Patent Eligibility: An Open Field for Civil Engineering

The American patent system strives to promote progress by legally protecting innovation. It thus mirrors civil engineering in contributing to the progress of mankind. Patent laws offer an open field for the largely mechanical art of civil engineering. But despite this broad eligibility, few civil engineers take their innovations to the United States Patent and Trademark Office, in contrast to the considerable number of electrical and mechanical engineers who do go. More civil engineers should use the patent system to promote innovation in their field and, as the American founders had hoped, to promote the progress of mankind.

By Stephen L. Keefe, P.E., Esq.

AGAINST THE BACKDROP of the lingering spirit of the Enlightenment and the emerging thinking of romanticism, the American founders included in the Constitution a clause in section 8 tailored to promote progress: "The Congress shall have Power...To promote the Progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries." This clause forms the core of American concepts of intellectual property, addressing in parallel copyright and patent protection in the United States. Counterintuitively, "science" encompasses copyright in the first part of the parallel structure of the clause: science is promoted by securing for limited times to authors the exclusive right to their writings. (It may be worth noting that certain factions within the intellectual property community maintain that the Copyright Term Extension Act, also known as the Sonny Bono Copyright Term Extension Act, successfully persuaded Congress and the Supreme Court to take a rather expansive view of "limited Times," which now amount to the author's life plus 70 years.)

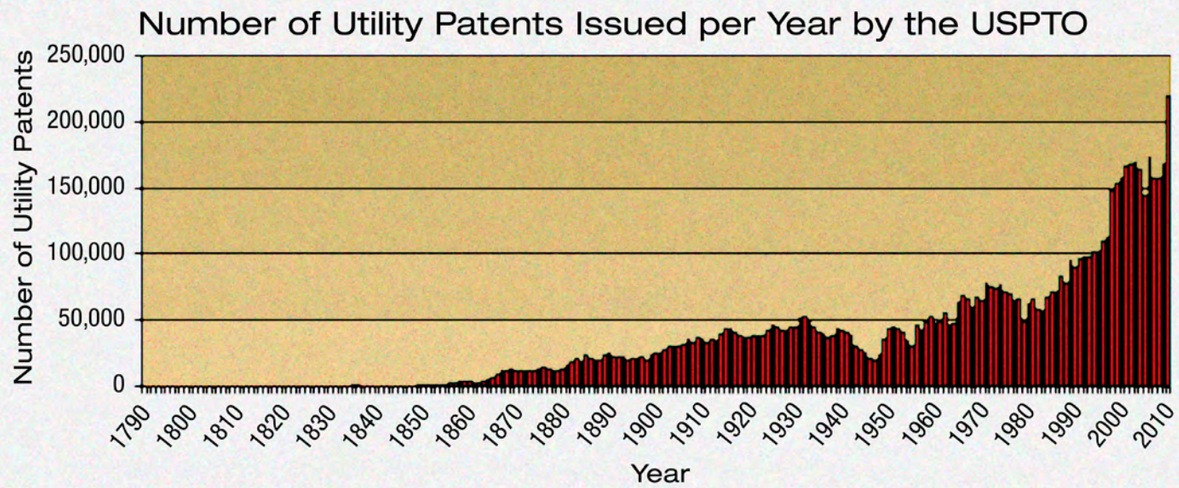
The other half of the parallel structure, "useful Arts," encompasses patent law: useful arts are promoted by securing for limited times (20 years from filing) to inventors the exclusive right to their discoveries. The Constitution may not be poetry, but it clearly lays the foundation for American intellectual property rights. Incidentally, trademark law, the other major pillar of intellectual property law, grew out of commercial legal thought in the 19th century, not from the Constitution. Although copyright and trademark remain of course relevant to civil engineering enterprises, this article focuses instead on protecting innovations through patent law, in particular, on considering the eligibility of civil engineering innovations for patent protection.

The ideal of mankind's steady progress, which underpins patent law, has not enjoyed universal acceptance since a newly independent United States ratified its Constitution. Nineteenth-century thought reflected grave reservations in regarding man as rational and progressive. Darwinian thinkers sought to use natural selection to justify imperialism, while socialism and capitalism struggled with the brutal realities of the Industrial Revolution. Certainly, nationalistic designs that culminated in the horror of the mechanized battlefields of the two world wars and the deaths of tens of millions of conscripted citizen soldiers derailed any hope of man's majestic political and technological ascent to a golden age.

Though the so-called irrational philosophies that followed them might provide truer reflections of man's nature, the American founders believed in continued progress and conceived a patent system with roots embedded in that optimistic ideal. Engineering, particularly civil engineering, arguably has similar roots in a goal to better mankind.

Developing within this philosophical turmoil, American patent law has exhibited a pendulum swing between favor and disfavor over the more than two centuries of its existence. Patent examination began with a sort of heroic age following the first patent act, enacted in 1790, with the secretary of state, the secretary of war, and the attorney general personally examining patent applications. Congress then flip-flopped between a registration system and an examination system as America pushed west toward war with Mexico. A strong patent system coincided with the burgeoning American economy as it moved out of the Civil War, through the turn of the century, and into the unbridled consumerism of the Roaring Twenties. Alexander Graham Bell and Thomas Edison led the patent booms of the late 19th century, and their inventions were followed by the heavily patented automotive and aviation breakthroughs of the early 20th century.

Patents then lost favor for decades, beginning with the Depression years. America embraced antitrust, and courts regularly struck down patents, which are legal monopolies, along with illegal monopolies and commercial conspiracies. The pendulum turned back to favor the patent system with the increasingly global markets of the 1970s. During Ronald Reagan's first term, Congress established the Court of Appeals for the Federal Circuit to consolidate appeals for several areas of federal law. This court remains the final stop for patent appeals in the United States, except for the relatively rare instances in which the U.S. Supreme Court grants certiorari to a patent appeal.



Fortune has favored the patent system since the early 1980s (see the figure above). American legal thought seems to concur with Hank Morgan, the protagonist in Mark Twain's *A Connecticut Yankee in King Arthur's Court,* who observed, "For I knew that a country without a patent office and good patent laws was just a crab, and couldn't travel any way but sideways or backways."

Not everyone supports strong patents, particularly some powerful lobbying interests in Washington, D.C., backed by Silicon Valley. After losing several hundred-million-dollar patent suits to nonproducing entities, the software industry appears to be doing its best to neuter the patent system. Although nonproducing entities have their supporters among the patent bar, many view these litigious patent-holding entities as hijackers—that is, as "patent trolls" under the bridge who extort patent royalties from manufacturers with the threat of an injunction, thereby hurting innovation far more than advancing it. The real effects of the Leahy-Smith America Invents Act, signed into law in September 2011, and nonproducing entities on patent strength may take years to assess, but the pendulum may be arcing back toward disfavoring patents. For now, though, patents remain strong and valuable. And when one accepts the premise that patents drive innovation, perhaps optimistically based on the technical achievements accomplished during the booming patent years of the late 1800s and early 1900s, one can argue that a strong patent system also drives commerce and, possibly, mankind's progress. Patents and civil engineering then seem to strive toward the same high ground. As ASCE decreed in 1961, civil engineering "is applied with judgment to develop ways to utilize, economically, the materials and forces of nature for the progressive well-being of humanity," a definition that mirrors the hope of the American and global patent systems. Indeed, the innate belief in progress that civil engineers seem to possess is probably what led them to a profession geared toward improving infrastructure.

PATENT LAW ENCOMPASSES civil engineering because patent law encompasses nearly everything. Congress provides the statutory baseline for patent eligibility and utility through section 101 under title 35 of the *United States Code:* "Whoever 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." Despite recent judicial and legislative attempts to curb the breadth of patent eligibility, patent law remains breathtakingly broad in its reach. The Court of Appeals for the Federal Circuit has extended the limits of patent law beyond such traditional fields as mechanical and electrical engineering to encompass biotechnology, software, and even business methods.

A machine (a concrete thing including parts or devices), manufacture (an article transformed from raw materials), and composition of matter (including two or more substances) cause less difficulty than is the case with the remaining category of processes. As recently as its 2010 decision in *Bilski v. Kappos,* the U.S. Supreme Court has rebuffed efforts to limit the processes eligible for patents, opining that although the Court of Appeals for the Federal Circuit's legal test for the patent eligibility of a process under section 101 (that is, the process must be tied to a particular machine or apparatus or must transform a particular article into a different state or thing) is useful, it is not the sole

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test. The decision reinforced patent eligibility for such relatively abstract subject matter as software processing and business methods. Fortunately, most of civil engineering rests securely within the patent eligibility green zone of mechanical and electromechanical engineering, far removed from the abstract border skirmishing of section 101.

In addition to establishing categories eligible for patents, section 101 requires that the applicant's invention possess utility. As a practical matter, lack of utility often plagues only such abstract or ultrascientific areas as software and biotechnology. However, a civil engineering application for an innovative method of drawing a moment diagram would probably evoke a lack of utility rejection under section 101.

From its Alexandria, Virginia, campus, the United States Patent and Trademark Office (USPTO) enforces section 101, attempting to balance legal patent monopolies with protecting the public domain. It also offers clear guidelines for avoiding section 101 problems. In applying for a patent on a useful process, machine, manufacture, or composition of matter, an applicant must not try to patent a law of nature, a purely natural phenomenon, or an abstract idea because the under secretary of commerce for intellectual property—the director of the USPTO—and his or her examining corps will reject it. For example, the USPTO presents a perpetual motion machine to its examiners as a classic example of a purely abstract concept that in violating physical laws is devoid of utility.

The USPTO rarely rejects a mechanical or electromechanical patent application for lack of eligibility or utility under section 101. It is not surprising that the director and his or her examining legions practically presume utility in civil engineering innovations, and only rarely will a USPTO technocrat bounce a civil engineering application under section 101 (for example, the moment diagram application). Outside of patent eligibility and utility, legal tests for novelty and obviousness may present civil engineers with additional obstacles, but these areas merit their own articles.

BASED ON THE SECTION 101 rules, patent eligibility constitutes a relatively open field for civil engineers. In fact, this open field includes much more potential mat ter than merely the prestressing anchors and seismic bearings that may come to an engineer's mind upon considering patents. The full breadth of a useful process, machine, manufacture, or composition of matter goes much, much further than these few examples.

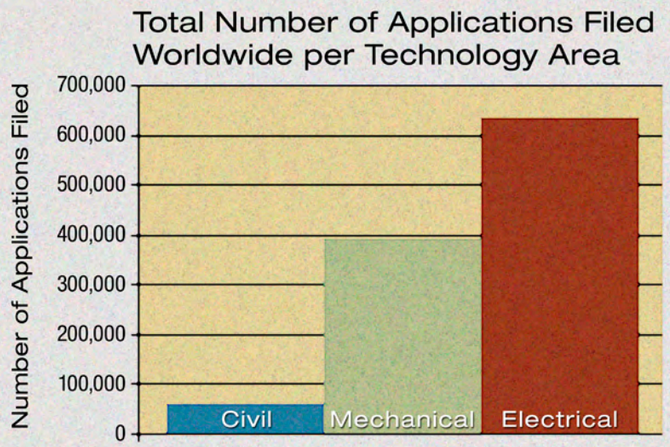
Processes come first under section 101. Civil engineering consultants' innovations are likely to be found within the process category. Consultants' plans tell contractors what to do, and contractors typically transform a particular article into a different state or thing. In other words, contractors turn the consultants' innovative techniques on paper into processes eligible for patents under section 101. Fast-forwarding to enforcing that patented process after the patent is granted by the USPTO, the patent-holding enterprise can target construction contractors who infringe its patented process. Although patenting processes executed by contractors can raise issues of divided infringement (difficulty in proving infringement because it may involve multiple actors) down the line during enforcement, these processes are still eligible for patents under section 101. Moreover, targeting contractors as infringers raises interesting overlaps between construction disputes and potential patent infringement suits against contractors, such as in probative evidence. For example, photographs taken by contractors to protect themselves against accusations of delay might also be used to prove infringement of a patented process. These issues seem to indicate that patenting a process may provide engineering consultants with some leverage against those general contractors accustomed to intimidating engineers with impunity.

Just about any conceivable construction process passes section 101 muster for patent eligibility because construction processes almost by definition transform a particular article into a different state or thing, which in *Bilski v. Kappos* the U.S. Supreme Court opined would meet section 101. When concrete cures, it chemically changes from a fluid mixture of aggregate, water, and cement into structural concrete, meeting section 101. Assembling any other structural material (for example, steel, pipe, or timber), be it by welding, bolting, or some other connecting means, also passes section 101 muster because the assembled structure provides the "different state." These examples alone capture much of the physical activity of a construction site. Therefore, structural construction methods should almost per se qualify as applications eligible for patents. Such methods could pertain to bridges, buildings, or other land structures; to such hydrological works as drainage structures and culverts; to foundations and earthmoving endeavors; to marine engineering structures; or to nearly any other type of structure.

Under the legal test of section 101, any process legally earns patent eligibility. Again, whether the process involves sufficient innovation to ultimately deserve a patent involves other aspects of patent law. Just to quickly touch on innovation, an engineer may not even realize when a construction technique merely eligible for a patent is sufficiently innovative to merit one. Innovatively reducing costs, providing elegant solutions to problems, pushing structures higher, and challenging and overcoming barriers presented by geography, for example, may warrant a patent. New methods of ordering, staging, or utilizing materials and shapes in new combinations also could lead to a breakthrough. Nearly every large project and many smaller ones present different challenges and opportunities to create innovative processes for overcoming those challenges. Owning a patented process for efficiently overcoming a problem may give the civil engineering team added leverage in its pitch to the client to distinguish itself from its competitors because no one except the patent holder and his or her licensees may use that process during the term of the patent.

The section 101 category of machines encompasses what engineers would probably view as more traditional subject matter eligible for patents. Machines comprise, for example, bearings and other connectors, expansion joints, prestressing devices, sensors, construction equipment, seismic devices, scuppers, seepage devices, and testing apparatuses. Any civil engineering device including parts should be able to come into the USPTO under section 101.

The remaining section 101 categories of a manufacture and a composition of matter involve primarily the materials science branch of civil engineering. These categories encompass new and useful materials, alongside the counterpart process for forming the new materials. Examples include concrete additives and cement, as well as steel, polymers, and wastewater treatment materials.



"WORLD INTELLECTUAL PROPERTY INDICATORS 2010," WORLD INTELLECTUAL PROPERTY ORGANIZATION (2007 DATA)

Because civil engineering falls squarely within the mechanical arts, section 101 does not present significant hurdles to the field. Still, some areas of civil engineering approach the problematic frontiers of patent eligibility. For example, civil engineering processes within the design arena—for example, computer-aided design methods, scheduling, and calculation methods—probably fall short of the section 101 legal test. Such other nonphysical processes as surveying also could lead to section 101 difficulties at the USPTO. But these potential section 101 problem areas fall well outside the heart of civil engineering as a mechanical art and accordingly will probably arise only rarely as section 101 issues.

The USPTO admits for examination applications directed to nearly the entire spectrum of civil engineering activity. In view of the roots of the patent system, this broad acceptance of civil engineering by the patent laws should not surprise civil engineers. The American founders probably thought of the mechanical arts as an important component of the discoveries promoting progress. Indeed, the founders may have thought first of their civil engineering compatriot Thaddeus Kościuszko as the inventor demonstrating the value of patent law, while viewing Benjamin Franklin's electrical experiments as copyrightable scientific material.

Although the founders probably thought of patenting mechanical arts before electrical arts two centuries ago, the situation has reversed itself over time. Today, the electrical arts have primacy at patent offices around the world. Of the several thousand examiners at the USPTO, only a handful examine civil engineering applications because civil engineers do not patent many of their innovations. Perhaps this relative lack of patenting activity relates to a possible decline in the status of the civil engineer in American society. Though civil engineers were highly paid and respected throughout much of the 19th and 20th centuries, many civil engineers today see themselves as taken for granted by an often thankless public. Perhaps this perceived drop in prestige derives from a failure to capitalize on innovation in the profession.

Though civil engineering subject matter probably has even more patent eligibility than such areas as electrical engineering within the context of section 101, electrical and mechanical engineers go to the USPTO in enormous numbers, whereas only few civil engineers file applications on their innovations (see the figure at left).

Thus the intersection of civil engineering and patent law remains volumetrically well below its potential. Accepting the premise that patents promote innovation—a basic tenet of the patent system—increased patenting activity could further stimulate technical advances in civil engineering. Civil engineers should keep the generally open patent eligibility for their work in mind when a project seems to break new technical ground.

Eligibility, however, is only the first hurdle. The patent applicant must also demonstrate the novelty and nonobviousness of his or her invention and satisfy such other requirements as clarity of the patent application to secure a patent. Even then, the patent holder must often prove the worth of the patented innovation through enforcement or threatened enforcement in the courts. The engineer must also think globally and consider patent filings and enforcement worldwide. He or she faces a long road to the enforceable patent right capable of generating injunctions, royalties, and damages against competitors and overreaching contractors. But using innovation as a touchstone, engineers may individually attain valuable patent rights for their innovations. In the aggregate, engineers can use patents to advance the profession's technical accomplishments and to help them recapture the greater prestige they once enjoyed in the public eye.

The innovative engineer fuels the progress of useful arts hoped for by the American founders when they empowered Congress to create a patent system at the dawn of the republic. Perhaps greater recourse to the patent system by civil engineers could help to promote the progress of mankind to the brighter future imagined by a more optimistic age. CE

Stephen L. Keefe, P.E., Esq., a professional engineer and attorney, is a patent attorney with Rabin & Berdo, P.C., in Washington, D.C.


Keefe

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