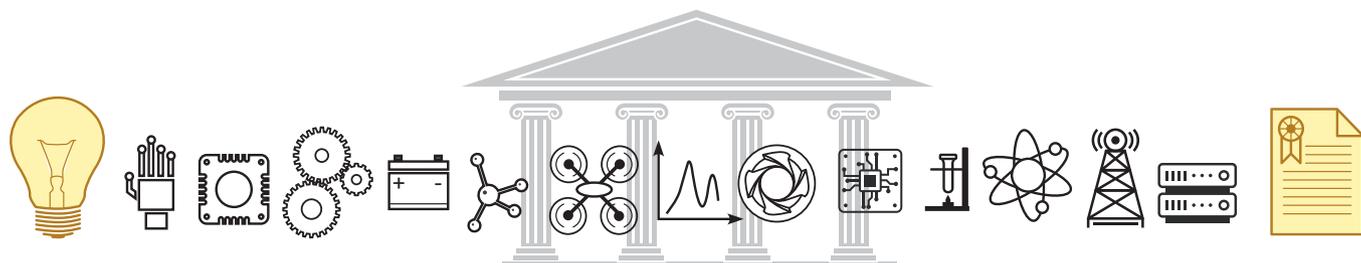


Looking at Patent Law: Patentable Inventions, Conditions for Receiving a Patent, and Claims

by E. Jennings Taylor and Maria Inman



In this column we address the classes of patentable inventions and introduce the novelty and non-obviousness requirements for obtaining a patent. In addition, we describe the parts of a claim. According to U.S. law,¹ a patentable invention is one of five statutory classes:

“any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof ...” (emphasis added)

From an electrochemical perspective, these five statutory classes could consist of: 1) a *process* or method for an electrodeposition, electrochemical surface finishing or electrosynthesis process; 2) a *machine* or apparatus such as an electrolytic cell; 3) a *manufacture* or product such as a microfluidic device fabricated using an electrochemical through-mask etching process in an electrochemical cell; 4) a *composition of matter* or chemical compound or alloy such as a battery electrode material; or 5) an improvement of said process, machine, manufacture, or composition of matter. Please note, these examples are not all inclusive but are meant to provide an electrochemical context.

The term “new” in the patent statute is generally understood to be irrelevant from the perspective of patentable subject matter as “new” (or novel) is one of the requirements for obtaining a patent discussed herein. Attempts to remove the word new from the patentable subject matter statute are currently being evaluated and discussed in a position paper by the Intellectual Property Owners Association.² However, the term “useful” in the patent statute is key and is consistent with the rationale put forth by the Founders in the Constitution of the United States:³

“to promote the progress of science and the useful arts ...”
(emphasis added).

Although generally rare, the United States Patent and Trademark Office has rejected patent applications based on lack of usefulness. A particularly interesting example is a patent application for a “Warp Drive”.⁴ The examiner rejected the patent application for lack of utility and in the office action stated that the applicant would have to provide a working model of the invention in order to overcome the rejection. The applicant has not yet replied!

In a previous column, we briefly discussed the requirements for obtaining a patent.⁵ In addition to fulfilling the requirements of usefulness and falling into one of the five patentable statutory classes, an invention must be novel (or new) and not anticipated by the prior art.⁶ This is where the term “new” is critical. Specifically, an applicant may receive a patent:⁷

“unless the claimed invention was patented, described in a printed publication, or in public use, on sale, or otherwise available to the public before the effective filing date of the claimed invention.” (emphasis added).

In other words, the invention must be new to the public! Novelty rejections are generally based on one prior art reference, more specifically:⁸

“A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference.”

In some instances, multiple prior art references can be used to provide support for the primary reference for a novelty rejection.⁹ In any event, novelty rejections are difficult to overcome and the patent applicant generally abandons the patent application or adds limiting elements to the claim to overcome the novelty rejection.

An important exception is that prior art disclosures made by the inventor or joint inventor one year or less before the filing date of the patent application may not be used as novelty rejections.¹⁰ In other words, if the inventor discloses the invention for example in

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an Electrochemical Society presentation or in an *ECS Transactions* publication, the inventor has one year in which to file a U.S. patent application. However, the ability to file foreign patent applications is prohibited by the public disclosure. Consequently, from a U.S. patent perspective, the U.S. could be considered a “first to publish” jurisdiction, provided the public disclosure is followed by a patent application within one year of the date of public disclosure. In contrast, the rest of the world functions under a “first to file” protocol. Specifically, the first inventor to file the patent application has priority to the invention. Another exception is for prior art disclosures by another applicant who is part of a joint research agreement, specifically.¹¹

“[The claimed] invention was made as a result of activities undertaken within the scope of the joint research agreement.”

This modification to the patent statute, the Cooperative Research and Technology Enhancement (CREATE) Act of 2004, was enacted to promote joint research activities between researchers at different universities and between researchers in industry and universities. For these collaborative arrangements, prior art of one of the collaborators may not be used subsequently to reject the patent application of other collaborators provided the prior art was part of the cooperative research activity.

In addition to fulfilling the requirements of usefulness, falling into one of the patentable statutory classes and not being anticipated by the prior art, an invention must be non-obvious in light of the prior art, specifically:¹²

“A patent for a claimed invention may not be obtained, ... if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art.”

The non-obviousness requirement was part of the common law understanding for obtaining a patent and was formally added to the patent statute in 1952. However, the statute did not provide explicit guidance on making an obviousness determination. Additionally, we and other inventors to whom we speak often feel their inventions are “obvious”; a notion often attributed to hindsight bias. Consequently, guidance regarding obviousness determination came from common law including an important Supreme Court case decided in 1966.¹³ Obviousness rejections are generally based on multiple prior art references and is generally the most common reason for rejections of patent applications. Obviousness hinges on several important determinations:¹⁴

1. Determining the scope of the prior art;
2. Ascertaining the differences between the claimed invention and the prior art;
3. Resolving the level of ordinary skill in the pertinent art.

A particularly challenging component of an obviousness determination is defining the “person having ordinary skill in the art” (PHOSITA). The PHOSITA is a hypothetical person who is assumed to be familiar with the relevant prior art at the time of the invention and have the capability of understanding the relevant scientific and engineering principles. The level of ordinary skill in the art is determined by:¹⁵

1. Type of problems encountered in the art;
2. Prior art solutions to those problems;
3. Rapidity with which innovations are made;
4. Sophistication of the technology;
5. Educational level of active workers in the field.

In addition, the PHOSITA is a person of ordinary creativity and is not an automaton.¹⁶ In other words, the PHOSITA is assumed to be inventive.

As noted above, obviousness considerations are the most common basis for patent application rejections and are generally the most challenging to overcome. Case law has provided guidance on ways in which the patent applicant may successfully overcome an obviousness rejection, including:¹³

1. Demonstration of commercial success;
2. Solution to a long felt but unresolved need;
3. Lack of success or failure of others;
4. Results which would be unexpected to one of ordinary skill in the art;
5. Demonstration of copying by others;
6. Success in licensing the invention;
7. Skepticism of experts.

During prosecution of the patent application, these factors are argued or supported by affidavits submitted by the inventor or others to rebut the examiner obviousness rejection. The use of affidavits will be included in a future patent column. An extensive legal review of decisions from the Patent and Trial Appeals Board, the administrative adjudicatory board of the U.S. Patent and Trademark Office, provides a detailed guide of successful arguments for rebutting obviousness rejections.^{17,18} Finally, the inventor should realize that “obviousness” in terms of patentability is a legal definition, not a “technical” definition. While an inventor may believe that their invention is technically obvious or nonobvious, this may not be true from a legal perspective.

The patent statute requires that the patent application contains a written description of the invention:¹⁹

“The specification shall contain a written description of the invention, and of the manner and process of making and using it, ... to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same.” (emphasis added).

Furthermore, the specification must conclude with:²⁰

“one or more claims particularly pointing out and distinctly claiming the subject matter ...”

As noted by former Judge Giles S. Rich of the Court of Appeals for the Federal Circuit (i.e., the patent court):²¹

“The name of the game is the claim.”

As stated, the claims define the “metes and bounds” of the intellectual property space covered by the invention.⁵ While the claims appear last in the patent, they are clearly the most important part of the patent and the previous sections of the patent “enable” or provide support for the claims. Depending on the statutory class of invention, the claims consist of process steps, structural components, functional attributes, or ingredients. The claim further describes the relationship between the various elements in order to practice the useful invention.²²

The claim consists of three parts

1. Preamble;
2. Transition phrase;
3. Body.

The preamble presents the statutory class of the invention and may only include one statutory class. The transition phrase connects the preamble to the body of the claim. The body of the claim presents the elements of the invention and their interrelationship. The transitional phrase is of particular importance and may be “open-ended” or “closed.”

Transitional phrases such as “comprising,” “including,” “containing,” or “characterized by” are open-ended or inclusive. This means that the claim does not exclude additional claim elements that are not cited in the claim.²³ The transitional phrase “consisting of” is closed or exclusive. This means that the claim excludes additional

claim elements that are not cited in the claim.²⁴ Other transitional phrases such as “having” may be interpreted as open-ended or closed in view of the intention as described in the specification.²⁵

Finally, claims are generally written in independent or dependent form. As the terminology implies, the independent claim “speaks for itself.” The dependent claims is a sort of shorthand manner in adding claims that include additional elements to the independent claim or qualifications of elements in the independent claim to which the dependent claim refers. Independent claims are broader, by definition, then their dependent claims. By adding dependent claims to the patent application, the patent attorney is providing added likelihood that if the broader independent claim is blocked by novelty or obviousness rejections, the less broad dependent claim may prevail. The same holds true for the issued patent, if the broader independent claim is not able to withstand an infringement proceeding hopefully the less broad dependent claim will prevail.

Independent claim 1 and dependent claim 3 from the “Vertical Paddle Plating Cell” patent²⁶ shown in Fig. 1 are presented below. The *class* of the invention is highlighted in *blue italics*. The *transitional phrase* is highlighted in *bold italics*. The *elements* of the invention are highlighted in *green italics*. The body of the claim describes the manner in which the claim elements are interrelated.

1. A *cell* for use in electroplating a flat article, **comprising**:
 - a. a *floor* and a parallel *ceiling* spaced therefrom;
 - b. a *front wall* and a parallel *back wall* spaced therefrom, and being fixedly joined to said *floor* and *ceiling* in a quadrilateral configuration having opposite first and second open ends;
 - c. a *rack* for supporting said *article* being removably positioned vertically to close said *first open end*, and including a *thief*^a for laterally surrounding said *article* and being coplanar therewith to define a *cathode*;
 - d. an *anode* being positioned vertically to close said *second open end*;
 - e. said *floor*, *ceiling*, *front wall*, *back wall*, *rack*, and *anode* defining a substantially closed, six-sided *inner chamber* for receiving an electrolyte therein for electroplating said *article* upon establishing current flow between said *cathode article* and said *anode*;
 - f. said *thief*, for surrounding said *article* being coextensively aligned with said *anode*;
 - g. said *floor*, *ceiling*, *front wall*, and *back wall* being effective for guiding electrical current flux between said *cathode* and *anode*.
3. A *cell* according to claim 1, in combination with:
 - a. a *paddle* disposed vertically inside said *inner chamber* adjacent to said *rack*;
 - b. means for reciprocating said paddle between said front and back walls for agitating said electrolyte inside said inner chamber.

From the preamble, the statutory class “cell” is a “machine” or apparatus. The transitional phrase “comprising” is open ended and therefore the claim is inclusive of additional elements. The elements represent the various structural components of the invention. Note the dependent claim 3 includes an additional structural element (paddle) and cites the relationship between the new element and those cited in the independent claim. Also, dependent claim 3 includes a “means for reciprocating” the paddle for agitating the electrolyte within the cell. This phrase is defined as a “means plus function” phrase in the patent statute:²⁷

“An element in a claim for a combination may be expressed as a means or step for performing a specified function without the recital of structure, material, or acts in support thereof ...”

^aA *thief* in this context is an electrode that acts as a current thief (collector).

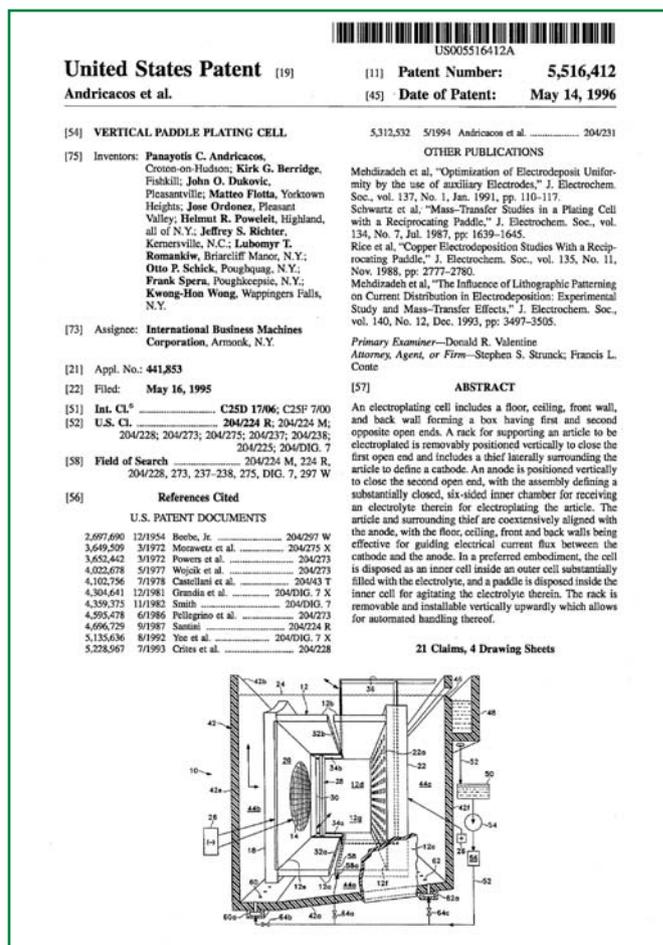


FIG. 1. “Paddle Cell” Patent 5,516,412.

After learning of the “means plus function” phrase, many inventors assume that this approach can be used to claim any means for accomplishing the function, in this case agitating the electrolyte by reciprocating. However, to continue:²⁷

“such claim shall be construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof.”

In other words, the means must be disclosed in the specification in order to be part of the claimed subject matter.

Independent claim 1 and dependent claim 2 from a “Non-aqueous Lithium Battery” patent²⁸ shown in Fig. 2 are presented below. The *class*, *transitional phrase* and *elements* of the invention are highlighted as noted above.

1. A *method* of making an anode-cathode assembly for a solid cathode non-aqueous liquid electrolyte alkali metal cell for delivering high current pulses, **comprising** the steps of:
 - a. *providing a cathode mix* comprising cathode *active material*;
 - b. *providing a cathode conductor* comprising a *body portion* and a *lead portion*;
 - c. *pressing* said *cathode mix* on said *conductor body portion* to form a *pellet*;
 - d. *encapsulating* said *pellet* with *separator material*;
 - e. *providing* a plurality of *cathode elements* according to the foregoing steps;

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- f. providing an elongated *alkali metal anode* comprising an elongated ribbon-like *anode conductor*, a pair of elongated ribbon-like *alkali metal elements* pressed together against opposite sides of said *conductor* to form an *anode structure* and *separator material* encapsulating said *anode structure*;
- g. *folding* said *anode* along the length thereof to form a *serpentine structure*;
- h. *placing* said plurality of *cathode elements* between corresponding ones of the folds of said *serpentine anode structure*.

2. A *method* according to claim 1, wherein said step of providing a cathode mix is:

- a. *followed* by drop-wise addition of a quantity of said *electrolyte* to said mix prior to said step of *pressing*.

From the preamble, the statutory class “method” is a “process.” The transitional phrase “comprising” is open ended and the claim is inclusive of additional elements. The elements represent the various steps used in the invention. Note the dependent claim 2 includes an additional step and qualifies the manner in which the electrolyte is added to the cathode mix.

Independent claim 1 and dependent claim 2 from a “Cathode Materials for Secondary (Rechargeable) Lithium Batteries” patent²⁹ shown in Fig. 3 are presented below. The *class*, *transitional phrase* and *elements* of the invention are highlighted as noted above.

1. A *cathode* in a rechargeable electrochemical cell, said cell also comprising an anode and an electrolyte, the cathode *comprising*:
 - a. An ordered olivine *compound* having the formula $LiMPO_4$ where *M* is a first-row transition-metal cation selected from the group consisting of *Fe, Mn, Ni, and Ti*.
2. The *cathode* of claim 1, where:
 - a. *M* is *Fe*.

From the preamble, the statutory class “cathode” is a “composition of matter” or material. The transitional phrase “comprising” is open ended and the claim is inclusive of additional elements. The elements represent the various ingredients of the composition of matter disclosed in the invention. In the independent claim, note the phrase:

“where *M* is ... selected from the group consisting of ...”

This phrase is known as a “Markush claim” and in this case identifies a group of alternatively useable ingredients (in this case Fe, Mn, or Ti) in the $LiMPO_4$ compound.³⁰ The Markush claim is named after Eugene A. Markush, the first inventor to successfully use this claim structure.³¹ Markush groups are usually used to describe ingredients of chemical compounds. Markush groups must be written in closed form using the phrase “consisting of” and are limited to the ingredients listed.

The dependent claim 2 further restricts the ingredients for “M” listed in claim 1 (Fe, Mn, Ni, Ti) to just Fe. This is generally recognized as good claim drafting practice because at the time of the patent application, Fe was the preferred embodiment and if the other ingredients listed in claim were found non-workable, the whole claim could be disallowed for lack of usefulness.

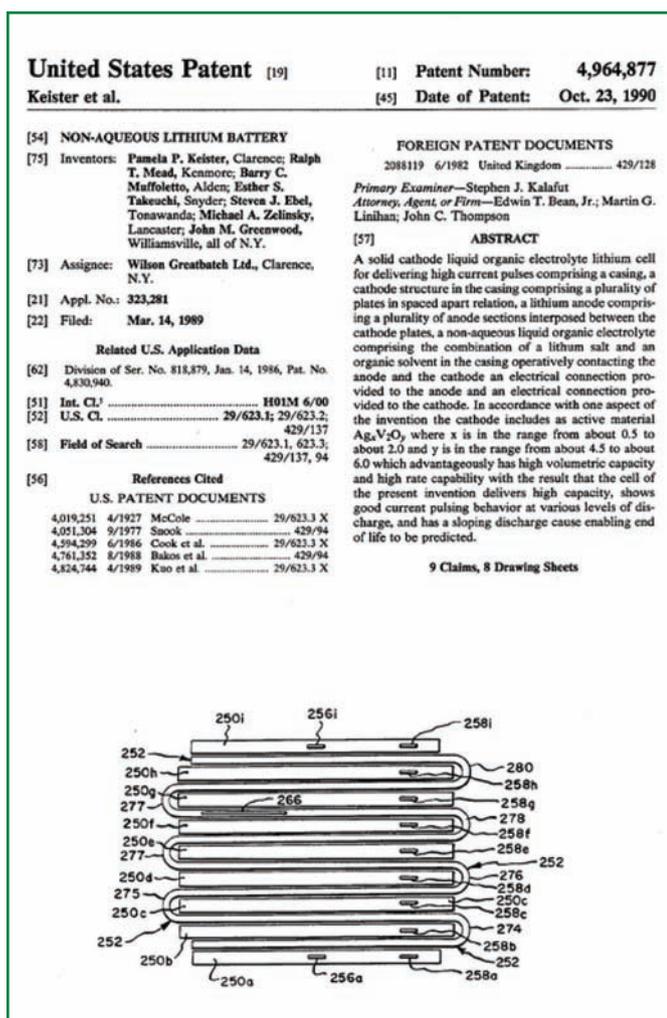


Fig. 2. “Battery” Patent 4,964,877.

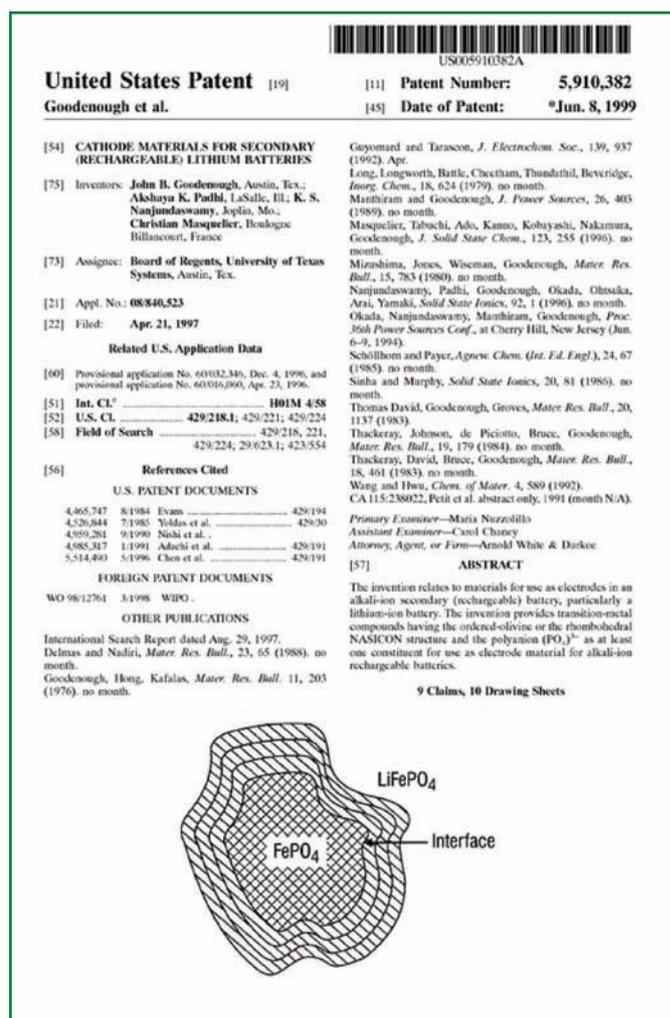


Fig. 3. “Battery Material” Patent 5,910,382.

At Faraday Technology, Inc., as well as most companies, universities, and federal facilities, the process of documenting a potential invention begins with an invention disclosure (ID). The ID generally includes both the business rationale to provide justification for incurring the cost of filing/prosecuting/maintaining a patent application/patent and the technical description of the invention. To facilitate the process of translating the ID into a patent application, we employ a “problem-solution statement” upfront in our ID, specifically:³²

“The problem(s) of ... is(are) solved by ...”

By forcing inventors to reduce their invention to this one albeit long statement, the problem the invention addresses and the elements of the invention are succinctly and broadly stated. Consequently, the problem-solution statement becomes the basis of the claims and interaction with patent counsel.

In this column we address the classes of inventions patentable and introduce the novelty and non-obviousness requirements for obtaining a patent. In addition, we describe the parts of a claim including the preamble, transition phrase and body. We further describe the relationship between independent and dependent claims. Our intent is that the inventor will be better prepared to effectively and efficiently interact with their patent attorney in preparing the patent application for their invention. ■

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