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Author(s)	Corcoran, Peter
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A Crash Course on Patents for Engineers

Peter M. Corcoran¹, *Fellow, IEEE*

Abstract— Most engineers are aware of the existence of patents. Indeed the preparation of patent disclosures is an important aspect of most research engineering job functions. Yet for many engineers the world of patents remains shrouded in a cloud of mystery. In this paper we try to dispel some of the mystery surround the quasi-technical, quasi-legal nature of patents and provide a set of practical, hand-on, guidelines to the patent literature from an engineer’s perspective.

I. INTRODUCTION

Patents are an important tool for technology-based businesses to protect rights and ring fence new technical and engineering techniques. Research and development is an expensive business and would not be viable commercially unless a company can protect new techniques from copying and duplication by competitors.

As most CE engineers work in a fast changing technological environment it is inevitable for most of us to eventually become involved in preparing technical disclosures and patent applications or being asked to analyze the patents of competitors. The patent process is, however, more complex than one might think and this article attempts to provide some additional insights to research engineers.

II. THE PATENTING PROCESS

On the face of it the patent process is quite simple – an inventor describes a new *invention* that is then formulated into a comprehensive legal document with well-specified legal claims. This *patent application* is evaluated by an examiner, who applies due process to determine the validity of the claims of invention. In practice, there are many shades of gray to this process. We will next consider some of these.

A. Disclosures and Applications

As mentioned above, the process begins with a *disclosure* from the engineer who has developed a new *invention*. However with the complexity of today’s technologies it is not always clear what, if any, aspect of a new technique or technology is novel and non-obvious. At the same time it is not always desirable to reveal all the details of a new system or process to competitors, particularly when it may not be clear if a strong case for inventiveness can be shown.

There can often be conflicting views at this point between engineering management and the legal department. Attorney’s prefer to err on the side of including more information, where as engineering may be reluctant to reveal every details of a process if only limited claims may issue.

At some point, however, a decision is taken and the material in the *invention disclosure* is converted to a *patent application*. The US patent office requires that this document

provides a “best effort” description of the underlying invention – as the actual *invention* may not be quite clear at this point the legal team may request additional information from engineering to ensure support for the broadest scope of claims. Conversely, engineering may resist providing some details they are uncomfortable with revealing to competitors.

B. Provisional Vs Non-Provisional Applications

Due to commercial pressures engineers are often pushed to prepare a disclosure document before the final system or process is finalized. This can happen, for example, when some public demonstration of a technology is to be shown. In the US patent office it is acceptable to provide an initial “best effort” description and to later amend this to a more detailed description. However claims date back to the description where they first find sufficient technical support. This first application is known as a *provisional* patent application

While this mechanism appears to be a helpful one to allow the description of an *invention* to be gradually refined it tends not to work out well in practice. Typically a poor and incomplete description is filed and both engineering and legal teams feel the main work is done. Later, as the deadline for completing the application approaches both engineering and legal teams may have moved onto new projects and it becomes challenging to motivate the relevant personnel to focus and provide an improved specification.

A difficulty with partly complete specifications is that descriptive material cannot be added once a final application is filed. The description of the invention is cast in stone. And it is quite common that deficiencies in the descriptive material are only realized as the patent examiner begins to review and analyze the legal claims.

C. The Examination/Prosecution Process

The examination, or prosecution, stage is often the most interesting part of the patenting process. It is during this stage that an examiner from the patent office performs an analysis of the patent claims and then searches the technical and patent literature to determine if there is a basis for some of the claims applied for.

Typically the examiner will initially construct a range of arguments demonstrating that the claims were known, or could be easily deduced by an expert in the field from documents that were available in the technical or patent literature. The company attorney, supported by the inventor(s) and engineering experts within the company will counter argue, often limiting or modifying the scope of some of the original claim set. Claims that are too broad in scope allow the patent examiner to introduce documents that may be only marginally related to the field of the original invention.

The full details of this process are available publicly and can be accessed by obtaining a “file wrapper” via the “public PAIR” section of the US patent office website. PAIR is a

¹College of Engineering & Informatics, National University of Ireland Galway

valuable tool to understand how a certain set of claims was eventually granted. Often a claim set that seems very broad in scope is in fact much more limited when considered in tandem with the relevant “file wrapper”.

This prosecution process can actually continue for several years. Even when an application receives a “final rejection” there are appeal mechanisms that allow new arguments to be presented. Naturally, this all takes time and money, and eventually either the patent examiner or the patent attorney will yield. This last aspect explains the lengthy and torturous claims that can be found in some patents. If a prosecuting attorney is tenacious enough, and has a large budget at his disposal, he will usually manage to get some grant of claims.

D. *Granted Patents*

Eventually the dance between patent examiner and attorney will end with one of two results. Either the patent will receive a final rejection or be abandoned in which case no patent will issue; or, more frequently than you might think, a set of patent claims will be agreed by the examiner and a patent will issue.

E. *After Grant – Continuations, Continuation-in-Part (CIP) and Divisionals*

We explained above that a provisional patent filing can be added to within a 12 month period. But in the US system there also exists a mechanism to continue with a patent even after it has been initially granted. This is known as a continuation and the idea is that not everything that could be claimed may have been included in the original granted patent. Thus it is possible, for a small fee, to continue the patenting process, after grant, and pursue a different set of legal claims. These must be supported by the original specifications but may differ significantly from the granted claim set.

It is also possible to add material to a granted patent specification - for example, if you modified some aspect of the invention that adds additional value to the original invention then you may file a *continuation-in-part*. Claims priority is only from the date you added the new material, but it may be possible to have some claims which only rely on the original material in which case those claims would have an earlier priority date in line with the original application.

A third form of extension of the original application is known as a *divisional*. This occurs when the examiner considers that your original specification includes 2 distinct inventions. He may limit your original case to one of these distinct concepts, but you have the option to “divide” the case and pursue the 2nd invention at a later stage in what is known as a *divisional* action.

III. THE VALUE OF PATENTS

Just because a patent issues does not imply that it is a very useful or valuable patent. Indeed many patents, on their own, would have very little value. Patents are generally more useful when combined into inter-related “families” with related or even overlapping claim sets. Such groups of patents are considerably more restrictive for competitors who might be able to “work around” a single patent.

It is also important to consider the commercial logic of the corporation or business that owns a patent. Very few larger companies want to engage in costly litigation and so most view their patent portfolios as tools to engage in business negotiations with competitors. Often patents become part of an overall business strategy and entire families of a portfolio may be sold off if a company decides to leave certain markets.

For smaller companies a patent portfolio is a badge of credibility and enables them to gain business from larger corporations.

IV. SEARCHING THE LITERATURE

A word you'll hear a lot in the context of patents is *prior art*. This refers to knowledge and skills that were known and/or practiced prior to your invention. Naturally these should not teach or suggest the new contribution embodied in your patent concept. If they did, then it wouldn't be patentable, would it? As you can imagine, skillful searching of the research literature is a prerequisite before you get to filing, or ideally before you even start to talk to an attorney.

A. *Getting original PDFs of a Patent*

These are available from the USPTO but only one page at a time. A better source is Google patents or the free utility <http://www.pat2pdf.org>. The full PDF will contain patent drawings which are often very valuable to understand the underlying concepts of an invention and determine how it relates to your own.

B. *Text Searching Techniques*

Unfortunately the PDF documents that are available generally don't contain the original text. For this reason you'll also find the US patent office website a useful resource as it offers the original text. This can be very helpful when trying to search a long document for key terms or concepts.

C. *Other Sources of Prior Art*

There are other important places you need to search in order to validate if your concept or idea is patentable. *Google* is an important starting point. *Google Scholar* is an effective tool to cover most of the academic literature - a lot of ideas are initially presented at conferences. Even if your work is better developed and works better, a short paper presenting a similar idea is sufficient to destroy the novelty of your work. I once had an excellent idea for a secure keyboard ruined by a discussion among some techies on a public Internet forum.

In fact it doesn't matter if the idea originally appears in a movie or a work of fiction (think *Science Fiction!*) as long as there is enough detail to pre-empt your new innovation.

V. CONCLUDING REMARKS

This is a topic which deserves a more extended treatment than can be provided in a short digest paper. As this article has received a positive response from reviewers I will develop an extended version, most likely for publication in the IEEE Consumer Electronics Magazine in the near future.