiming U.S. PPAs as priorities, after the U.S. and Canada, are, in this order, Israel, Korea, Taiwan, Germany and Japan, with 2% each. The applicant countries with the highest number of EPO filings claiming U.S. PPAs as priorities, after the U.S. and Canada, are, in this order, the Netherlands, Switzerland, Israel, with 3% each, and Korea, Germany and Sweden, with 2% each. After these, in both cases, there are a large number of applicant countries with less than 1%.

[86] This is based on the classification of applicants by institutional sector provided in PATSTAT, which relies on the EEE-PAT keyword methodology developed by ECOOM (Centre for Research & Development Monitoring), Belgium. It should be noted that this is a keyword-based classification and as such has errors (Callaert et al. (2011)).

claiming priority in PPAs has significantly dropped after the Leahy-Smith America Invents Act (AIA) signed in September 2011 entered into force in March 2013, following some years where they were filing a large number of applications at the USPTO claiming priority in PPAs. This change must have been due to the fact that the AIA Act changed the U.S. system from "first to invent" to "first to file", which faced strong opposition from associations of individual inventors because it arguably made it more difficult and costly to prove priority.

5 Issues and Concerns Regarding PPAs

In very competitive areas like pharmaceuticals, biotechnology or ICT, inventors might file several PPAs for the same invention within a year to secure their priority claim to it. This strategy is critical in industries where the first-mover advantage can be extremely valuable, be it because securing long terms of protection can be the only way to recoup investments, as in the life sciences, or because short product lifecycles make it necessary to gain market share rapidly, as in IT. The technology fields with the highest shares of standard patent applications claiming U.S. provisionals are indeed biotechnology and pharmaceuticals (59% of USPTO filings and 48% of EPO filings, as shown in the Appendix Tables), where, as argued by Chen and Chen in 2016, patent term sensitivity is the main driver for the use of PPAs. They are also significantly used in the U.S. in a field where the incentive to use PPAs is rather related to filing date sensitivity, such as IT methods and management, where they are used as priorities in 38% of all regular U.S. filings. At the EPO, however, fields where U.S. PPAs are used intensively as priorities (more than 33%) are limited to the life sciences, reflecting differences in the R&D and industry focus between the U.S. and Europe. Moreover, as previously noted, the majority of the applicants for standard patents claiming U.S. provisionals as priorities are primarily based in the United States. This suggests that the practice of filing U.S. provisionals remains more prevalent among U.S. companies compared to their European counterparts.

Filing provisionals may also be linked in the U.S. to other practices that have long only been available in the U.S., such as the use of continuations and continuations in part. Righi et al.[87] argue that U.S. applicants file continuations to keep prosecution open and change the patent scope after locking in gains with the initial patent. They conclude that provisionals are indeed systematically positively correlated with continuing application filing, as another way to delay claim drafting, and are often used by sophisticated applicants for their more valuable inventions. Further empirical research would be needed to study the relation between provisionals, patenting strategies and patent value, notably in view of the expansion of provisionals to other jurisdictions as discussed in Sect. 3 above.

In what follows, we present a discussion on the relationship between PPAs and standard patent applications using the CRISPR case as an example, explore the inflexibility of PPAs, and examine the challenges of broad claims. These issues

[87] Righi, Cannito and Vladasel (2023).

underscore the legal complexity at hand and highlight the need for further empirical research to capture these nuances. The aim would be to better understand the incentives driving applicants to file provisionals and how they relate to the value of the subsequent patents.

5.1 Relationship Between a PPA and a Standard Patent Application – CRISPR

The relationship between PPAs and standard patent applications is crucial – deciding when to file a patent application is a strategic move that affects an invention's protection and potential profits.

A PPA allows inventors to claim an early filing date for their invention, giving them extra time to finish their research and refine their invention before committing to a full patent application. However, filing a standard patent application too soon can be risky if the final invention differs from the initial description, weakening the patent's effectiveness, and linking multiple PPAs to one invention can become complicated, especially if the initial descriptions are broad.

The dispute over the priority date in the Clustered Regularly Interspaced Short Palindromic Repeats (CRISPR) case, which has prompted vivid discussion in academia, is a prime example of the complexity and challenges involved in determining priority in the field of complex biotechnological inventions, particularly when multiple parties have made significant contributions to the development of a given technology. CRISPR-Cas9, an innovative genome editing technology, has become the focus of a globally recognised patent dispute, highlighting the challenges and complexities of intellectual property law in the field of advanced scientific research.[88]

CRISPR technology has been the subject of much research and development in recent years. The Broad Institute, Harvard University and MIT on the one hand and UC Berkeley on the other are among the institutions that have been involved in its development. Both parties filed priority applications for CRISPR at around the same time, leading to a patent dispute over who has the rights to the technology.

The Broad Institute successfully argued for the distinctness of its CRISPR application in eukaryotic cells,[89] despite UC Berkeley's earlier priority filings that covered CRISPR use in general. This distinction was pivotal in the USPTO decision to award key patents to the Broad Institute, despite Berkeley's earlier filing date.[90]

In 2020, the USPTO issued a final decision in the case and granted the Broad Institute, Harvard University, and MIT the rights to the CRISPR patent. However, UC Berkeley appealed this decision, and the USPTO again ruled in March 2022 against Berkeley.[91]

The heart of the dispute lies in the timing and description of inventions, particularly those submitted through priority applications like PPAs. PPAs allow inventors to establish an early filing date for their inventions, which is crucial in the

[88] *See* Irvine and Coombes (2020); Dominique Guellec (2020).

[89] Broad Institute (2022).

[90] Sherkow (2017), p. 2.

[91] Sherkow (2018), pp. 5–9.

first-to-file patent system. However, the broad nature of the initial description in PPAs, especially in complex fields like biotechnology, can lead to disputes over the scope of the invention and who first conceived it.

Moreover, the CRISPR patent saga highlights the importance of a scrupulously crafted patent strategy that considers both the timing of filings and the precision of the claims and description.[92] Broad descriptions of inventions in PPAs can be intended to provide a comprehensive scope of protection in the claims of the subsequently filed standard patent applications, but may also invite challenges if they overlap with the claims of others working in related areas.

5.2 Inflexibility of PPAs

The inflexibility of PPAs presents a notable challenge for inventors. Once a PPA is filed, changes to its description are not permitted. This limitation is crucial when it comes to drafting patent claims that accurately represent the invention's full scope in a subsequent standard patent application.

Unlike PPAs, regular patent applications do allow for some modifications after filing. Specifically, while applicants can amend claims or correct errors in a standard patent application, significant changes to the invention's core description are generally not permitted without filing a new application.[93] Other allowable adjustments can include corrections to the title, the invention's description, and the patent claims, all intended to clarify and unify the content.

The inflexibility of PPAs presents a significant challenge because they are often filed during the early stages of development when the invention may not be fully defined. However, the authors recognise that allowing for greater flexibility could lead to uncertainty and legal disputes over the same invention. This inability to amend a PPA forces inventors to either narrow down their claims in later standard applications or file additional applications, which can add both cost and time to the patenting process.

The description within the PPA must be detailed enough to support future patent claims, yet it should not be so comprehensive that it limits the possibility for modifications or further development of the invention. Moreover, the inability to amend a PPA may force inventors to narrow the scope of claims in their subsequent standard patent application, potentially leading to the exclusion of parts of the invention or the need for additional patent applications.

The fixed nature of PPAs can make it difficult for inventors to adjust their inventions based on new market trends or technological progress. Therefore, it is essential for inventors to carefully draft their PPAs to ensure they provide enough detail to support future claims while still maintaining flexibility for possible invention adjustments.

5.3 Broad Claim Issue

The practice of using broad descriptions in PPAs by applicants to claim early rights to inventions under development can lead to complications. A wide description that

[92] Baker and Statler (2018).

[93] Reilly (2018).

includes numerous specific aspects or applications of the invention might cause issues with the scope of the subsequent standard patent application.

Specifically, a standard patent application that relies on the broadly described PPA might face challenges during the examination by the relevant patent office.[94] Science can lead to unexpected results, and inventors may find that the claims in a standard patent application need to be more restricted than those in the PPA or expanded to include new aspects of the invention not initially covered.

On the other hand, we believe that trying to claim a broader scope than what the PPA's written description supports will likely encounter objections from patent offices. This becomes more complex when elements discovered after the PPA filing, and not detailed in the PPA, are included in the claims of the subsequent standard patent application. Therefore, to prevent a claim from being invalidated, patent applicants might be inclined to describe their invention as broadly as possible. However, as noted, basing a patent claim on a wide and comprehensive description can lead to its own set of challenges.

Instead, a more effective strategy might involve detailing essential aspects of the invention to support the core claims that will be made in the subsequent standard patent application. This approach balances the need for comprehensive coverage with the flexibility to adapt as the invention develops.

5.4 Legal Certainty and Transparency of PPAs

As mentioned earlier, PPAs can create significant challenges as to the transparency and legal certainty of the patent system. One obvious reason is that PPAs are not subject to publication in most jurisdictions. Because of this, competitors may only discover that a PPA has been used as a priority in a standard application when the latter is published and its filing date becomes that of the PPA.

There are, however, two more aspects that are worth mentioning. First, in the decision of 10 October 2023 in Case G1/22, the EPO adopted a generous approach towards the applicant, claiming earlier priority, be it from an SPA or a PPA. According to this decision, there is a presumption under the autonomous law of the EPC that an applicant claiming priority in accordance with Art. 88(1) EPC and the corresponding Implementing Regulations is entitled to claim priority. By reversing the burden of proof, the EPO, in fact, privileges applicants who do not need to prove whether there was an explicit agreement between them and the former applicant or applicants. This rule can be crucial, especially for individual PPAs filed by multiple applicants, where there could be doubt about the legal succession.

Yet another problem with the transparency of PPAs is related to the fact that several national patent offices[95] deem themselves not competent either to verify

[94] Barney (1999).

[95] For instance, according to the approach of the Polish Patent Office and administrative courts, verifying the Patent Office decisions, the office has the competence to assess only the matter based on substantive law, contrary to formal issues, which remain beyond its realm of control. The questions of legal succession and the identity between a priority file and a latter application are deemed to be formal issues, *see* judgment of the Polish Supreme Administrative Court of 8 February 2007, II GSK 114/06.

whether a party is entitled to claim priority under Art. 87(1) EPC or to assess whether the inventions claimed in the PPA and the later standard application are identical. The EPO does find itself competent to assess both issues; however, when a European patent reaches domestic patent systems, the EPO's competence can no longer be used in the invalidation proceedings. The party claiming invalidity of a European patent, for instance, due to the lack of identity of both applications and thus the lack of novelty of the latter one, is left without proper means of judicial control over the patent's validity.

6 Conclusions

PPAs provide a low-cost means of obtaining a priority date and, furthermore, they allow an inventor to test the market for an invention and evaluate its commercial potential before committing to a full patent application. Depending on the jurisdiction, they can also effectively provide an inventor with 21 years of patent protection if a standard patent application is granted based on a PPA priority, or if a PPA is used as a basis for international priority under the Paris Convention.

Despite these advantages, there are some potential drawbacks to using PPAs. Defining the patent claim from a provisional application can be challenging and may lead to an invalidation of the patent claim. Additionally, PPAs are only valid for a limited period, and the inventor must file a full patent application within that time frame to maintain the priority date. Failing to file the standard application within this period does not result in the loss of existing patent rights – since PPAs do not grant any patent rights – but rather the loss of the priority advantage. This loss could be critical if another similar patent application is filed during this period, potentially jeopardising the inventor's ability to secure patent protection for their invention.

To further improve the PPA system in Europe, we believe it would be beneficial if the European Patent Office provided standardised guidelines for PPAs, offering soft guidance and examples of known cases with issues arising from claims that are too broad or too narrow. Additionally, it would be advantageous for PPA regulations to be harmonised across EU jurisdictions to ensure similar principles and reduce legal uncertainty. Such harmonisation would mean that in countries offering PPAs, the principles guiding the process would be aligned, making it easier for applicants to navigate the system. We see a significant role for the EPO in achieving substantive harmonisation of these procedures. Such an initiative would eventually lead to the improved effectiveness and reliability of the patent system.

Another issue with PPAs is the potential for multiple inventors or companies, whether as competitors or collaborators, to file separate PPAs for the same invention independently, leading to a complicated and costly process of sorting out ownership and potential infringement issues. This situation is especially common in fast-moving and highly competitive industries like ICT and the life sciences, where multiple parties may be working on similar technologies or innovations. Additionally, differences in handling joint ownership between PPAs and full patent applications can make these disputes even more challenging, as demonstrated by cases like CRISPR, where disagreements among collaborators have resulted in extended legal battles.

To address some of these challenges, we recommend implementing a regulation similar to the Australian PPA system in countries offering PPAs. This would involve making the title and applicant of the PPA publicly available information. Although Australia's regulations are an exceptional case, it is believed that this approach would enhance the transparency of the process. There are some drawbacks to this solution, as the optimal timing of such publication would be less clear to applicants. Publishing a PPA too early could provide competitors with an advantage, allowing them to intensify research in the same direction, knowing that the invention is not yet fully defined. Nevertheless, the authors recommend increasing the transparency of the PPA system by publishing the title and applicant name of the PPA, with other details remaining confidential unless the subsequent patent application is granted.

In conclusion, while PPAs are a useful tool for securing priority for an invention, they come with some potential risks and challenges, including defining the patent claim, a limited validity period, the potential for multiple unpublished PPAs for similar inventions, and ownership and infringement disputes. Despite these challenges, PPAs remain a popular and valuable option for inventors, especially in industries like the life sciences and IT, where levels of innovation and competition are high. We believe that the patent system as a whole would benefit from more transparency regarding PPAs and, importantly, from more empirical research grounded in a solid understanding of the legal issues at stake, particularly now that they seem to be expanding to a larger number of jurisdictions as indicated by the proposals included in the draft legislation in progress in Poland and Spain.

This situation could be similar to what happened with "submarine patents"[96] in the U.S., where patents were hidden until they were published as granted. This often led to unexpected claims that disrupted industries. Making the PPA process more transparent and harmonised could help prevent these kinds of problems today.

Concurrently, the regional and national systems should provide tools for verifying the legitimacy of patents granted based on PPAs, in terms of both substantive law and procedure, so that PPAs do not cause difficulties or the inability to invalidate patents that otherwise could – and should – have been invalidated.

Appendix

See Tables A1 and A2.

[96] IP Watchdog (2010).

Table A1 USPTO SPAs claiming U.S. PPAs as priority: share of all USPTO SPAs by technology fields within technology sectors. USPTO patent applications with filing years/calendar years 2005–2020

	2005	2010	2015	2020	2005–2020 Average	2005–2020 All SPAs
Technology sector: CHEMISTRY	**29%**	**37%**	**42%**	**45%**	**39%**	**1,268,533**
Organic fine chemistry	38%	47%	47%	48%	47%	241,189
Biotechnology	48%	57%	62%	63%	59%	259,488
Pharmaceuticals	47%	58%	62%	63%	59%	326,195
Macromolecular chemistry, polymers	20%	28%	29%	32%	29%	131,319
Food chemistry	29%	36%	44%	38%	37%	73,107
Basic materials chemistry	24%	33%	36%	37%	34%	191,806
Materials, metallurgy	16%	23%	26%	29%	24%	118,154
Surface technology, coating	17%	24%	28%	33%	26%	210,412
Micro-structural and nano-technology	21%	34%	33%	40%	34%	32,463
Chemical engineering	21%	29%	36%	40%	33%	206,645
Environmental technology	20%	29%	32%	37%	30%	95,291
Technology sector: INSTRUMENTS	**22%**	**30%**	**35%**	**38%**	**32%**	**1,459,280**
Optics	11%	15%	19%	26%	17%	330,753
Measurement	20%	26%	30%	31%	27%	433,923
Analysis of biological materials	45%	55%	56%	55%	54%	98,598
Control	21%	26%	32%	33%	28%	255,846
Medical technology	31%	42%	47%	51%	44%	494,260
Technology sector: ELECTRICAL ENGINEERING	**16%**	**21%**	**25%**	**27%**	**23%**	**3,066,889**
Electrical machinery, apparatus, energy	13%	18%	22%	24%	20%	549,930
Audio-visual technology	12%	16%	23%	28%	20%	493,978
Telecommunications	18%	26%	30%	33%	27%	377,981
Digital communication	21%	29%	33%	35%	29%	625,426
Basic communication processes	16%	19%	25%	27%	22%	130,039
Computer technology	18%	21%	26%	28%	23%	1,241,949
IT methods for management	32%	37%	40%	40%	38%	237,890
Semiconductors	9%	15%	16%	19%	15%	439,625
Technology sector: MECHANICAL ENGINEERING	**16%**	**23%**	**26%**	**27%**	**23%**	**1,321,205**
Handling	18%	28%	30%	32%	28%	188,847
Machine tools	15%	24%	26%	26%	23%	169,263
Engines, pumps, turbines	12%	18%	21%	23%	19%	186,300
Textile and paper machines	11%	18%	21%	25%	19%	115,317
Other special machines	22%	29%	34%	37%	31%	249,792
Thermal processes and apparatus	16%	23%	26%	28%	24%	92,713
Mechanical elements	13%	21%	25%	27%	22%	212,696
Transport	16%	19%	21%	23%	19%	336,835
Technology sector: OTHER FIELDS	**22%**	**30%**	**36%**	**37%**	**33%**	**525,210**
Furniture, games	24%	31%	39%	40%	35%	197,941
Other consumer goods	20%	27%	34%	33%	30%	162,746
Civil engineering	22%	31%	36%	40%	33%	190,835

Note: Technology fields from the WIPO-Tech classification and correspondence with International Patent Codes, as available in PATSTAT. Data by calendar year (January 1 to December 31). Technology fields having on average more than 33% of standard patent applications claiming priorities from PPAs for the years considered are coloured in grey. The sum of the number of SPAs by technology field are higher than the totals indicated in the table because SPAs can be assigned to several technology fields and sectors leading to multiple counting. Averages per sector are calculated based on the sector allocation of patents, as in Fig. 3: they are not based on field averages

Source: Authors' own compilation. EPO worldwide database on patent statistics (PATSTAT), Autumn 2023 edition

Table A2 EPO SPAs claiming U.S. PPAs as priority: share of all EPO SPAs by technology fields within technology sectors. EPO patent applications with filing years/calendar years 2005–2020

	2005	2010	2015	2020	2005–2020 Average	2005–2020 All SPAs
Technology sector: CHEMISTRY	**27%**	**29%**	**30%**	**30%**	**29%**	**646,041**
Organic fine chemistry	34%	35%	36%	34%	35%	119,561
Biotechnology	44%	47%	49%	48%	48%	116,614
Pharmaceuticals	44%	48%	49%	48%	48%	164,742
Macromolecular chemistry, polymers	18%	22%	23%	22%	22%	75,277
Food chemistry	22%	27%	28%	26%	26%	33,856
Basic materials chemistry	22%	29%	27%	25%	26%	104,323
Materials, metallurgy	11%	14%	17%	13%	15%	69,648
Surface technology, coating	17%	18%	20%	19%	18%	66,290
Micro-structural and nano-technology	23%	23%	26%	29%	27%	10,181
Chemical engineering	18%	20%	23%	23%	21%	96,659
Environmental technology	12%	16%	17%	20%	17%	47,217
Technology sector: INSTRUMENTS	**20%**	**25%**	**27%**	**28%**	**25%**	**532,605**
Optics	13%	16%	20%	24%	17%	87,819
Measurement	15%	17%	19%	19%	18%	158,474
Analysis of biological materials	37%	40%	41%	38%	40%	43,653
Control	13%	13%	18%	16%	15%	73,148
Medical technology	27%	34%	38%	39%	35%	213,608
Technology sector: ELECTRICAL ENGINEERING	**15%**	**18%**	**21%**	**20%**	**19%**	**823,880**
Electrical machinery, apparatus, energy	10%	13%	13%	12%	12%	210,114
Audio-visual technology	13%	14%	19%	25%	18%	115,615
Telecommunications	16%	20%	23%	23%	20%	109,762
Digital communication	19%	25%	29%	26%	25%	216,315
Basic communication processes	16%	16%	21%	16%	17%	26,262
Computer technology	19%	20%	23%	22%	21%	225,840
IT methods for management	26%	27%	28%	24%	26%	44,390
Semiconductors	11%	14%	15%	14%	14%	76,922
Technology sector: MECHANICAL ENGINEERING	**8%**	**10%**	**14%**	**13%**	**11%**	**677,190**
Handling	10%	12%	14%	15%	13%	93,744
Machine tools	9%	10%	13%	12%	11%	75,338
Engines, pumps, turbines	6%	8%	17%	11%	10%	103,664
Textile and paper machines	10%	14%	14%	15%	13%	58,260
Other special machines	12%	15%	19%	17%	16%	121,984
Thermal processes and apparatus	8%	10%	10%	9%	9%	57,085
Mechanical elements	6%	9%	12%	11%	10%	100,640
Transport	7%	8%	10%	11%	9%	164,521
Technology sector: OTHER FIELDS	**10%**	**10%**	**14%**	**14%**	**13%**	**215,786**
Furniture, games	12%	11%	16%	17%	14%	60,925
Other consumer goods	10%	10%	13%	14%	12%	73,537
Civil engineering	8%	10%	14%	13%	12%	91,010

Note: Technology fields from the WIPO-Tech classification and correspondence with International Patent Codes, as available in PATSTAT. Data by calendar year (January 1 to December 31). Technology fields having on average more than 33% of standard patent applications claiming priorities from PPAs for the years considered are coloured in grey. The sum of the number of SPAs by technology field are higher than the totals indicated in the table because SPAs can be assigned to several technology fields and sectors leading to multiple counting. Averages per sector are calculated based on the sector allocation of patents, as in Fig. 3: they are not based on field averages

Source: Authors' own compilation. EPO worldwide database on patent statistics (PATSTAT), Autumn 2023 edition

References

AstraZeneca (2023) AstraZeneca has entered into a definitive agreement to acquire CinCor Pharma, Inc. (CinCor). https://www.astrazeneca.com/media-centre/press-releases/2023/astrazeneca-acquire-cincor-for-cardiorenal-asset.html. Accessed 17 May 2024

Australian Patent Office (2023) How to search existing IP overseas. https://www.ipaustralia.gov.au/patents/applying-patent/provisional-application-what-include/international-type-search. Accessed 11 November 2023

Austrian Patent Office (2022) Patentanmeldung. https://www.usp.gv.at/betrieb-und-umwelt/laufender-betrieb/weitere-informationen-laufender-betrieb/geistiges-eigentum/patentanmeldung.html. Accessed 17 May 2024

Austrian Patent Office (2023) PRIO application – provisional patent application. https://www.patentamt.at/en/prio-application. Accessed 17 May 2024

AusPat Database (2024) Protect the value of your ideas. http://pericles.ipaustralia.gov.au/. Accessed 17 May 2024

Baker M, Statler K (2018) CRISPR decision highlights the importance of strategic claims drafting. https://www.ipcg.com/wp-content/uploads/2020/10/CRISPR_Decision_Highlights_the_Importance_of_Strategic_Claims_Drafting.pdf. Accessed 17 May 2024

Barney JR (1999) Student works: an overview of the pros and cons of provisional patent applications. Yale J.L. & Tech 1. https://digitalcommons.law.yale.edu/yjolt/vol1/iss1/2. Accessed 17 May 2024

Broad Institute (2022) Journalists' statement and background: CRISPR patent process. https://www.broadinstitute.org/crispr/journalists-statement-and-background-crispr-patent-process. Accessed 17 May 2024

Callaert J, Du Plessis M, Grouwels J, Lecocq C, Magerman T, Peeters B, Song X, Van Looy B, Vereyen C (2011) Patent statistics at EUROSTAT: methods for regionalisation, sector allocation and name harmonisation. Eurostat Methodologies and Working Papers 2011/11

Chen C, Chen D (2016) Who files provisional applications in the United States? Scientometrics 107(2):555–568. https://doi.org/10.1007/s11192-016-1855-z

Chisum D (2010) Chisum on patents. Chapter 14 priority by foreign filing, § 14.02 historical development. Matthew Bender/LexisNexis, Seattle

Crouch D (2008) A first look at who files provisional patent applications. http://patentlyo.com/patent/2008/06/a-first-look-at.html. Accessed 17 May 2024

Crouch D (2009) Is novelty obsolete – chronicling the irrelevance of the invention date in U.S. patent law. Michigan Telecommunications & Technology Law Review 16(1):28. http://repository.law.umich.edu/mttlr/vol16/iss1/2. Accessed 17 May 2024

European Patent Office (2022) The European patent system and the grace period: an impact analysis. https://link.epo.org/web/the_european_patent_system_and_the_grace_period_study_en.pdf. Accessed 17 May 2024

Finnegan (2014) Priority pitfalls in European patent applications based on U.S. https://www.finnegan.com/en/insights/articles/priority-pitfalls-in-european-patent-applications-based-on-u-s.html. Accessed 17 May 2024

Finnegan (2015a) Infringers need to receive actual notice of a published patent. https://www.finnegan.com/en/insights/articles/infringers-need-to-receive-actual-notice-of-a-published-patent.html. Accessed 17 May 2024

Finnegan (2015b) Effective filing date: what is that again? https://www.finnegan.com/en/insights/blogs/prosecution-first/effective-filing-date-what-is-that-again.html. Accessed 17 May 2024

Galvez-Behar G (2020) The 1883 Paris Convention and the impossible unification of industrial property. In: Gooday G, Wilf S (eds) Patent cultures: diversity and harmonization in historical perspective. Cambridge University Press, Cambridge, pp 36–68. https://doi.org/10.1017/9781108654333.003

Government of Poland (2022) Project of industrial property law of 25th April 2022. https://legislacja.rcl.gov.pl/projekt/12359055. Accessed 17 May 2024

Guellec D (2020) Discovering CRISPR: the research cycle cognitive operations and science policy. https://www.academia.edu/44605313/Discovering_CRISPR_The_research_cycle_cognitive_operations_and_science_policy

INPI (2023) The Soleau envelope solution. https://www.inpi.fr/en/proteger-vos-creations/lenveloppe-soleau/enveloppe-soleau. Accessed 17 May 2024

IP Australia (2024) Provisional patent applications. https://www.ipaustralia.gov.au/patents/how-to-apply-for-a-standard-patent/provisional-patent-applications. Accessed 17 May 2024
IP Watchdog (2010) Submarine patents alive and well: TiVo patents DVR scheduling. https://ipwatchdog.com/2010/02/19/submarine-patents-alive-and-well-tivo-patents-dvr-scheduling/. Accessed 17 May 2024
Irvine C, Coombes C (2020) Update on the CRISPR IP saga and lessons to be learnt. https://www.hgf.com/wp-content/uploads/2020/07/Update-on-the-CRISPR-IP-Saga-and-lessons-to-be-learnt-by-Claire-Irvine-and-Cath-Coombes.pdf. Accessed 17 May 2024
Köniğer K (2019) A friendly reminder 25 years after TRIPs: an international harmonisation of the grace period in patent law remains preferable. J Intellect Prop Law Pract 14(5):341–342. https://doi.org/10.1093/jiplp/jpz038
Ladas SP (1975) Patents, trademarks, and related rights: national and international protection, vol 3. Harvard University Press, Cambridge
Mayfield DL (2016) Medical patents and how new instruments or medications might be patented. Mo Med 113(6):449
Michaud RP (2004) Provisional patents solve inventors' problems. In: Proceedings of the 30th Annual Northeast Bioengineering Conference, pp 245–46. IEEE, New York. https://doi.org/10.1109/NEBC.2004.1300086
Miller TR (1996) The same effect United States provisional patent applications and Paris Convention priority rights. J Patent Trademark Office Soc 78
Moreira VS (2022) Filing a priority document in Portugal. Inventa. https://inventa.com/en/news/article/780/filing-a-priority-document-in-portugal. Accessed 17 May 2024
Nakagawa J (2011) Harmonization of intellectual property rights. International Harmonization of Economic Regulation, International Economic Law Series, Oxford. https://doi.org/10.1093/acprof:oso/9780199604661.003.0005
Naqi S (2012) Comment on provisional patent rights. Nw. J. Tech. & Intell. Prop. 10(7):595. https://scholarlycommons.law.northwestern.edu/njtip/vol10/iss7/6. Accessed 17 May 2024
Ozyhar T, Barnabei L, Myrick D (2022) When speed matters: a discussion on the benefits of a grace period in patent law to accelerate pharmaceutical innovation in times of pandemic. J Law Biosci 9(1):lsac004. https://doi.org/10.1093/jlb/lsac004
Pochart F, Bardon E, Martin L (2020) France: publication of Decree No. 2020-15: a risky simplification of patent proceedings. https://www.mondaq.com/france/patent/885270/publication-of-decree-no-2020-15-a-risky-simplification-of-patent-proceedings
Public Law 103-465 (1994) Uruguay Round Agreements Act. 108 Stat. 4809. https://www.govinfo.gov/app/details/STATUTE-108/STATUTE-108-Pg4809. Accessed 17 May 2024
Puchberger & Partner (2023) Provisional patent application. https://www.puchberger.at/en/services/provisional-patent-application/. Accessed 17 May 2024
Reilly G (2018) Amending patent claims. Harv J Law Technol 32(1)
Republic of France (2020a) Brevet: la demande provisoire, une nouvelle possibilité pour le déposant. https://www.economie.gouv.fr/apie/brevet-la-demande-provisoire-une-nouvelle-possibilite-pour-le-deposant. Accessed 17 May 2024
Republic of France (2020b) Décret n° 2020-15 du 8 janvier 2020 relatif à la création d'une demande provisoire de brevet et à la transformation d'une demande de certificat d'utilité en demande de brevet d'invention. https://www.legifrance.gouv.fr/loda/id/JORFTEXT000039803704. Accessed 17 May 2024
Republic of Portugal (2021) Portugal Industrial Property Code (approved by Decree-Law No 110/2018 of 10 December 2018, and amended by Decree-Law No 9/2021 of 29 January 2021). https://www.wipo.int/wipolex/en/legislation/details/21381. Accessed 17 May 2024
Righi C, Cannito D, Vladasel T (2023) Continuing patent applications at the USPTO. Res Policy 52(4):104742
Schmoch U (2008) Concept of a technology classification for country comparisons. Final report to WIPO. https://www.wipo.int/export/sites/www/ipstats/en/docs/wipo_ipc_technology.pdf. Accessed 17 May 2024
Sherkow JS (2017) Patent protection for CRISPR: an ELSI review. Journal of Law and the Biosciences 4 [lsx036], NYLS Legal Studies Research Paper No 3093608. https://ssrn.com/abstract=3093608
Sherkow JS (2018) The CRISPR patent landscape: past, present, and future. CRISPR J 1:5–9. https://ssrn.com/abstract=3490211. Accessed 17 May 2024

Smith R (2017) Implementation by the INPI of the electronic Soleau envelope. https://www.reedsmith.com/en/perspectives/2017/01/implementation-by-the-inpi-of-the-electronic-solea. Accessed 17 May 2024

Sperry C (2015) Comparing U.S. and Australian provisional patent applications. https://www.mintz.com/insights-center/viewpoints/2015-09-11-comparing-us-and-australian-provisional-patent-applications. Accessed 17 May 2024

Supra JD (2015) Comparing U.S. and Australian patent systems. https://www.jdsupra.com/legalnews/comparing-u-s-and-australian-80102/. Accessed 17 May 2024

UK Intellectual Property Office (2018) Information released under the Freedom of Information Act. https://www.gov.uk/government/publications/provisional-patents. Accessed 17 May 2024

United States Patent and Trademark Office (1995a) Bogsch letter. https://www.uspto.gov/web/offices/com/sol/notices/bogsch-letter.html. Accessed 18 May 2024

United States Patent and Trademark Office (1995b) Lehman letter. https://www.uspto.gov/web/offices/com/sol/notices/lehman-letter.html. Accessed 18 May 2024

United States Patent and Trademark Office (1995c) Provisional patent notice. https://www.uspto.gov/web/offices/com/sol/notices/provisional.html. Accessed 18 May 2024

United States Patent and Trademark Office (1995d) A guide to filing a utility patent application: nonprovisional (utility) patent application filing guide. https://www.uspto.gov/patents-getting-started/patent-basics/types-patent-applications/nonprovisional-utility-patent#heading-1. Accessed 18 May 2024

United States Patent and Trademark Office (2023a) Grace period for industrial designs policy. Available at: https://www.uspto.gov/ip-policy/industrial-design-policy/grace-period-industrial-designs. Accessed 18 May 2024

United States Patent and Trademark Office (2023b) Chapter 2100: patentability. https://www.uspto.gov/web/offices/pac/mpep/mpep-2100.pdf. Accessed 17 May 2024

United States Patent and Trademark Office (2024a) Manual of patent examining procedure § 2152. https://www.uspto.gov/web/offices/pac/mpep/s2152.html. Accessed 18 May 2024

United States Patent and Trademark Office (2024b) Provisional application for patent. https://www.uspto.gov/patents/basics/apply/provisional-application. Accessed 18 May 2024

Van Horn CE (1994) Practicalities and potential pitfalls when using provisional patent applications. Am Int Prop Law Assoc Q J 22:263–64. https://heinonline.org/HOL/LandingPage?handle=hein.journals/aiplaqj22&div=17&id=&page=. Accessed 17 May 2024

Wirten EH (2021) In the service of secrecy: an enveloped history of priority, proof and patents. J Mater Cult 26(3):241–261

World Intellectual Property Organization (2020) PCT applicant's guide – international phase. https://www.wipo.int/export/sites/www/pct/en/docs/guide/gdvol1.pdf. Accessed 17 May 2024

World Intellectual Property Organization (2022) PCT – frequently asked questions. https://www.wipo.int/pct/en/faqs/faqs.html. Accessed 18 May 2024

World Intellectual Property Organization (2023) Certain aspects of national/regional patent laws: (4) grace period. https://www.wipo.int/export/sites/www/scp/en/national_laws/grace_period.pdf. Accessed 17 May 2024

Żelechowski Ł, Osajda K (2022) Industrial property law, 2nd edn. Warsaw