Science 17 March 2000:
Vol. 287. no. 5460, pp. 1933 - 1934
DOI: 10.1126/science.287.5460.1933

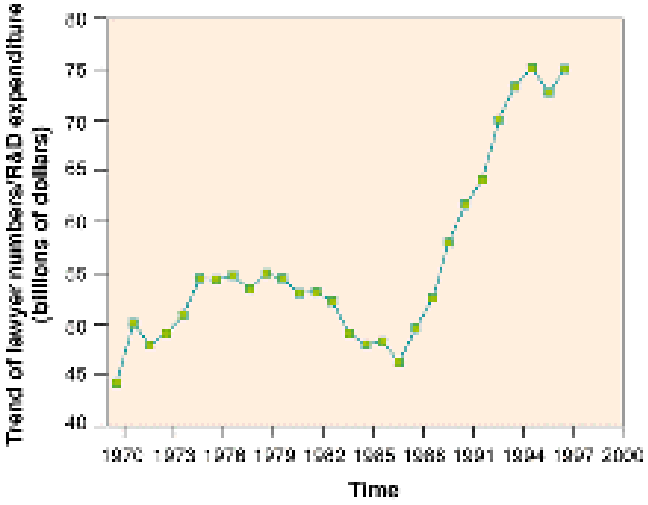
Policy Forum

INTELLECTUAL PROPERTY RIGHTS:

Reforming the Patent System

John H. Barton[*]

The number of intellectual property lawyers in the United States is growing faster than the amount of research (see figure) (1). This suggests that legal costs are growing as well--and these costs are substantial; lawyer's costs alone approach $10,000 to obtain a patent and $1.5 million (per side) to litigate a patent (2). To respond to this problem, this article proposes three reforms: to raise the standards for patentability, to decrease use of patents to bar research, and to ease legal attack on invalid patents.



Numbers of intellectual property lawyers per unit of research expenditures in billions of dollars (1).

Raising the Standards for Patentability

There is no economic value in conferring a patent monopoly except for an invention that will have a significant impact. By reducing the number of patents on minor inventions, the total cost of the system can be reduced--and without any effect on the incentives

provided for more important innovation. Current law, however, appears to assume that the normal scientific and engineering development process should be rewarded by a patent; it is thus often possible to obtain a patent on almost any new product, although it may be a relatively narrow patent drafted around previous patents.

Reducing the number of patents would also help to solve the problem of defensive patent portfolios. During the 1980s, Polaroid's suit against Kodak (3), and Texas Instrument's suits against semiconductor competitors (4) showed that patents could be used as important competitive weapons. Kodak, for example, was forced out of the instant camera business. Firms now attempt to protect themselves against such suits by acquiring patent portfolios (frequently on very minor inventions) of their own, so that they can deter litigation through the threat of reciprocal suit. The portfolios have become so substantial that every firm is likely to infringe patents held by each of its competitors. This is the pattern for products in the semiconductor industry (5); it may become the pattern for operating methods in the online services industry and for research and production methods in the agricultural biotechnology industry. Building the portfolio requires enormous legal cost but contributes little to research incentives. Moreover, large firms (who are likely to have the larger patent portfolio, but not necessarily to be more creative) can use their portfolios to obtain royalties from their competitors and to restrict them to specific areas of technology.

The number of patents can be reduced by raising the standards for obtaining a patent. The U.S. Patent Code defines two relevant standards, "novelty" and "nonobviousness," but the courts have applied these standards much more loosely than is required by the statute. For example, novelty is the standard that prohibits a patent if a description of the invention has been previously published. Prior publication, however, will not bar issuance of a patent unless all the features of the invention have been disclosed in a single prior publication (6). Therefore the extension of a well-known and published technique to a new situation may well be "novel," because the application of the technique to the particular situation had not been described in a single prior article. It may also be "nonobvious" for patent law purposes, even though a scientist might reasonably think of trying the technique. This is because the standard for nonobviousness in such a situation is whether the approach offered a "reasonable expectation of success" (7).

The courts could reinterpret such doctrines more strictly, for example, by raising the standard of nonobviousness in this context to reject a patent when a scientist would seriously consider a particular approach, and to grant the patent only when the approach seemed quite unlikely to work and still proved successful. Such changes would decrease the number of patents, while remaining consistent with the statute and rewarding more significant invention.

Freeing Research

A second reform that should be enacted arises from the risk that broad basic patents on fundamental research processes may deter and complicate follow-on research. The National Institutes of Health (NIH) emphasized this point in their study of research tools such as expressed sequence tags (ESTs) and research mice (8). Even now, those who wish to introduce a new pharmaceutical product must negotiate an unwieldy number of licenses with firms that have patents on various steps in the research (9). And, as exemplified by the recent single nucleotide polymorphism (SNP) consortium, it has

become necessary to negotiate complex cross-licenses and agreements to maintain freedom of access to broadly useful information and technology.

In dealing with this issue, it is crucial to balance incentives to initial innovators against incentives to follow-on innovators. Although the point deserves further study, experience suggests that this balance is currently weighted too much in favor of the initial innovator. The problem is likely to become increasingly serious in biotechnology and computer software, where the practical limit on claim breadth seems to be only the imagination of the claim drafter.

When the U.S. Supreme Court last explored this issue in 1966, in *Brenner* v. *Manson* (10), it rejected a broad claim to a group of chemicals:

. . . a process patent in the chemical field, which has not been developed and pointed to the degree of specific utility, creates a monopoly of knowledge which should be granted only if clearly commanded by the statute. Until the process claim has been reduced to production of a product shown to be useful, the metes and bounds of that monopoly are not capable of precise delineation. It may engross a vast, unknown, and perhaps unknowable area. Such a patent may confer power to block off whole areas of scientific development, without compensating benefits to the public (10, p. 534).

In spite of the Supreme Court's historical sensitivity, the current relevant doctrines are almost all biased toward the initial innovator. Although it has recently proposed new and probably more narrow utility standards that may restrict the patenting of ESTs (11), the U.S. Patent and Trademark Office (PTO) has been permitting broad claims that would preempt broad areas of research. An example is a recent patent claiming the use of computer-implemented artificial neural networks for identifying binding motifs of polypeptides; the patent is based on one example of the technique (12).

More balanced principles are available. The utility doctrine, which was at issue in *Brenner* v. *Manson*, can be used to restrict the patenting of very fundamental concepts, and infringement can be defined in a way that excludes use for research purposes (13). A certain freedom of use of patented inventions for experimental purposes without infringement is already defined by the courts (14). It is normally stated as applying only to research conducted for noncommercial purposes but could be expanded. Why not provide an automatic, royalty-free license to use any patented technology in research (but only in research), unless the patent holder is making the technology available through selling a product or licensing a kit? An alternative is a reasonable royalty compulsory licensing mechanism in which anyone has the right to use a patented invention in research. Either approach keeps an inventor from preempting broad areas of technology but still permits the inventor to achieve an economic return on a research-oriented invention (15).

Controlling Invalid Patents

The third reform deals with the fact that many patents are issued erroneously. *Science* recently reported on patents that seem likely to be reflections of pseudoscience, for example, cold fusion devices and detectors of psychic forces (16). These extreme examples probably have no economic consequence, but the issue is broader. Under the PTO's current reexamination procedure, less than a quarter of the patents reexamined survive without some change (17). Some of these patents must cover important

technologies and bring substantial costs; for example, litigation costs, should the patent holder attempt to assert the patent against a person using the technology or should such a person seek to attack the patent. Even without such litigation, the patent may constitute a barrier to investment within the scope of its claims. Current law, however, creates a statutory presumption of validity that strongly favors the holder of even an invalid patent (18).

Any serious analysis should begin with the realities of the process. A PTO examiner can give each application an average of 25 to 30 hours (19), and may in fact give much less (20). This is much less than the average time spent by a lawyer in preparing an application (21). The PTO process is ex parte, with the applicant represented, but with those who oppose grant of the patent not represented. Common sense suggests that this decision should not be conclusive in an infringement trial, in which both sides are represented and in which many thousands of hours of expert time may be invested (22).

The best way to improve patent validity is for the PTO to issue better decisions in the first place. This is a matter of the quality of the PTO staff and of the time that staff can allocate to each application. Increased salaries might permit greater retention of employees, so that PTO service becomes a career rather than a stepping stone to private practice after 3 or 4 years (23). Improvement also depends on having good databases. For software patents or business method patents, the state of the art cannot readily by defined by reference to published literature.

The threat of seriously bad patents suggests going further. The 1992 Report of the Advisory Commission on Patent Law Reform (17) urged strengthening of the reexamination process, and a weak reform was included in the legislation enacted last fall (24). Even as reformed, the process deals only with newly discovered prior art; it offers no way to reconsider a patent on the grounds that the examiner misapplied the law. It may also be better to make review available before the patent is issued; in Europe the application is published 18 months after filing, and third parties can make observations to oppose the patent's issuance (25).

Those likely to be harmed in the future by a patent may not realize which of the patents being issued are likely to be significant to them, and they may not be able to afford to contest all of them. It would be wise to go further to weaken the presumption of validity and to make it easier to bring litigation to have a patent declared invalid, presumably with some device to protect a patent holder from repeated litigation.

Next Steps

The recent trend in Congress has been to strengthen intellectual property rights, so it is essential to begin with a broader discussion and economic analysis of reforms such as those suggested here in order for there to be a chance of future enactment. Such studies could also be used before the courts in reform-oriented litigation. The same issues should be discussed at the World Intellectual Property Organization. International patent harmonization and integration are essential for business, but they must rest on a balanced substantive law.

References and Notes

1. Lawyer numbers are the membership of the Section on Patents, Trademarks, and Copyright of the American Bar Association, taken from the introductions to that Section's annual reports and, for 1997, estimated from information on its Web site. Inflation-corrected overall research expenditures are from National Science Board, *Science and Engineering Indicators--1998* (National Science Foundation, Arlington, VA, 1998).
2. Derived from a survey by the American Intellectual Property Law Association (AIPLA), *Report of Economic Survey1999* (AIPLA, Arlington, VA, 1999), tables 21 and 22.
3. *Polaroid Corp*. v. *Eastman Kodak Co*., 641 F. Supp. 828 (D. Mass. 1985).
4. See F. Warshofsky, *The Patent Wars: The Battle to Own the World's Technology* (Wiley, New York, 1994), pp. 122-123.
5. B. Hall and R. Ham, "The patent paradox revisited: Determinants of patenting in the U.S. semiconductor industry" (Working Paper 7062, National Bureau of Economic Research, prepared for NBER Patent System and Innovation Conference, 8 to 9 January 1999, San Diego; revised March 1999).
6. *Studiengesellschaft Kohle* v. *Dart Indus. Inc*., 726 F.2d 724 (Fed. Cir. 1984).
7. *Amgen, Inc*. v. *Chugai Pharmaceutical Co*., 927 F.2d 1200 (Fed. Cir. 1991).
8. See *Report of the NIH Working Group on Research Tools* (1998), available at http://www.nih.gov/news/researchtools/index.htm.
9. M. A. Heller and R. S. Eisenberg, *Science* **280**, 698 (1998).
10. 383 U.S. 519 (1966).
11. 64 Fed. Reg. 71440 (21 Dec. 1999).
12. J. Skolnick *et al*., U.S. Patent 5,933,819, 3 August 1999.
13. Another important direction to consider is modifying the enablement doctrine to narrow patent claims.
14. See R. Eisenberg, *Univ. Chicago Law Rev.* **56**, 1017 (1989). There is also a specific U.S. statutory research exemption for firms preparing to market drugs as the patents on the drugs expire, 35 U.S.C. § 271(e).
15. Such an approach can probably be designed consistently with the Uruguay Round Agreement on Trade-Related Aspects of Intellectual Property. Article 30 of that agreement permits certain limited exceptions to exclusive rights, and French law has long permitted a compulsory license in a similar circumstance.
16. D. Voss, *Science* **284**, 1252 (1999).
17. USPTO Reexamination Statistics, Appendix C in *A Report to the Secretary of Commerce: The Advisory Commission on Patent Law Reform*, August 1992 [1985-1991 Statistics] (The Commission, Washington, DC, 1992).
18. 35 U.S.C. § 282.
19. Based on PTO application statistics and on examiner numbers for 1993 (E. Wayne, personal communication, 12 July 1999), the PTO handles about 80 applications per examiner per year, with a slight long-term downward trend.
20. H. Manbeck, former Commissioner of the PTO, has testified that the examiner spends 15 to 17 hours per application [*Boehringer Ingelheim Vetmedica, Inc*. v. *Schering-Plough Corp*., 1999 U.S. Dist. LEXIS 16989 at 49 (DNJ 1999)].
21. The median numbers of applications filed annually by lawyers who spent 50% or more of their time developing protection ranged from 11 to 20 [AIPLA, see table 13 in (2)].

22. Based on the $1.5 million median cost of patent litigation. Even at a legal fee of $300 per hour (and much of the litigation team will receive less) this amounts to more than 5000 hours.
23. Statement by PTO Commissioner Q. T. Dickinson in S. Zeller, *Gov. Exec*. (February), 39 (2000).
24. Public Law 106-113, 29 November 1999.
25. European Patent Convention, arts. 93 and 115.

The author is the George E. Osborne Professor at Stanford Law School, Stanford University, Stanford, CA 94305-8610. E-mail: jbarton@leland.stanford.edu