AC 2007-1448: WHY REINVENT THE WHEEL? THE U.S. PATENT AND TRADEMARK OFFICE AS A DESIGN TOOL

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Why Reinvent the Wheel? The U.S. Patent and Trademark Office as a Design Tool

Abstract

While learning the design process, many freshman and sophomore engineering students never realize or make use of the great deal of information that is available to them through the U.S. Patent and Trademark Office ("USPTO"). Because these students often have little theoretical or practical knowledge of working designs, they lack the ability and skills needed to generate "from scratch" alternatives for consideration. They can, however, perform elementary reverse engineering analyses on the ideas contained in patents, and use these ideas as a foundation for the development of creative and innovative design solutions. This paper outlines the experiences gained using the USPTO patent library to develop design solutions in the Introduction to Engineering Design with CAD course project. In this course, freshman and sophomore engineering students use the patent library to develop an understanding of engineering concepts and then apply these concepts to develop an integrated set of design components. Use of the patent library allows students to make significant and rapid progress in understanding and developing an integrated solution without having to have had all of the advanced engineering courses necessary to develop the components.

Introduction

Over 7.4 million U.S. patents have been issued since the first U.S. patent was issued on July 31, 1790,[1] and if the authors' undergraduate engineering education and past teaching experience is typical, relatively few of these have been used in teaching engineering design. The number of issued patents is a measure of the technological progress of a society, and approximately 160,000 patents are issued each year by the U.S. Patent and Trademark Office (USPTO) (Figure 1).[2] Almost all of these patents reference other, previously issued patents and, in so doing, provide a history of the "prior art" leading up to any given invention.

This prior art is typically quite rich. As a condition to obtaining a patent, the inventor must adequately describe the invention so that others skilled in the art can practice it.[3] During the patent term,[4] this description is available to the public through the USPTO patent library, but the inventor retains the right to exclude others from using or practicing the invention.[5] As the patent term expires, however, the invention and its description are donated to the public. In either case, the patent library provides a wealth of technological information for inventors, design engineers, and engineering students to draw upon.

The purpose of this paper is to explore how the USPTO patent library can be used in teaching design to freshman and sophomore engineering students, and how students can avoid reinventing the wheel and lawfully make use of the information contained in the patent database. First, the content of a patent disclosure is described. Second, the use of patents in an introductory engineering design course is discussed. Third, examples of patent use in engineering instruction and projects are provided.

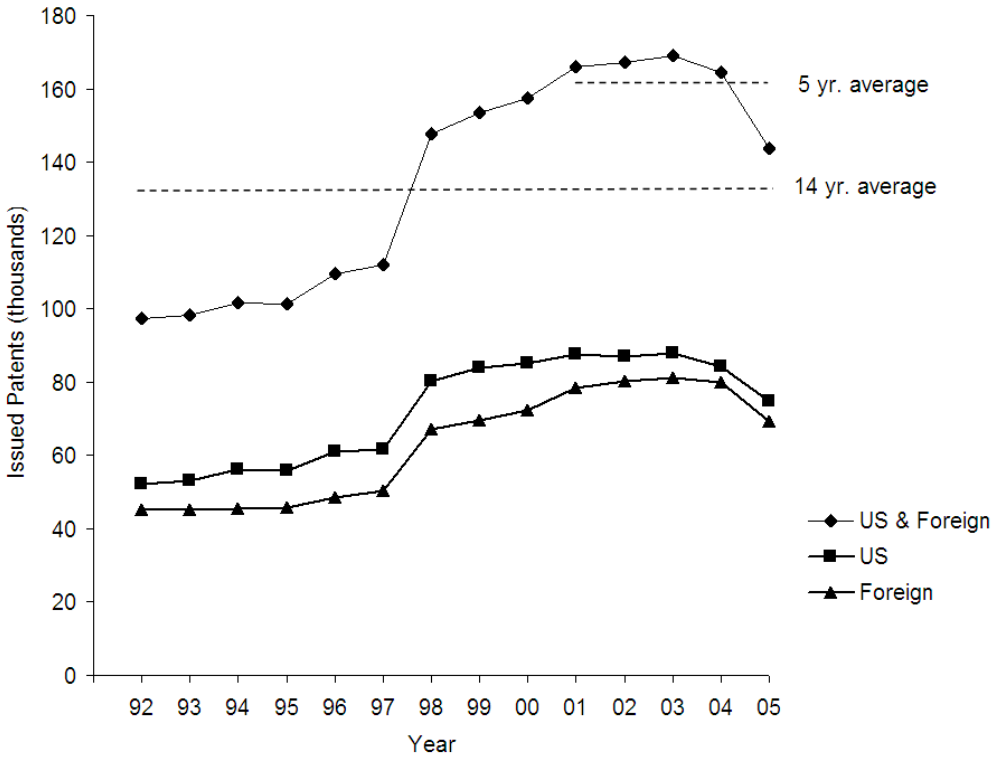


Fig. 1. The number of USPTO-issued patents, shown by country of origin, peaked in 2003 due in part to an increase in the pendency of applications.

The Patent Disclosure

A patent gives the patent holder the right to exclude others from making the patented invention, or using it, selling it, and offering it for sale within—or importing it into—the United States.[6] In exchange for this limited monopoly the patent holder subjects him or herself to the patent laws found in title 35 of the United States Code. The patent laws define the types of inventions that may be patented, when the inventor may begin practicing and publicizing the invention, and the form in which the invention must be disclosed in a patent application. Of particular interest here is the type of invention that may be patented and the requirement of disclosure.

In order to obtain a patent, the invention itself must satisfy a number of requirements, including the type of invention that may be patented.[7] The three main requirements, however, are (1) utility, (2) novelty, and (3) non-obviousness. These three requirements present a bar to inventions that have no functionality, have been invented before, or are too insignificant of a modification to deserve a patent. Utility requires that the invention described in the application "do something" or have some function.[8] Utility, for example, restricts perpetual motion machines of the first or second kind from achieving patent status. Novelty requires that the invention not be in prior use by others or known previously to others.[9] This requirement stems from the patent statute—no invention can be assigned more than one patent.[10] Non-obviousness demands that a patent applied for not be a slight modification over previous patents.[11] This requirement prevents small changes to an invention from receiving a patent, and it sets an "inventiveness" standard to be met or exceeded. All of these requirements have been discussed in other publications.[12]

Not only must the invention satisfy certain requirements, the applicant for patent must satisfy the so-called "written description" requirement ("WDR") in describing his or her invention.[13] The WDR is what makes patents and the USPTO patent library such a useful tool for those in the design field. The WDR states something more than the obvious, that an invention must be described in writing. After all, all patents are presented in writing. Rather, the WDR requires that an invention be described in useful enough terms so that those with average skill in the art can make use of the invention after reading the written description. In other words, the inventor must adequately disclose his or her invention.

This disclosure is available for public inspection. In fact, the term "patent" is derived from the Latin root word, patere, which means to make available or to lay open.[14] If an inventor wants the monopoly rights associated with a patent, then the inventor must be willing to publish the disclosure of invention so the public can inspect the invention. So, the WDR coupled with the publication of the disclosure provides an open technical library of patented inventions.

The patent disclosure itself contains two major parts: the specification and the claims. The specification in a patent disclosure differs from what many engineering students and design engineers think of as a specification. The specification is not a detailed blueprint but instead (1) describes the invention and the manner and process of making and using it, (2) enables one of ordinary skill in the art to practice the invention without "undue experimentation," and (3) sets forth the best mode—or "preferred embodiment"—contemplated by the inventor at the time of filing the patent application.[15]

Writing the specification is an art form similar to the writing of a journal manuscript. The purpose of the specification is to provide the person with ordinary skill in the art (commonly given the acronym "PHOSITA") with enough information to build or practice the invention. There are many schools of thought on how much information should be disclosed. "Why give the competition all of our technology?" is a common query. Other schools of thought lean to giving more information, much more, than is necessary in order to obfuscate the truly new technology. At the median between these two extremes is the likely best practice: describe in adequate detail the claimed invention so that the PHOSITA can practice the invention. This practice assures that the patent will be enforceable as it satisfies the statutory requirement of complete disclosure.

So then, what is the best practice for disclosing the invention? The patent specification, which is commonly the invention disclosure supplied by the inventor to the IP office or patent attorney, is the foundation on which the patent is based. This specification must disclose everything about the invention, including how the invention is made and what is the best way to operate the invention. In this sense, the patent specification is much like the typical research or journal article in that the writer is attempting to convey the detailed workings of the subject of the paper. For a patent, however, only enough detail is required for the PHOSITA to operate the invention. Detailed manufacturing drawings are not required – in fact they are discouraged by the rules of the U.S. Patent and Trademark Office. A good rule of thumb is to err on the side of providing too much information than too little. Too little information could end up invalidating the patent. Information disclosed in the specification but not initially claimed can be included in a

subsequent amendment to the claims to capture that information. In the end, however, elements of an invention disclosed but not claimed are "donated to the public." That is, elements disclosed but not claimed are fair game for anyone to use.

The D'Andrade patent for a "pinch trigger pump water gun"[16] provides a good example of a specification, and one that most students can readily understand. Figure 2 shows two of the drawings D'Andrade used to help describe his invention and present the preferred embodiment. Note that no dimensions or tolerances are shown, but certain features or components of the invention are numbered. These drawings, along with their numbered components, are then referenced in the written description, a portion of which is shown below:

> Referring now to FIGS. 1, 2, and 3 there are shown the respective top, side and front views of one preferred embodiment of the present invention 1 with like parts being like numbered. Shown from the Figures is the general gun like shape of the embodiment 1, having a main housing 3 with extending barrel 9, trigger 7, and handle 5. The detachable water reservoir 13 is held to the main housing 3 via an attachment collar 11 and reservoir mount 33. The air pump of the present invention is embodied within the main housing 3 but the handle to the pump is attached to the slider handle 25 that travels along, and is guided by the water gun barrel 9.[17]

Writing a specification is somewhat like writing a research article. (The same holds true for reading a specification.) Everything regarding the invention must be described in such a way that a person with average skill in the art understands the invention and can, without 'undue experimentation,' practice the invention. The draftsman who writes a specification so that it is difficult for a potential competitor to understand or practice the invention does so at his own peril. Making the specification more difficult to understand and practice may place the specification outside the bounds of the enablement requirement. A specification that does not enable a person with average skill in the art to make or use the invention could potentially be rejected by the USPTO.

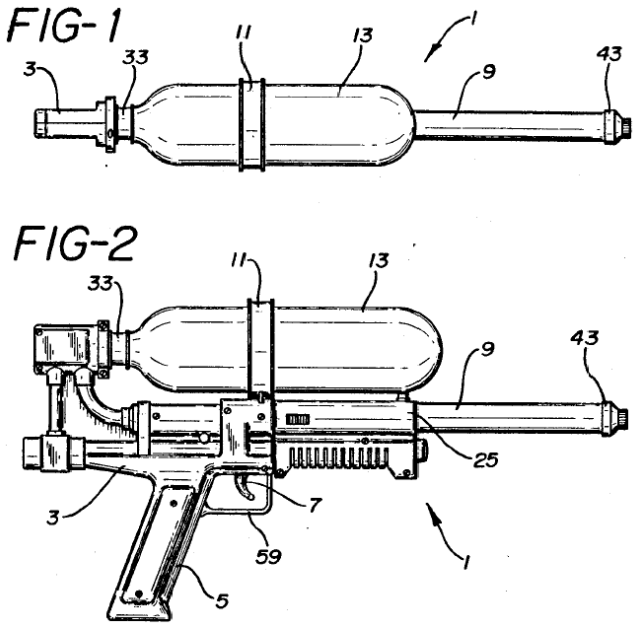


Fig. 2. Two of the drawings found in D'Andrade's US Patent 5,074,437 showing the top and side view of the preferred embodiment of a "pinch trigger pump water gun."

The claims, which are technically considered to be part of the specification, always fall at the end of the specification. They describe the scope of the invention and must be definite, pointing out and distinctly claiming the subject matter sought to be patented.[18] The claims are the equivalent to the metes and bounds of a description of land, and they constitute what the inventor and—in an issued patent—what the USPTO considers to be the complete and full legal description of the invention. As such, the claims constitute that portion of the invention that the inventor wishes to be able to enforce against others who may decide to use the invention.

As the claims are the enforceable portion of the invention against others, it is critical that these be drafted with care. Crafting proper claims often requires the use of very specific terms and, although not difficult, requires some training in the art of "drafting" patent claims. The claims are sometimes called the "sword" of a patent, as the claims can be used in a proactive manner to exclude others from using the claimed invention.

The D'Andrade patent contained eighteen claims. A portion of the first, and broadest, claim reads as follows:

> What is claimed is:
> 1. A high pressure, self-contained, air pressured toy water gun, which comprises:
>   (a) a housing;
>   (b) an extended handle connected to said housing;
>   (c) a trigger located on said housing adjacent said handle;
>   (d) a barrel portion of said housing extending outwardly away from said handle;
>   (e) a high pressure, detachable water storage reservoir having only a single orifice;
>
> . . .
>
> (j) a nozzle at the end of said barrel, said nozzle being connected to said avenue of release;
> wherein said attachment means and water storage reservoir are remotely located on said housing away from said pressuring means slider.[19]

Subsequent claims typically depend from the first claim and serve to narrow the invention claimed.[20] For example, D'Andrade's second and third claims read as follows:

> 2. The invention of claim 1 wherein said water storage reservoir is designed to hold at least 100 pounds per square inch of pressure.
> 3. The invention of claim 1 wherein the flow of air from said water storage reservoir to said means of pressurization is prevented by a one way flow device.[21]

The specification is intimately linked to the claims because the specification must support the claims, and the claims must be described fully in the specification. If a term or description used in the claims is not defined in the claims, the reader turns to the specification for explanation. If an ambiguity is found in the claims, the specification is looked to first for clarification of the ambiguity. If a claim contains a term that is not defined in the specification or in other claims, then the claim is invalid as being "indefinite" under patent law.[22] There is, however, a catch. Any part of the invention not found in the claims but described in the specification is donated to the public.

Using Patents in an Introductory Engineering Design Course

At Oklahoma State, all students take a two-credit hour introduction to engineering design with CAD course. Within this course, all students are introduced to the engineering design process, and they learn the fundamental concepts of engineering drafting and drawing using either AutoCAD or Pro-E. Students then apply the engineering design process by executing a conceptual design project over the last five weeks of the semester-long course. Patents have begun to play a very important role in providing more realistic and attainable initial design experiences within the course; they are being used to:

1. introduce students to the development and documentation of ideas and concepts that provide engineering solutions to problems
2. "lay open" concepts and provide descriptions that those with average skill in the art can easily assimilate; and
3. provide resources to assist and guide students to be successful in their first design projects.

At the current time, many engineering programs provide an introduction or overview to engineering design early in the student's academic career. This introduction, to be meaningful, often includes an initial exposure to engineering design through a small design project. Students, however, are generally not prepared to develop solution concepts "from scratch," nor are they prepared to document and describe their solutions in precise engineering terms. This is where exposure to and use of patent information can have significant impact.

Patents, by their very nature, provide conceptual descriptions of solutions, accompanied by annotated conceptual drawings. In design courses at the introductory level, students cannot perform engineering analysis, nor are they very familiar with many engineering concepts and mechanisms. They can, however, quickly grasp and adapt concepts within the context of solutions to problems similar to the ones for which they seek solutions as part of their design project. The patent library functions particularly well as a fully-indexed, searchable source for these similar concepts.

The content and use of the patent library in engineering design is developed well in advance of the assignment of the students' design project, during lectures in the course and after introducing and developing the engineering design process. The focus of these 'introduction to patents' lectures is the mechanics of accessing and using the patent library through the study of the evolution and modification of a commonly understood product through the patents that have been granted over the product's lifetime. These patent lectures take place after the engineering design process and tools that are used in the process—problem definition, problem decomposition, brainstorming, sketchstorming, morphological charts—have been introduced and discussed. As shown in figure 3 below, enumeration of all major steps and decisions—as well as the role of research and consideration and use of information from the product lifecycle (Design, Produce, Use, Upgrade, and Dispose)—is emphasized in the course's model of the design process.

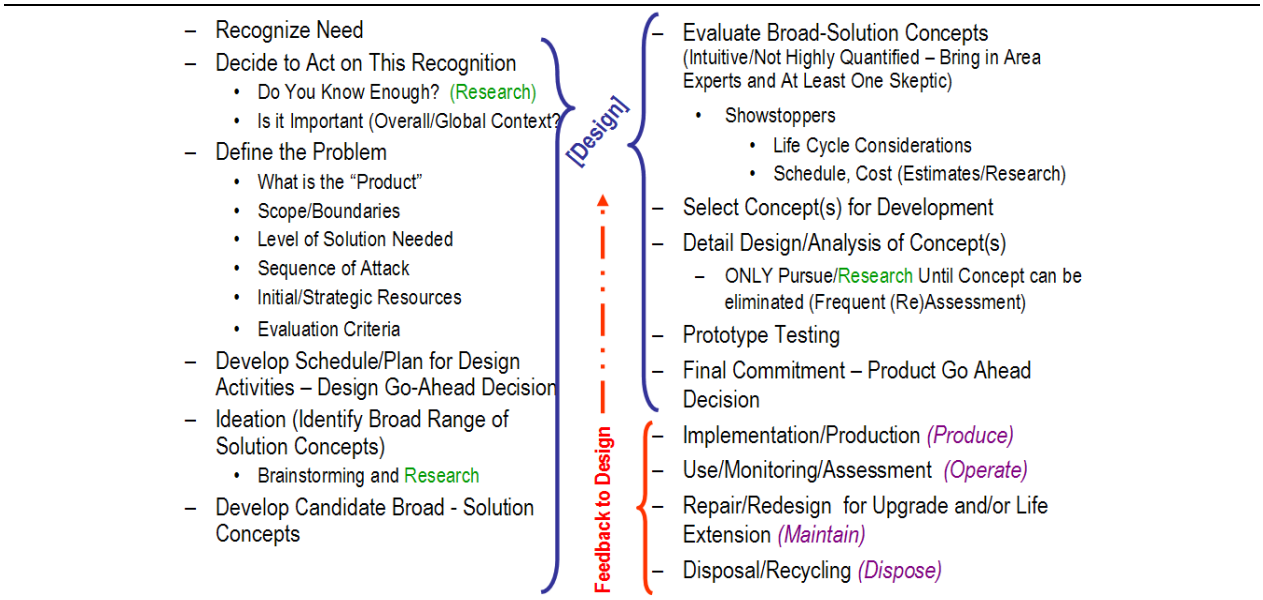


Fig. 3. Design process as defined in the OSU Introduction to Engineering Design with CAD course.

Typically, students did not realize the potential use of the USPTO as they began to develop a broad range of solution concepts during the ideation step. As these students are early in their engineering studies, they are characterized—and often frustrated—by lack of exposure and knowledge of engineering approaches and methods as they attempt to self-generate innovative and viable engineering solutions to problems and projects. Using patents as part of the ideation-step research enables instructors to directly address a number of problems that students often self-impose and find frustrating as they undertake a design project: (1) unrealistic definition of innovation requirements; (2) inability to identify a number of solution approaches; (3) inability to understand and obtain the engineering and physical principles involved in a device; and (4) inability to document and express solutions at the conceptual level.

Unrealistic Definition of Innovation Requirements—Study of the evolution of patents enables the students to gain a sense of the novelty requirement, that is, that innovation in a component of the solution is often sufficient; radically new and completely different solutions are not required to meet an innovation requirement. Often, students impose impossible-to-meet innovation expectations on themselves and thus doom themselves to frustration and (self-defined) failure in their first design project.

Using the USPTO, instructors are able to demonstrate to students that students always have a source of publicly available concepts and that, throughout their engineering career, they will likely never be tasked with a design problem requiring a solution that is completely new, never-before-conceived, and unrelated to anything previously conceived.

Inability to Identify a Number of Solution Approaches—Using the USPTO's Patent Full-Text and Image Database,[23] students can easily identify patent materials related to their project or problem using searches for particular keywords in the title, abstract, or description of the patent. Alternatively, students can use the USPTO's patent classification class and subclass codes to identify related patents. When students identify a patent related to the design problem, they can

easily retrieve the patent of interest using the USPTO's page-by-page display system, or retrieve the entire patent using a consolidation site such as Pat2pdf.org.[24]

Once the patent document is retrieved, its drawings and descriptions will describe the concepts in language that students can readily assimilate. The students can then trace related documents via the 'References Cited' sections of the patent and identify preceding patents and more fundamental components and concepts. By understanding the components, they build an understanding of the physical elements used to develop the solution as well as an understanding of their integration.

Using the search engines provided by the USPTO, students can also trace any succeeding patents, that is, later patents that cite the patent of interest. These searches can be used to demonstrate the power and efficiency of disciplined, citation-based research.

Inability to Understand and Obtain the Engineering and Physical Principles Involved in a Device—The images and descriptions found in the patent must reveal the principles sufficient for a person with 'average skill in the art' to understand the invention. Experience has shown that most of the time, freshman and sophomore engineering students can readily understand the general principles and methods from the patent's description. When they have difficulty in understanding a patent, they often pursue the (many) other alternatives and ideas that can be found quickly as they search the USPTO library. In other words, they and do not get 'stalled' in their projects.

Often, the USPTO is the only means available for students to gain an understanding of the 'workings' of a device. Few, if any, commercial products reveal their inner workings and innovations based on proprietary (and potential products liability) concerns. A patent must reveal how it works and do so in a coherent and understandable manner. Students can derive significant understanding of devices and physical principles by reviewing the USPTO's on-line patent library.

Inability to Document and Express Solutions at the Conceptual Level—Beginning students often have no experience in documenting concepts and explaining device operations using annotated drawings. As a result, they often misinterpret this lack of experience as a lack of ability and can be lost, via self-elimination, from the engineering discipline. When they review the relatively short patent documents, they can readily see—despite some legalese interpretation problems—examples of how concepts and drawing can be merged and used to provide readily understood descriptions of complex designs. From this, they develop a capability and confidence in text and graphical documentation.

Too often, students self-impose a detail design requirement that their background and current level of education and experience cannot attain. They often perceive that the only way an engineer can or should describe a device is to produce an extensive series of precise, fully dimensioned and toleranced, 2- or 3-D models or drawings of the device. While this ability is a goal of their engineering discipline preparation, they need to understand that this is not necessary or reasonable to expect at the early stages of their academic career.

Examples of Patent Usage in Engineering Instruction and Projects

The benefits of patent usage, as described above, are obtained by providing students both in-class and project exposure to the USPTO. In class, one can select a product to which the students can relate, and then identify and develop either a 'look-back' from a recent patent to much earlier ones, or a 'follow the development' by selecting a older patent and following its improvement and development.

Looking Back—Captain Avalanche—A relatively recent patent that we have used to illustrate a look back approach is Levy et al., US Patent 6,349,950. In this January 19, 2000 patent, Levy et al. reveal the design of a single-user snow sled designed for sledding down ski slopes at high speed. Implemented commercially as "Captain Avalanche,"[25] the device is readily understood by students and its X-games demeanor provides a great deal of appeal to 18–21-year old students. In addition, the references cited in the patent trace all the way back to the original Samuel Allen April 1888 patent on a snow sled (US Patent 381,665). The Allen patent can be linked to his later patent for an improved snow sled (US Patent 408,681), which was the basis for the "Flexible Flyer" sled.

The development of a high-speed sled from a child's toy sled and be seen in the following collection of patent illustrations. As Table 1 shows, engineering students readily relate to the range of ideas and product evolution, and quickly comprehend the innovations incorporated.

Looking Forward—Windsurfer—A relatively recent patent that we have used to illustrate a look forward is that of Schweitzer and Drake's US Patent 3,487,800. Students can relate to the sailboard, and it provides a large number of follow-on patents, mostly for component improvements and innovations as shown in Table 2.

Further design insight can be provided to students by demonstrating or by assigning exercises that investigate, via patent searches, solutions of similar problems for similar products—such as sleds, skis, surfboards, sailboards, snowboards, jet-skis, snowmobiles—which have similar functions, shapes, and requirements but vary in application. From these examples, students can be shown, and can see, the common physical principles that underlie various devices—for example, aerodynamic analysis of wings through air, sailboards through and on water, snowboards on (frozen) water. Students can also be shown differences and similarities in solutions to similar problems —for example, a stopping device when rider becomes separated, securing of rider to device, release of securing device when needed.

Design Project Experience—Post-Disaster Self-Help Device Design—During the most recent course offering, students were encouraged to use the USPTO's resources to identify, evaluate, and select conceptual solutions for devices that could aid victims of natural or man-made disasters by providing self-help for up to seven days in the aftermath of the event. While the course project was modeled after the 2007 ASME Design Contest to design a human-powered, potable water still, it was broadened to include design of devices for potable water, self-rescue, and food preservation and preparation devices.[26]

TABLE 1 Evolution of Levy et al.'s high speed snow sled[27]

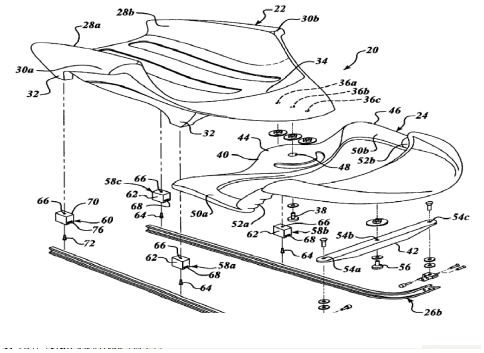
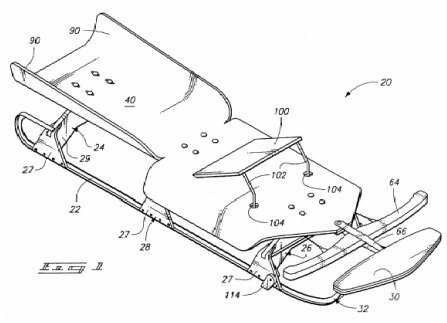
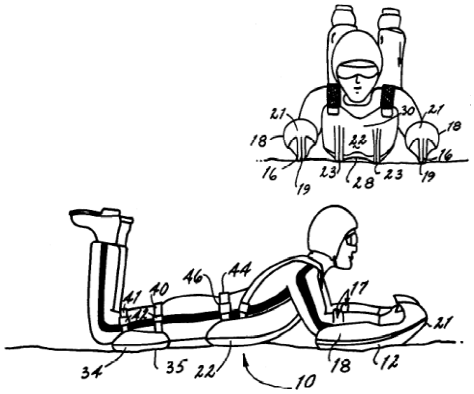
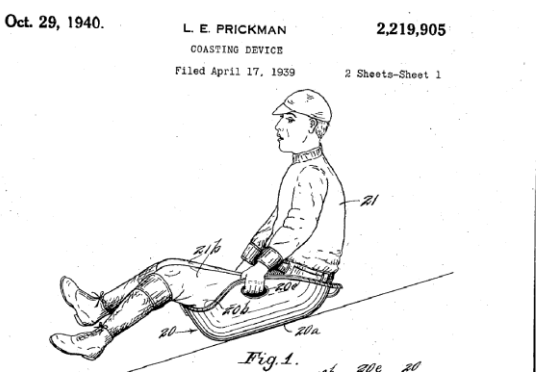
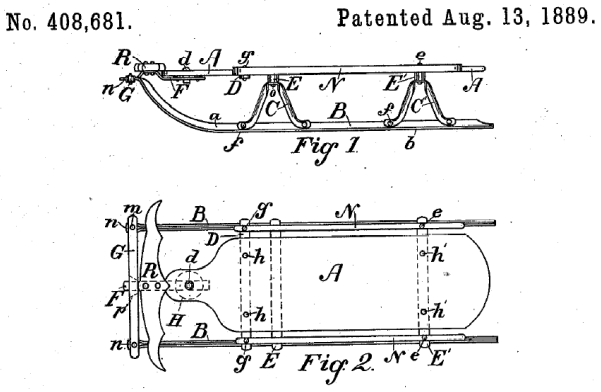
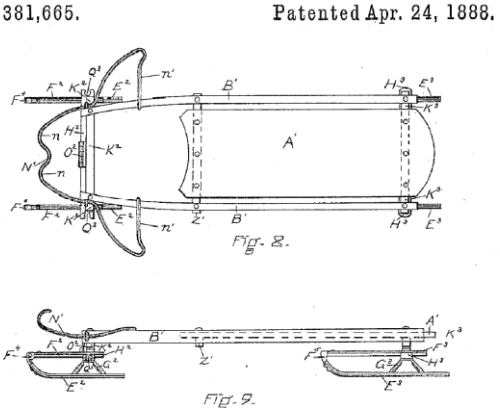
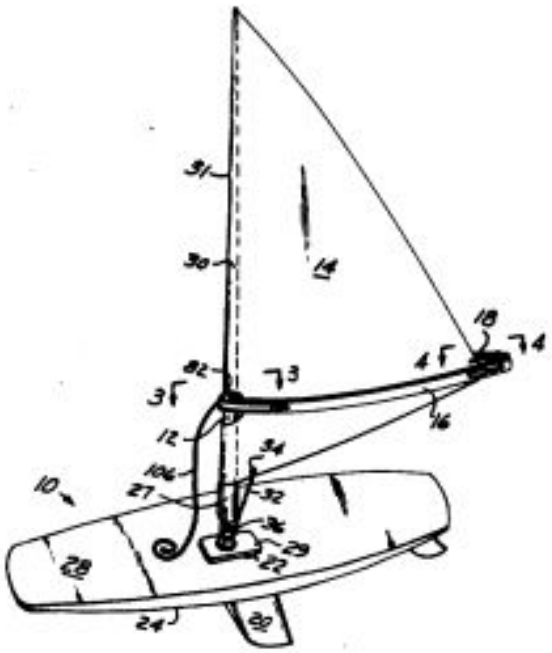
Levy et. al.'s "Captain Avalanche"	Olivieri – Articulating Sled w/Safety Brake
	
Pendleton – Sled Worn on Body	**Prickman – Coasting Device**
	
Allen – Snow Sled	**Allen – Snow Sled**
	

TABLE 2 Sailboard and patents citing original patent

Schweitzer & Drake - Wind propelled apparatus



Listing of patents citing 3,487,800

PAT. NO.	Title
1 5,826,530	Wing sail
2 5,076,185	Tangs cycleboard
3 5,060,590	Sailing apparatus
4 5,042,412	Windsurfer sail and mast righting device and method
5 4,922,845	Boom for a sailing device
6 4,799,443	Swing sail boat
7 4,771,723	Sailboard assembly having a foot-operable steering assembly

Listing of patents continued.

PAT. NO.	Title
8 4,706,590	Deck mounted lateral mast rake adjuster
9 4,679,516	Sailboard assembly having a limited diplacement mast
10 4,628,853	Recreational watercraft
11 4,610,212	Fast self righting catamaran
12 4,541,355	Sail rigging
13 4,537,145	Wind propelled vessel
14 4,508,046	Wind surfing hydrofoil apparatus
15 4,501,214	Mast for a sail
16 4,489,957	Tool for sailing with skates etc.
17 4,465,010	Sail and method of construction
18 4,437,425	Air flow direction indicator
19 4,434,737	Displacement, planing sailboard
20 4,418,631	Apparatus for controlling a wind propelled sailing device
21 4,401,047	Wind-propelled craft
22 D269,668	Boardsailing board
23 4,365,570	Sail system for sailboards
24 4,334,488	Fixture for attaching the wishbone to the mast of a sail-board
25 4,276,844	Soft sailboard
26 4,253,209	Sail boards
27 4,236,476	Articulate mast footing arrangement, in particular for wind surfboards
28 4,204,694	Sail apparatus for a land vehicle
29 4,166,425	Elastic connection assembly for the mast of a sailboat
30 4,149,482	Aerodynamic mainsail and furling device
31 D249,493	Hull for a sailboat
32 4,094,262	Icecraft
33 4,073,254	Sailing mast for sailing boards
34 4,054,100	Sport sailboat
35 4,037,553	Apparatus for connecting a sailing mast to a sailing board
36 3,996,868	Windsurfer
37 D242,614	Hull for a sailboat
38 3,982,766	Wind-propelled skateboard
39 3,656,444	Sailboat rigging

Students were encouraged to first use brainstorming and then use the on-line patent libary as they identified possible solutions to the problem. Students self-reported that the use of the patent library significantly enlarged the solution space they investigated, and that they identified and considered a substantial number of concepts beyond those identified by the initial team brainstorming. They also self-reported that many concepts that were considered most viable—and most that were ultimately selected for recommendation—were derived from the patent information and would not have been considered if they used only the knowledge of the team to identify concepts.

Students used the patent information to better understand, and, as a result, were enabled to modify or combine concepts found in the underlying technology of the patented devices. Some traced commercial devices back via their patent number and reported that it was the reading of the patent that enabled them to understand how and why the device worked. Many related that the patent information allowed them to develop an understanding of the technology of the device and, in the absence of understanding, that the patent provided the terminology that could be used to find needed technology explanations. Almost all the students questioned indicated that simply

reviewing the patent drawings gave them valuable insight into the device operations and provided a relatively quick way to gather high-level concept and technical understanding.

In addition to increased understanding and broadening the solution space, the instructor and teaching assistants also sensed a considerable decrease in student anxiety and stress compared to previous course offerings in which patent use in the design was less extensively discussed and presented. Teams seemed to be more confident in the technical feasibility of the devices they recommended and significantly fewer 'trivial' or 'technically or economically infeasible' solutions were proposed by the teams.

Conclusion

The patent process provides a means of securing intellectual property rights and provides public access to the innovative concepts contained in that intellectual property. Access to this information is easily obtained on-line and students can benefit substantially when they learn to use this information to improve their understanding of technology, its application to various problems, and the number and scope of possible solutions to engineering design problems and projects.

References Cited

[1] U.S. Patent and Trademark Office (USPTO), PTMB Products and Services Brochure at Introduction, http://www.uspto.gov/web/offices/ac/ido/oeip/taf/brochure.htm#Pat+PatActivity (last accessed Jan 15, 2007). The first U.S. patent was issued to Samuel Hopkins of Philadelphia for a process to make one of the first industrial chemicals important to the new Nation: potash. Id. As an aside, the standard legal citation system is used in this article. Although this citation style may provide some challenges to our engineering colleagues, it is necessary so that the legal citations can be found. For example, in note 3 supra the citation 35 U.S.C. § 112 ¶ 1 refers to title 35 of the United States Code, section 112, paragraph 1. Entering this citation in various search engines, including Google, will allow for a search of documents that reference this section of the patent law and that section itself. As this is a standard citation method, use of any other citation style would preclude this search. The term ".id" is meant to refer to the reference immediately preceding the note containing the ".id" whether it be in the same note (see note 1) or in the preceeding endnote (see note 6). Other than the title-code-section citation style presented in note 3, the citations should be apparent.

[2] See USPTO, Patents By Country, State, and Year - Utility Patents (Dec. 2005), http://www.uspto.gov/web/offices/ac/ido/oeip/taf/cst_utl.htm (last accessed Jan. 15, 2007).

[3] See 35 U.S.C. § 112 ¶ 1.

[4] As a general rule, the patent term is twenty years from the date of filing of the patent application. Prior to passage of the American Inventors Protection Act of 1999, Pub. L. No. 106-113, Title IV, 113 Stat. 1501 (1999), the patent term was seventeen years from the date of issue, not the date of filing.

[5] 35 U.S.C. § 271(a).

[6] Id.

[7] See id. at § 101.

[8] Id. This section of the patent law states that "[w]hoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor,

subject to the conditions and requirements of this title." This section is commonly called the utility requirement as it requires a "useful" invention or improvement thereof. A deficiency under § 101 also creates a deficiency under § 112 for failure to teach how to use the invention claimed.

[9] Id. at § 102.

[10] 35 U.S.C. at § 171.

[11] Id. at § 103.

[12] E.g. Janice M. Mueller, An Introduction to Patent Law (2d ed., Aspen 2006).

[13] 35 U.S.C. § 112(1).

[14] Wikidictionary, http://en.wiktionary.org/wiki/patere (last accessed Jan. 14, 2007).

[15] "The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as 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, and shall set forth the best mode contemplated by the inventor of carrying out his invention." 35 U.S.C. § 112 (1).

[16] US Patent 5,074,437.

[17] D'Andrade, US Patent 5,074,437 at 5 (emphasis in original).

[18] 35 U.S.C. § 112(2).

[19] D'Andrade, US Patent 5,074,437 at 6.

[20] See 35 U.S.C. § 112(3)–(5) (form of independent, dependent, and multiple dependent claims).

[21] Id. (emphasis in original).

[22] See id. at § 112.

[23] Issued patents, and applications published since March 15, 2001, can be searched online at http://www.uspto.gov/patft/index.html. Full text is available for patents issued since 1976, and full page images are available for patents issued since 1790.

[24] http://www.pat2pdf.org.

[25] http://www.captainavalanche.com.

[26] http://www.asme.org/Events/ Contests/DesignContest/2007_Design_Problem.cfm.

[27] All of these patents are available at http://www.pat2pdf.org by searching their patent number: Olivieri (US Patent 5,573,257); Pendleton (US Patent 4,413,832); Prickman (US Patent 2,219,905); Allen (US Patent 408,681 & US Patent 381,665).