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How to Write Your First Patent

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Abstract— this paper presents guidelines for students writing their first patent in the field of computer science and electronic/computer engineering. The set of guidelines is comprehensive and presents a step-by-step approach that allows beginners to produce the text description for their first patent. The proposed methodology is used to teach invention abstraction and claiming to both graduate and undergraduate students.

Keywords—*intellectual property; invention abstraction; invention claiming; patents*

I. INTRODUCTION

Patents are receiving growing attention due to recent litigation processes. One example of this is the acquisition of Motorola Mobility by Google. An official press release by Google [1] states that: “*Motorola Mobility’s patent portfolio will help protect the Android ecosystem*”. Many other sources affirm that patents played a main role in this acquisition.

In general, engineers lack formal training in writing, or the training is restricted to practical paper or report writing. Patents are a field that link several areas of expertise, including: writing, logical thinking, legal knowledge and technical knowledge. In order to write a good patent, an inventor/writer has to have a complete view of the contents that a patent must incorporate.

In order to provide a holistic view of the contents of a patent, this paper proposes a method of writing that is based on a 26-step procedure. Initial steps are directed to decide what the invention is and how it should be claimed. Final steps are related to the construction of a patent text by cutting and pasting answers in a template. The 26-step procedure can be used either to generate a final text (by cutting and pasting in the templates), or to produce the necessary information for an initial invention disclosure to be handled afterwards by a patent attorney.

This paper is organized as follows. Section II briefly introduces the structure of a patent. The 26-step procedure is presented in section III. Some additional advice is given in section IV. Finally, Section V presents the conclusions.

II. THE STRUCTURE OF A PATENT

A patent is composed of four sections: Abstract, Invention description, figures and claims. The part that has legal value is the claim section, which can contain several claims. The scope of protection of a patent is given by the text of the claims

interpreted with the help of the invention description and the figures. Patents follow what is called the all element rule, which says that to infringe a patent a product has to have all elements listed in a single claim. For this reason, claims with fewer elements have a broader scope of protection. Conversely, claims with many elements have a narrow scope of protection and therefore are less valuable. As a first order approach, the value of a claim is inversely proportional to the number of words it contains. The four sections of a patent have to form a seamless ensemble. For this reason, next section presents a set of questions that help to contemplate all aspects to be covered in a patent as well as the relationship among the sections.

III. WRITING A PATENT IN 26 STEPS

This section describes how to generate the text of a patent using the method of questionnaire-based interview with the inventor. The writer/inventor has to complete 26 small steps to produce a patent text.

A. Step 1: Understand what you need to know

Read all the steps listed in this section, which presents a questionnaire interview with the inventor. Read all questions without answering them. This step serves to give an overview of what a person needs to understand before writing a patent.

1) Criteria for success

The writer achieves success in this step by creating a vision of all the issues involved in writing a patent. The inventor has to understand that the proposed questions are distinct and should have different responses, without repetition.

2) Criteria for failure

The writer fails in this step by not having an overview of all the issues involved or if he or she believes that there are questions that ask the same thing.

B. Step 2: Understand what is the novelty of the invention

In this step, the inventor has to read the questions 1-6 described below and focus on question 6. Question 1: What is the name of your invention? Question 2: What is the scope of this invention? (Where it applies, what are the potential customers?). Question 3: What problem the invention solves? Question 4: How the problem that the invention solves was solved earlier by other products or services? Or simply it was not solved? Question 5: In which ways the previously available solutions to the problem that the invention solves were not

fully satisfactory? Question 6: How the invention solves the problem? How this new way of solving the problem differs from previously available solutions? What are the features of the invention that make it different from the solutions previously available?

By focusing on question 6, the inventor is asked to carefully answer the part of "what are the features of the invention that make it different from the solutions previously available?"

1) Criteria for success

The writer achieves success in this step by producing a list of innovative features of the invention. This list should be sorted in order of importance. A subset of items on the list should be seen as a list of features of the invention which make the invention to be the invention. It is good to have a large list with a small essential subset. The list describes the intrinsic characteristics to what was invented. The inventor has to think the invention as an object and list characteristics of the object.

2) Criteria for failure

The inventor fails in this step by not being able to list any innovative feature of the invention. It is not good if a very extensive list of features is considered essential to the invention. It is also bad if the list contains extrinsic characteristics, e.g.: purpose of use of the invention, method of use, advantages of use, etc.

C. Step 3: Make a general claim

In this step, the inventor has to write the claim number 1, which will have the form described below, where the essential characteristics come from step 2.

Claim One. "NAME THE INVENTION" characterized by ESSENTIAL CHARACTERISTICS.

1) 3.3.1 Criteria for success

Success is achieved if the name of the invention is relatively short and quite comprehensive. The essential features in the claim define the claimed invention. In order to achieve good protection, it should not possible to practice the invention without all the essential features listed in the claim. The claim consists of just one sentence. The single phrase in the claim is well designed and makes sense.

2) 3.3.2 Criteria for failure

Failure in this step can occur in different ways, as listed in the following. The claim has more than one sentence. The claim is a phrase that makes no sense. The claim uses pronouns instead of names. The claim contains extrinsic characteristics. The claim contains features that are not essential to the invention.

D. Step 4: Create a name for your invention

The inventor has to answer the question: What is the name of your invention?

1) Criteria for success

The inventor has to come up with a clear title, which may correspond to the name used in the claim. Note that the PTO tends to require that the title of the invention is used in the

claims. In this sense is good listing various natures (Method, system and apparatus) that can be used in different claims. A short title (not more than one line of text) is desirable.

2) Criteria for failure

Failure in this step can occur in different ways, as listed in the following. The title is too long. The title is too specific. The title lists the purpose of the invention.

E. 3.5 Step 5: Describe the field / application area

The inventor has to describe the scope of the invention in simple terms, avoiding jargon as much as possible. In this step the writer has to answer the question: What is the scope of this invention? (Where it applies, what are the potential customers, why the corresponding field of economic activity is important).

1) 3.5.1 Criteria for success

The writer has to produce at least half page response, being quite verbose over the area of the invention. The sentences must have a clear subject, without using synonyms for the subject, and without using pronouns for the subject.

2) 3.5.2 Criteria for failure

The inventor has to avoid being laconic, e.g.: giving single line answers. Failure in this step can occur in different ways, e.g. using several different synonyms for the subject in different clauses; use of pronouns for the subject; quote the invention; quote the problem the invention solves.

F. Step 6: Describe the problem addressed

The inventor has to answer the question: What problem the invention solves? Describe in simple terms, avoiding technical jargon, without citing the invention.

1) Criteria for success

The writer has to produce at least half a page response, being quite verbose about the problem the invention solves. The sentences must have a clear subject, without using synonyms for the subject, and without using pronouns for the subject.

2) Criteria for failure

Failure in this step can occur in different ways, as listed in the following. The inventor has to avoid being laconic, e.g.: giving single line answers. Other issues to be avoided include: using several different synonyms for the subject; using of pronouns for the subject; quoting the invention; not describing the problem the invention solves.

G. Step 7: Describe the previous solutions

In this step, the inventor has to answer the question: How the problem that the invention solves was solved earlier by other products or services? Or was it simply not solved?

1) Criteria for success

The writer has to produce at least half a page response, being quite verbose in response to the question. Sentences must have a clear subject, without using synonyms for the subject, and without using pronouns for the subject.

2) *Criteria for failure*

Failure in this step can occur in different ways. Examples of bad answers include the inventor being too laconic (e.g. giving single line answers); using several different synonyms for the subject; the use of pronouns for the subject; quoting the invention; explaining why the previous solution was not satisfactory.

H. Step 8: Describe the weaknesses of the previous solutions

The inventor has to answer the question: Why the solutions available before the invention were not fully satisfactory?

1) *Criteria for success*

The inventor has to describe problems in the previous solutions that motivate the creation of the invention. This has to be done in simple terms avoiding jargon as much as possible. The writer has to produce at least half a page response, being quite verbose in response to the question. Sentences have to have a clear subject, without using synonyms for the subject, and without using pronouns for the subject.

2) *Criteria for failure*

Text is not clear. The inventor is too laconic, e.g.: giving single line answers. The inventor uses several different synonyms for the subject in different sentences, to a point it is not clear if it is the same thing or not. The text uses pronouns for the subject. The invention is quoted. Problems that also exist in the invention are quoted.

I. Step 9: Develop a set of figures

The inventor has to prepare the figures to be used in describing the invention.

1) *3.9.1 Criteria for success*

Simple figures, black and white, no shades of gray. Parts of the figures should be clearly visible, indicated by numbers. Avoid using text, perhaps with the exception of histograms (that can have text). Figures should describe only one object, not multiple unrelated objects. Essential features of the invention have to appear in one or more visible figures.

2) *3.9.2 Criteria for failure*

Figures are complex, colorful, with many shades. Some parts are difficult to identify or are not displayed in any figure. Figures make abundant and unnecessary use of text. Figures contain various objects unrelated to each other. Figures contain unrelated details and independent objects indicated by the same number. Essential items for describing the invention are not shown in any figure.

J. Step 10: Create a list of names / numbers

The writer has to make a list associating names to each of the items shown in the figures.

1) *Criteria for success*

The writer has to make a table where each numbered item appearing in a picture, has a name that will always be used to name the feature corresponding to the number.

Element_Number Element_Name

Element_Number Element_Name

This table is for use during writing and will not be part of the patent itself. It serves only to be used as a reference by the inventor/writer, not as a part of the submission.

If the same element is appearing in different figures it may have different numbers. One way of doing this is to use four digit numbers where the first two digits indicate the figure and the last two digits represent the element itself. For example, the numbers 0107 and 1507 could represent the element number seven in figures 1 and figure 15.

2) *Criteria for failure*

The same number is used for different elements. Used numbers are not shown in the figures. Different names are used for the same number.

K. Step 11: Describe each picture individually

The inventor has to write a text describing each figure individually. This text is only to describe the figure itself, and how the figure should be interpreted and what the figure shows.

1) *Criteria for success*

The inventor has to produce one independent paragraph describing what each figure represents and which elements are indicated in the figure. Use numbers in parenthesis to associate the names of its elements in the figures indicated. That is, the text should use the convention *name (number)* to associate the elements with the figures where these elements are described, following the table generated in the previous step.

2) *Criteria for failure*

Describe the operation of the invention rather than describing the contents of the figure. Describe more than one figure in the same paragraph. Not describing all items shown on a figure.

L. Step 12: Describe HOW the invention solves the problem

The inventor has to answer the following questions: How does the invention solve the problem? How this way of solving the problem differs from previously available solutions? What are the features of the invention that make it different from the solutions previously available?

1) *Criteria for success*

Describe clearly how the invention solves the problem. The text uses simple terms, avoiding jargon as much as possible. The writer has to produce at least half a page response, being quite verbose about how the invention solves the problem. Sentences should have a well identified subject, always using the convention *name (number)* so that the reader can identify objects in pictures.

2) *Criteria for failure*

Confuse text, not clarifying how the invention solves the problem. The inventor has to avoid being laconic, e.g.: giving single line answers. Several different synonyms are used for the subject, violating the convention *name (number)*. Pronouns are used for the subject, violating the convention *name (number)*. The text describes the advantages of the invention, rather than describing only the differences.

M. Step 13: Describe the advantages of the invention

The inventor has to answer the question: What are the advantages provided by the invention? Why is the invention better than the solutions previously available?

1) 3.13.1 Criteria for success

The text clearly describes the advantages provided by the invention compared to previous solutions. The description is provided in simple terms, avoiding jargon as much as possible. The writer has to produce at least half a page response, being quite verbose about what are the advantages of the invention. Sentences present a clear subject, always using the convention name (number) so that the reader can identify objects in pictures.

2) Criteria for failure

Confuse text, without making clear what are the advantages provided by the invention. The inventor has to avoid being laconic, e.g.: giving single line answers. The text uses several different synonyms for the subject, violating the convention name (number). Pronouns are used for the subject, violating the convention name (number).

N. Step 14: Relate the advantages to new features

The writer has to answer the question: how the advantages provided by the invention (step 13) are related to innovative features (step 12) of the invention? How the novel features of the invention provide the advantages that the invention provides with respect to previously existing solutions?

1) Criteria for success

To clearly describe how the advantages provided by the invention with respect to previous solutions relate to the innovative characteristics of the invention. The description uses simple terms, avoiding jargon as much as possible. The writer has to produce at least half a page response, being quite verbose when relating the advantages of the invention as derived from the innovative features. Sentences with clear subject, always using the convention name (number) so that the reader can identify objects in pictures.

2) Criteria for failure

Confuse text, not clarifying how the advantages provided by the invention with respect to previous solutions relate to the novel features of the invention. Several different synonyms are used for the subject, violating the convention name (number). Pronouns are used for the subject, violating the convention name (number).

O. Step 15: Describe the status of disclosure

The inventor has to answer the question: The invention has been disclosed and/or marketed previously? On which date the disclosure has occurred?

1) Criteria for success

A clear answer to the question must be provided.

2) 3.15.2 Criteria for failure

Not knowing how to answer the question, or have publicly disclosed the invention more than a year ago. In this case there are nuances, it is necessary to ask for clarification.

P. Step 16: Describe a complete example

The writer has to answer the question: Describe a complete example of operation of the invention. What is the invention? What the invention needs as input? How it works? Illustrate the working cycle: beginning middle and end. If additional illustrations are necessary, add the figures.

1) Criteria for success

The text describes clearly an example of full operation of the invention. Many countries require an example as a prerequisite to patentability. It is important to be quite verbose when describing the example. Sentences must have a clear subject, always using the convention name (number) so that the reader can identify objects in pictures.

2) Criteria for failure

Confuse text, not describing a full example of application of the invention. Several different synonyms are used for the subject, violating the convention name (number). Pronouns are used for the subject, violating the convention name (number).

Q. Step 17: Identify other ways of practicing the invention

Answer the question: Is there another way slightly modified to make the invention? What would a competitor do to enter the market proposing something a little different? Describe a complete example of this new form as the previous example. Note that new figures may be necessary.

1) Criteria for success

The inventor has to clearly describe other examples of full operation of the invention, including small modifications to make the most comprehensive protection. Do not forget to be quite verbose about variations around the general idea. Sentences a clear with subject, always using the convention name (number) so that the reader can identify objects in pictures.

2) Criteria for failure

If any competitor is able to practice the invention in a slightly modified way to suppress at least one of the features listed as essential, the inventor has failed to achieve protection. Confuse text, without clear additional examples of application of the invention (including modifications). Several different synonyms are used for the subject, violating the convention name (number). Pronouns are used for the subject, violating the convention name (number).

R. Write generalizing conclusion

Write a completion generalizing to be added to the end of the specification. The goal is to explain that simple equivalent modifications still correspond to the invention.

1) Criteria for success

Describe in a few short phrases that the examples do not have a goal of limitation, but they have illustration purposes. Explain that the invention can be practiced with equivalent forms and provide a simple list of other similar small changes that could be made without characterizing a different object with respect to the invention.

2) *Criteria for failure*

Failure happens by forget to list some form of simple and obvious generalization that is not present in any form in the text of the patent.

S. *Step 19: Write derived claims*

It is desirable to write additional derived claims of the first claim (made in step 3) by adding the features listed in step 2. Write a sequence of derived claims from the pervious claim by adding one-by-one (i.e. a characteristic by claim) the essential and additional features listed in step 2. This set of derived claims will have the form:

2nd. "NAME OF INVENTION" according to claim 1, characterized in SECOND added feature.

3rd. "NAME OF INVENTION" according to claim 2, characterized in THIRD added feature.

1) *3.19.1 Criteria for success*

Each claim consists of just one sentence. The phrase corresponding to each claim is well designed and makes sense. All of the claims using names following the convention *name (number)*. There is no claim containing extrinsic characteristics. All claims have distinct claim numbers, and the claims are numbered in sequence without skipping any sequence number.

2) *Criteria for failure*

Some claim has more than one sentence. Some claim is a phrase that makes no sense. Some claim is using pronouns instead of names. Some claim contains extrinsic characteristics. There are claims with the same claim number. The sequence of claim numbers skips one number in the sequence.

T. *Step 20: Write figure-inspired claims*

The inventor can write additional claims detailing components of the invention. One way of doing so is just to add the structural definitions of components as shown in the figures. The basic idea is to paste the description of a component to form a derived claim, as for instance:

n. "NAME OF INVENTION" according to claim ###, characterized in that the X component is composed of *full paragraph about the figure describing the component X (modified such that that the claim has only one sentence and it makes sense)*.

1) *Criteria for success*

The claim consists of just one sentence. The phrase is well written and makes sense. The claim uses names following the convention *name (number)*. The claim does not contain extrinsic characteristics. The claim incorporates the elements described in figure which describes the structure of the component.

2) *Criteria for failure*

The claim is composed of more than one sentence. The phrase is not well developed and does not make sense, and it is possible to see that the addition of the sentences of the paragraph into a single phrase has caused the text to lose coherence. The claim does not use proper names following the

convention *name (number)*. The claim contains extrinsic characteristics. The claim does not incorporate the elements described in the paragraph that describes the structure of the component. The claim mentions the figure explicitly.

U. *Step 21: Write claims of different nature*

Additional claims can be written by changing the nature of the invention. The inventor can claim the invention as a method, algorithm, etc. For this purpose, the following structure can be used.

n. "METHOD TO NAME OF INVENTION" characterized by ESSENTIAL FEATURES (steps 2 and 3, first claim), wherein the method is implemented in the form of an integrated circuit.

The nature of a "method" can not be patented in some countries, where this is not directly patentable matter. However, the fact of implementing the method in the form of an integrated circuit to claim makes the claim not to be directly about a "method", but on an integrated circuit that implements the method. Thus, many patent offices will consider that this claim is legal and admit it as patentable matter.

1) *Criteria for success*

The claim consists of just one sentence. The phrase is well written and makes sense. The claim uses names following the convention *name (number)*. The claim does not contain extrinsic characteristics.

2) *Criteria for failure*

The claim is composed of more than one sentence. The phrase is not well written and does not make sense, and it is possible to see that the change of nature has made the text to lose its coherence. The claim does not use proper names following the convention *name (number)*. The claim contains extrinsic characteristics.

V. *Step 22: Write the invention description section*

The inventor has to produce the description of the invention according the invention description section template presented in [2]. Using the texts developed in the previous steps, the inventor has to cut and paste these texts in the placeholders in the template [2].

1) *Criteria for success*

Producing a seamless text, that causes the impression that it has been written as a whole. Erase all text markers that were part of the initial template.

2) *Criteria for failure*

Producing a text extremely non-homogeneous, that appears to be a collage of completely independent parts. Forgetting to delete some of the text markers that were part of the initial template, making it clear that edition was not careful and there are pieces of text that are not part of the patent, but part of the template.

W. Step 23: Write the claim section according to template

The inventor has to write the final version of the claims, by pasting the claims produced in prior steps in the template model of the claims [2].

1) 3.23.1 Criteria for success

First claim is fairly general (short text with few words). The set of claims contains a large number of claims, which are derived by adding details gradually. Few independent claims are provided. Claims are numbered in sequence without skipping any numbers.

2) 3.23.2 Criteria for failure

First claim is too specific (too much text). The set of claims contains too many independent claims, which do not mention any other claim. Claims are numbered out of sequence, skipping numbers, or referencing claims with higher number. Different claims with same claim numbers. The claims have circular references, forming loops of references among the claims. The text markers that were part of the initial template are not properly deleted, making it clear that edition was not careful and there are pieces of text that are not part of the patent, but part of the template.

X. Step 24: Create the figure section according the template

The inventor has to complete the final version of the figure section by pasting the figures in the figure section template [2].

1) Criteria for success

The figures have to be correct when printed (review the final print, to be sure that everything is visible). Figures have to be numbered in sequence without skipping any numbers. Figures have to present clear and correct information, with elements specified in a clear and correct way and well visible in the figures.

2) Criteria for failure

A subtle error that can occur when making the copy and paste of figures in the figure section template is the relative displacement of the signaling elements relative to the figure itself. This can happen when the indication of elements was drawn as floating lines and text boxes on top of the figure. Test the final printing to avoid this. Figures numbered out of sequence, skipping numbers. Distinct figures with same figure numbers. Distinct elements have the same numbers (either in the same figure, either in distinct figures). The text markers that were part of the initial template are not properly deleted, making it clear that edition was not careful and there are pieces of text that are not part of the patent, but part of the template.

Y. Step 25: Write the abstract according the template

The inventor has to write the final version of the abstract directly in the abstract template [2].

1) Criteria for success

The abstract serves mainly for indexing purposes in patent databases. It does not give legal value to the scope of patent protection. The success of abstract writing is simply to describe the type of object that the patent protects in one or two paragraphs.

2) Criteria for failure

If the abstract is very distinct from the invention, the examiner may request to rewrite, which is a waste of time in the patent application procedures. Forgetting to delete some of the text markers that were part of the initial template, making it clear that edition was not careful and there are pieces of text that are not part of the patent, but part of the template.

Z. Step 26: Finalize and review all content

After completing the prior steps, the inventor has to review all content and correct possible errors or pending issues. If revision is completed without finding any error that needs to be corrected the work of writing the patent is finished. Now is just a question of applying it to the patent office.

1) Criteria for success

The inventor has printed descriptive report, figures, claims and abstract. Then inventor has reviewed all content and confirmed that no changes and corrections are necessary. Apply the patent with the local patent office.

2) Criteria for failure

Failure happens when errors are found in the final versions. A different form of failure is to put the text of the patent in a drawer and not apply it as a patent, after all the effort spent on the writing.

IV. SOME ADDITIONAL ADVICE

This section provides some additional advice to understand how to pursue patent application.

A. Difference between patents and papers.

Patents are different from papers in several aspects. A paper has the goal to report scientific advances, normally by formulating a hypothesis, proposing an experiment to test it, executing the experiment, collecting data and analyzing the data to judge the hypothesis. A patent is aimed to describe an object or a process to produce an object that presents advantages with respect to previously existing objects (or processes) with the same finality. Even if a fundamental requirement of patents is novelty, this novelty has not to be proven in a scientific way (as in a paper). The patent text has only to describe clearly the invention, giving support to understand what is claimed as new.

B. Patents are made of words and drawings

Even if it is an obvious thing to say, it is important to reinforce that patents are made of words and drawings. The implication is that nothing more than words and drawings are necessary to produce a document that can be applied (and granted) as a patent. That means that it is possible to apply for patents on inventions that can be described with words and drawings as early as possible, even during specification phase. This means that patents can be pursued long time before having a product ready to be sold.

C. Where to find more information

If you do not know nothing about patents read [3, 4], if you want to write yourself read also [5]. It is worth to think about a

strategy [6] to harvest [7] patents if you want to make profit [8] from innovation. Engineers and Scientists [9] must convince themselves that well written claims [10] are important in the case of litigation [11]. Patents are important for open source and free software licensing [12, 13, 14], even if software patents are sometimes misused [15, 16]. It is important to notice that writing papers [17] is different from writing patents.

D. Review your final document for coherence

The part of the patent that has legal value is the claim section. The legal value of the patent will be determined by the content of the claims, interpreted with the help of the descriptive report. One very important point to check is to verify if the terms used in the claims is supported by the descriptive report. Terms used in the claims should be defined and explained by the descriptive report. It is not possible to claim something that has not been described in the main text in the patent, and this is a very important check for beginners. Also, the choice of the words to be used in claims is important. A resource for a wise choice of words to be used in claims is a dictionary of the usual meanings that words take when claims examined during litigation [18]; this book provides a very useful set of alternative constructions of words and phrases used in the writing of claims.

V. CONCLUSIONS

We have presented a 26-step procedure to instruct inventors on how to write their first patent. For each step, the criteria for success or failure are listed, so that first time writers can correct their applications by themselves. This method has been used to instruct more than ten inventors to successfully produce their first application. This method is being taught in both graduate and undergraduate courses.

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