

Blocking Patents and the Scope of Claims

by

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Abstract

The patent statutes expressly authorize patents for improvements to earlier inventions, but they do not address the allocation of rights between the patents for the original inventions and the improvements. Numerous cases have held that improvements can give rise to blocking patents in which the permission of the patentees on both the original invention and the improvement is required for either patentee or anyone else to make, use or sell the improvement. Unfortunately, blocking patents may lead to costly negotiations and create the possibility of deadlock in which nobody can exploit an improvement. The enactment of the nonobviousness requirement for patentability in 1952 appears to have eliminated blocking patents on improvements, however, because an improvement cannot be both nonobvious and within the scope of patent protection for the original invention. Consequently, cases prior to 1952 that recognize blocking patents on improvements are no longer controlling or persuasive. Nevertheless, several cases arising out of the massive litigation in the 1970's and 1980's over the patent rights to polypropylene developed a theory of the enablement requirement for patentability that would permit blocking patents for improvements. This precedent has been substantially undercut by a number of recent Federal Circuit decisions, though. As a result, blocking patents now appear to be limited to patents for processes for making or using products that are subject to patents and to combinations of components that are separately patented.

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I. Introduction

Technological progress is generally cumulative. Most often, inventors rely on the discoveries of others to make a new discovery, and so the new discovery is really a combination of the old with the new. When this is so, the issue of how to allocate intellectual property rights between the former and later inventors may arise. Obviously, there are tradeoffs.¹ Granting all the intellectual property rights to the first inventor (or inventors, if the later inventor relies on multiple prior inventors) removes the incentive for the later inventor to make the new discovery because the first inventor would reap all the rewards from both the initial and new discoveries. If the first inventor lacks either the expertise or sufficient incentive to make the new discovery, then there may be no scientific progress.

On the other hand, granting all the intellectual property rights to the later inventor may remove at least some of the incentive for the first inventor to make the original discovery. While the first inventor still would have the benefit of intellectual property rights from the original discovery, these may not be very valuable if the new discovery produces competition or renders the original discovery obsolete. Lacking the benefit of intellectual property rights from the new discovery could make enough of a difference that the first inventor would lack sufficient incentive to make the original discovery in the first place.² Again there may be no

¹ See generally Suzanne Scotchmer, *Standing on the Shoulders of Giants: Cumulative Research and the Patent Law*, 5 J. ECON. PERSP. 29, 30 (1991) (“The challenge is to reward early innovators fully for the technological foundation they provide to later innovators, but to reward later innovators adequately for their improvements and new products as well.”).

² Jerry R. Green & Suzanne Scotchmer, *On the Division of Profit in Sequential Innovation*, 26 RAND J. ECON. 20, 20 (1995) (“[T]he social value of an early innovation includes the net social value of the applications it facilitates. If the first innovator does not collect that

technological progress, especially if the new discovery would not have been possible without the original discovery.

It would appear that allocation of intellectual property rights would require consideration of a variety of factors. These would probably include the relative significance of the contributions of the first and second inventors as well as the payoffs each of them needs to recover their costs of making their respective discoveries. Both are difficult to ascertain.

Copyright law awards all the intellectual property rights to the first creator of an original work of authorship.³ In contrast, patent law authorizes an inventor of an improvement to an original invention to obtain a patent on the improvement, provided that the improvement satisfies the standards for patentability.⁴ A possible reason for this difference is that the range of potential works of authorship is greater than the range of improvements for inventions. The range of potential works of authorship is limited only by the imagination of the author. The author of a screenplay about a sports figure does not have to use the character of Rocky Balboa, for example, but is free to make up an original character, while Sylvester Stallone retains all the rights to develop derivative works based on the Rocky character.⁵ Thus, the ability of later authors to obtain intellectual property rights for their new works of authorship is not irretrievably constrained by awarding all the intellectual property rights to the first creator of an

value as profit, he might not invest even if the combined profit of the innovations exceeds the combined costs.”).

³ See, e.g., *Mulcahy v. Cheetah Learning LLC*, 386 F.3d 849, 852 (8th Cir. 2000) (“[B]ecause the owner of the original copyright has the exclusive right to prepare derivative works, the creator of an original derivative work is only entitled to a copyright if she had permission to use the copyrighted work.”); *Schrock v. Learning Curve Int’l, Inc.*, 531 F. Supp. 2d 990, 996 (N.D. Ill. 2008) (same).

⁴ See 35 U.S.C. § 101 (2000) (authorizing inventor of “any new and useful improvement” of an invention to obtain a patent for the improvement).

⁵ See *Anderson v. Stallone*, 1989 WL 206431 (C.D. Cal.).

original work of authorship. Patentable inventions, on the other hand, are constrained by the laws of nature, because they must actually work to be patentable.⁶ An inventor is not as free to make up an improvement that does not rely on an original invention as a later author is to create a work of authorship that does not rely on an original work of authorship. Accordingly, there may be greater justification for awarding intellectual property rights to the inventor of an improvement than there is for awarding them to the author of a derivative work.⁷

While an inventor of an improvement to an original invention may receive a patent, the patent on the improvement could potentially be subject to a patent on the original invention. In these circumstances, neither the inventor of the improvement nor the inventor of the original invention would be allowed to make, use, offer to sell, or sell the improvement without the consent of the other.⁸ The patent on the improvement would block the inventor of the original invention from practicing the improvement without permission of the inventor of the improvement, and if the improvement is within the scope of the patent on the original invention, the patent on the original invention would block the inventor of the improvement from practicing the improvement without permission of the inventor of the improvement. Third

⁶ See 35 U.S.C. §§ 101 (requiring invention to be useful), 112 (requiring patent application to contain a written description of the invention that enables a person of ordinary skill in the area to make and use the invention).

⁷ For a more thorough analysis of the different treatments of improvements to inventions in patent law and derivative works in copyright law, see Mark A. Lemley, *The Economics of Improvement in Intellectual Property Law*, 75 TEX. L. REV. 989 (1997). Professor Lemley calls the reason presented in the text for the differing treatment of improvements under patent and copyright law the “different works” argument. *Id.* at 1034-38. He also considers three additional justifications for the differing treatment that he calls the moral rights, balance of power, and market power arguments. *Id.* at 1031-34, 1038-42. He ultimately rejects all these arguments and concludes that copyright law should be modified to conform more closely to the patent law approach for allocating intellectual property rights in improvements. *Id.* at 1044, 1069, 1084.

⁸ 35 U.S.C. § 271(a) (2000).

parties who wished to practice the invention on the improvement would have to get permission from both inventors. Consequently, the first and second inventors would share the intellectual property rights in the patent on the improvement with the allocation of the licensing revenue left to negotiation between them.

The situation is an example of a bilateral monopoly in which two parties have to bargain with each other over something of value.⁹ In the absence of a market to determine a price within the bargaining range, the parties to a bilateral monopoly could incur substantial costs to arrive at a settlement point, or they could be unable to settle with each other at all. Similarly, two inventors with blocking patents could be unable to agree on the allocation of their intellectual property rights in the improvement with the result that neither they nor any third parties would be able to make, use, offer to sell, or sell the improvement. Blocking patents could therefore interfere with technological progress.¹⁰

Whether a patent on an original invention blocks a patent on a later invention depends on the scope of the patent on the original invention and whether the later invention comes within the scope of the patent on the original invention. Generally, the scope of a patent depends on its claims, which are found at the end of the specification in the patent application and the issued patent.¹¹ Usually a patent attorney will draft patent claims as broadly as possible in order to

⁹ For discussions of bilateral monopoly, see *Matter of Hopkins*, 102 F.3d 311, 315 (7th Cir. 1996) (Posner, J.), *overruled on other grounds*, *Associates Commercial Corp. v. Rush*, 520 U.S. 953 (1997); *Walgreen Co. v. Sara Creek Property Co.*, 996 F.2d 273, 276 (7th Cir. 1992) (Posner, J.); Richard A. Posner, *ECONOMIC ANALYSIS OF LAW* 62, 597-98 (7th ed. 2007).

¹⁰ For examples of blocking patents interfering with progress in the early electrical lighting industry and the development of automobile, aircraft, and radio technology, and see Robert P. Merges & Richard R. Nelson, *On the Complex Economics of Patent Scope*, 90 COLUM. L. REV. 839, 885-93 (1990).

¹¹ The patent case law has also developed a doctrine of equivalents, which in some cases may extend the range of a patent beyond the literal scope of the claims. The additional range from the doctrine of equivalents is limited to insubstantial variations that perform the same

maximize the coverage of the patent. There are a number of constraints, however, on the scope of claims available to a patent drafter.

On the one hand, the scope of claims is constrained by the prior art in the field. The requirement of novelty, for example, bars claims from encroaching on inventions that were known or used by others in the United States, or that were described in a printed publication anywhere in the world before the patent applicant's own invention.¹² In addition, the requirement of nonobviousness bars claims for an invention whose differences from the prior art are such that the new invention would have been obvious to a person having ordinary skill in the art at the time the patent applicant first made the invention.¹³

On the other hand, the scope of claims is constrained by the disclosures that the patent applicant makes in the specification in the patent application. The specification is required to provide a written description of the invention, as well as the process for making and using it, that is sufficient to enable any person who is skilled in the art to make and use the invention.¹⁴ In addition, the specification must specify the best mode for carrying out the invention that the inventor contemplated.¹⁵

It would seem that combining the enablement requirement for an original patent with the nonobviousness requirement for a later patent would preclude the possibility that the original patent could block the later patent. If the first inventor failed to provide a written description

function in substantially the same way to produce the same result as the original invention, and it is therefore dependent on the literal scope of the claims. For additional discussion of the doctrine of equivalents, see text accompanying notes 94-107, *infra*.

¹² See 35 U.S.C. § 102(a).

¹³ See 35 U.S.C. § 103(a).

¹⁴ See 35 U.S.C. § 112.

¹⁵ *Id.*

that enabled any person skilled in the art to make and use the later invention, then the enablement requirement would bar the first inventor from including the later invention in the claims in the original patent. Consequently, the original patent would not block the later patent, because the later patent would be outside the scope of the original patent. On the other hand, if the first inventor did provide a written description that enabled any person skilled in the art to make and use the later invention, then the later invention must have been known to the first inventor and the later invention would have been part of the prior art. Consequently, the second patent would be invalid on account of the nonobviousness requirement.

Despite this syllogism, the existence of blocking patents has long been recognized by the courts as well as by academic commentators.¹⁶ Under the traditional view, the patent system operates under a reward theory in which an inventor is given an exclusive right to practice an invention in order to capture returns from the investment in research and development in exchange for full disclosure of the invention so that the public may use the invention after expiration of the patent's term.¹⁷ Edmund Kitch has challenged this traditional view with an alternative theory that he named the prospect theory.¹⁸ Under the prospect theory, the scope of a patent should extend beyond what the inventor had accomplished to cover improvements to the invention that are later developed by others. Professor Kitch argued that the prospect theory

¹⁶ See, e.g., Merges & Nelson, *supra* note 10, at 861, n.96, and references cited therein.

¹⁷ The Supreme Court provided the following summary synopsis of the reward theory in *Universal Oil Products Co. v. Globe Oil & Refining Co.*, 322 U.S. 471, 484 (1944):

As a reward for inventions and to encourage their disclosure, the United States offers a seventeen-year monopoly to an inventor who refrains from keeping his invention a trade secret. But the *quid pro quo* is disclosure of a process or device in sufficient detail to enable one skilled in the art to practice the invention once the period of the monopoly has expired; and the same precision of disclosure is likewise essential to warn the industry concerned of the precise scope of the monopoly asserted.

¹⁸ Edmund W. Kitch, *The Nature of the Patent System*, 20 J. L. & ECON. 265 (1977).

would enhance public welfare by giving unification of control over the development of the invention to the original inventor, thereby providing the original inventor with greater incentives to make investments without fear that the fruits of the invention will be appropriated by competitors.¹⁹ This prospect theory thus offers a rationale for extending the scope of a patent beyond the inventor's disclosure in the patent application.

In a recent line of decisions, however, the Court of Appeals for the Federal Circuit appears to have significantly narrowed the permissible scope of patents to their disclosures.²⁰ It would seem that a likely consequence of the Federal Circuit's restriction of the scope of patents to their disclosures would be the elimination of the possibility of blocking patents for improvements. Nevertheless, there are some circumstances where blocking patents still exist.²¹

This article begins in Part II by tracing the historical background of blocking patents. Part III sets out the enablement, written description and nonobviousness requirements for patentability. Part IV analyzes the most recent example of a blocking patent that has been upheld by the Federal Circuit – the great polypropylene case. Part V then discusses the recent line of decisions from the Federal Circuit. Part VI examines the circumstances in which blocking patents may be found, and is followed by a brief conclusion.

¹⁹ *Id.* at 275-76.

²⁰ *See* *Sitrick v. Dreamworks, LLC*, 516 F.3d 993 (Fed. Cir. 2008); *Auto. Techs. Int'l, Inc. v. BMW of N. Am., Inc.*, 501 F.3d 1274 (Fed. Cir. 2007); *Liebel-Flarsheim Co. v. Medrad, Inc.*, 481 F.3d 1371 (Fed. Cir. 2007); *Lizardtech, Inc. v. Earth Resource Mapping, Inc.*, 424 F.3d 1336 (Fed. Cir. 2005); *Chiron Corp. v. Genentech, Inc.*, 363 F.3d 1247 (Fed. Cir. 2004); *Plant Genetic Sys. N.V. v. DeKalb Genetics Corp.*, 315 F.3d 1335 (Fed. Cir. 2003).

²¹ These would include instances where: 1) a machine or manufacture is made by combining components, each of which is subject to a patent, and 2) there are patents for processes to make or use compositions of matter, machines and manufactures that are in turn subject to patents. For a discussion of these circumstances, see *infra* text accompanying notes 237-244.

II. Historical Background of Blocking Patents

The history of blocking patents in the United States appropriately begins with the following provision in the Patent Act of 1793:

[A]ny person, who shall have discovered an improvement in the principle of any machine, or in the process of any composition of matter, which shall have been patented, and shall have obtained a patent for such improvement, he shall not be at liberty to make, use or vend the original discovery, nor shall the first inventor be at liberty to use the improvement : . . .²²

The Supreme Court examined this provision in *Evans v. Eaton*,²³ a case involving a patent on an improved version of a machine for used for manufacturing flour called a Hopperboy. The patentee contended that the patent was for the whole of the improved Hopperboy, or alternatively, for only the improvement in the Hopperboy that the plaintiff developed. The Court first determined that the plaintiff was not entitled to a patent on the whole of the improved Hopperboy, because the plaintiff's invention consisted of only an addition to the previous embodiment of the Hopperboy.²⁴ The Court then decided that the plaintiff was not entitled to a patent on his improvement of the Hopperboy, because he had not specified what the improvement was. The plaintiff had described the whole of the improved Hopperboy, but the Court ruled that he was required to describe what his own improvement was in order to obtain a patent on the improvement.²⁵

²² Act of Feb. 21, 1793, ch. 11, § 2, 1 Stat. 318, 321.

²³ 20 U.S. (7 Wheat.) 356 (1822).

²⁴ *Id.* at 430-31. *See also* *Woodcock v. Parker*, 30 F. Cas. 491, 492 (C.C.D. Mass. 1813) (No. 17, 971) (unless the patentee invented a whole new machine, the patent should be confined to the improvement).

²⁵ 20 U.S. at 432-35.

The explicit provision for blocking patents was repealed in 1836,²⁶ and it has never been reenacted. Nevertheless, the courts continued to recognize the principle that an original patent could block the practice of a patent on an improvement to the invention in the original patent.²⁷ The earliest published decision with such a holding probably is *Woodworth v. Rogers*.²⁸ Although *Woodworth* was decided in 1847, it relied on the Act of 1793, which had been repealed over a decade before, for the proposition that “no one can make an improvement on [a patented invention], . . . while the original term, or renewals of it, exist, without the license of the original patentee.” *Woodworth* was followed in *Star Salt Caster Co. v. Crossman*,²⁹ which involved an agreement allocating royalties between the owner of a patent on an original invention and the owner of a patent on an improvement to the original invention. In enforcing the agreement, the court stated:

Two patents of the kind may both be valid where the second is an improvement upon the first, in which event, if the second includes the first, neither can lawfully use that of the other without the other's consent. Plainly the second patent could not be used without the consent of the owner of the first, nor could the owner of the first patent use the second without the consent of the owner, as the patent contains an invention which the owner of the first patent never made.³⁰

In *Cochrane v. Deemer*,³¹ the Supreme Court held that the defendants infringed a patent on a process for making flour, even though the defendants made improvements to the patented process that might themselves have been patentable. The Court concluded that that the patented

²⁶ Act of July 4, 1836, ch. 357, § 20, 5 Stat. 117, 125.

²⁷ See William Redin Woodward, *Definiteness and Particularity in Patent Claims*, 46 MICH. L. REV. 755, 767-68 (1948).

²⁸ 30 F. Cas. 581 (C.C.D. Me. 1847) (No. 18,018).

²⁹ 22 F. Cas. 1132 (C.C.D. Mass 1878) (No. 13,321).

³⁰ *Id.* at 1135.

³¹ 94 U.S. 780 (1876).

invention was “at the bottom of” the defendants’ improvements, and the defendants could not appropriate the patent “even though [the patented invention was] supplemented by and enveloped in very important and material improvements of their own.”³²

The Supreme Court next addressed the relationship between original and improvement patents in *Cantrell v. Wallick*.³³ One of the defenses that was raised in the patent infringement action was that the patent was invalid because the invention was not entirely novel, but instead was an improvement on an earlier patented invention. Rejecting this argument, the Court explained:

Two patents may both be valid when the second is an improvement on the first, in which event, if the second includes the first, neither of the two patentees can lawfully use the invention of the other without the other's consent. *Star Salt Caster Co. v. Crossman*, 4 Cliff. 568. Therefore letters patent for an improvement on a patented invention cannot be declared void because they include such patented invention.³⁴

In *Herman v. Youngstown Car Manufacturing Co.*,³⁵ the trial court relied on the fact that the defendant was licensed under a patent on an improvement in concluding that the defendant did not infringe a patent on an original invention. In reversing, the Sixth Circuit Court of Appeals explained that the trial court’s reasoning was based on a fundamental error: “A patent is not the grant of a right to make or use or sell. It does not, directly or indirectly, imply any such right. It grants only the right to exclude others.”³⁶ The appellate court continued by noting that many patents are granted in a field that is covered by a prior generic or basic patent, and that these patents are tributary to the prior patent and cannot be practiced without a license from the

³² *Id.* at 787.

³³ 117 U.S. 689 (1886).

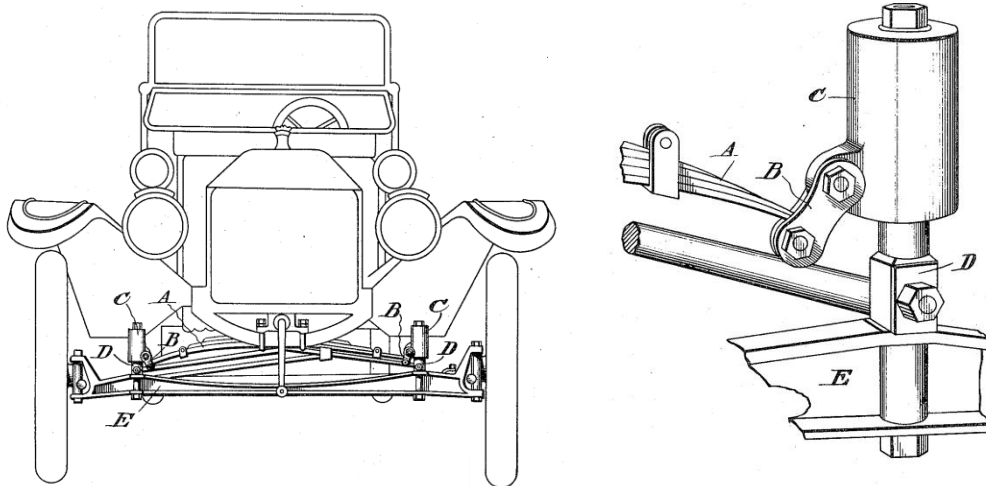
³⁴ *Id.* at 694.

³⁵ 191 F. 59 (6th Cir. 1911).

³⁶ *Id.* at 584.

owner of the prior patent.³⁷ The court also explained that even though the issuance of an improvement patent indicates that there is a patentable difference between the improvement and original invention, the existence of a patentable difference does not negative infringement, because the improvement could still be based on the original invention.³⁸

The Supreme Court has dealt with the subject of blocking patents in only one other case besides *Cochrane and Cantrell: Temco Electric Motor Co. v. Apco Manufacturing Co.*³⁹ The plaintiff was the assignee of a patent issued to Ralph and William Thompson for shock absorbers on motor vehicles. The Thompson patent involved combining relatively high frequency coiled springs with the relatively low frequency leaf springs that were originally built into motor vehicles. See Figure 1 below. Because the coiled springs and leaf springs oscillated at different frequencies, their oscillations interfered with each other and together the two springs quickly absorbed vibrations from the road.



The Thompson Patent

³⁷ *Id.* at 584-85.

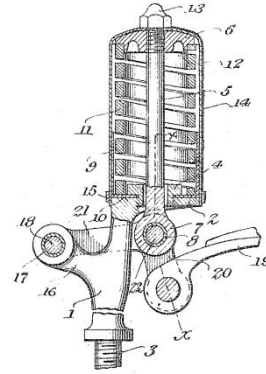
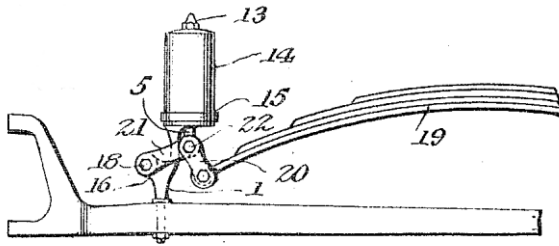
³⁸ *Id.* at 585.

³⁹ 375 U.S. 319 (1928).

The Thompson shock absorbers were quite successful, but after several years, it was observed that the coiled springs were wearing out because of friction between the springs and the casings in which they moved when the vehicle body was tilted by an uneven load. The solution to this problem was to attach the metal guides for the coiled springs to the vehicle axle so that the springs would move in a vertical direction and to attach the rod inside the coiled springs to the leaf springs with a pivot so that the leaf springs and vehicle body could tilt without affecting the vertical orientation of the coiled springs. See Figure 2 below. The Thompsons applied for a patent for this improvement to their shock absorbers, but the Patent Office determined in an interference proceeding that William Storrie had priority on account of a patent application filed six months after the issuance of the original Thompson patent. The Patent Office therefore issued the patent for the improvement to Storrie.⁴⁰ Storrie licensed his patent to the defendant, and the defendant raised the license from Storrie as a defense in the plaintiff's action for infringement of the Thompson patent. Citing *Cochrane* and *Cantrell*, the Supreme Court rejected this defense. It held: "It is well established that an improver cannot appropriate the basic patent of another, and that the improver without a license is an infringer, and may be sued as such."⁴¹

⁴⁰ *Id.* at 325.

⁴¹ *Id.* at 328.



The Storrie Patent

After the *Temco* decision, the lower federal courts followed the principle that a patent on an original patent could block the practice of a patent on an improvement. For example, the Second Circuit Court of Appeals recognized the possibility of blocking patents in *New Jersey Zinc Co. v. Singmaster*,⁴² explaining: “The prior patentee cannot use the improvement without the consent of the improver, and the latter cannot use the original invention without the consent of the former.”⁴³ Similarly, in *Wine Railway Appliance Co. v. Baltimore & O.R. Co.*,⁴⁴ the Fourth Circuit stated that “it is perfectly well settled that a device which embodies the principles of a basic patent as well as one for an improvement infringes both.”⁴⁵ The Fifth Circuit declared in *Zachos v. Sherwin-Williams Co.*⁴⁶ that “an improver must respect the rights of the patent on which he improves,”⁴⁷ and affirmed a judgment finding that the owner of an improvement patent infringed an original patent.

⁴² 71 F.2d 277 (2nd Cir. 1934).

⁴³ *Id.* at 279.

⁴⁴ 73 F.2d 312 (4th Cir. 1935).

⁴⁵ *Id.* at 315-16.

⁴⁶ 164 F.2d 234 (5th Cir. 1948).

⁴⁷ *Id.* at 235.

The Federal Circuit has also recognized the possibility of blocking patents on improvements. In *Milliken Research Corp. v. Dan River, Inc.*,⁴⁸ the court commented: “We, of course, agree . . . that one may not be able to practice the invention protected by a patent directed to an improvement of another’s patented article or method except with a license under the latter.”⁴⁹ The court expressed the same principle in mathematical terms in *Atlas Powder Co. v. E.I. du Pont De Nemours & Co.*:⁵⁰ “Du Pont concedes that, if Atlas patents A + B + C and Du Pont then patents the improvement A + B + C + D, Du Pont is liable to Atlas for any manufacture, use, or sale of A + B + C + D because the latter directly infringes claims to A + B + C.”⁵¹ Similarly, the court remarked in *Texas Instruments, Inc. v. United States International Trade Commission*:⁵² “Devices that have been modified to such an extent that the modification may be separately patented may nonetheless infringe the claims of the basic patent.”⁵³

While recognizing blocking cases on improvements, these cases did not address either the enablement requirement⁵⁴ for the original patents or the nonobviousness requirement for the improvement patents. The enablement and written description requirements may place

⁴⁸ 739 F.2d 587 (Fed. Cir. 1984).

⁴⁹ *Id.* at 594 (dictum).

⁵⁰ 750 F.2d 1569 (Fed. Cir. 1984).

⁵¹ *Id.* at 1580. The Federal Circuit upheld the trial court’s findings that there was no literal infringement but that there was infringement under the doctrine of equivalents.

⁵² 805 F.2d 1558 (Fed. Cir. 1986).

⁵³ *Id.* at 1563. For additional cases recognizing blocking patents on improvements, see 5 DONALD S. CHISUM, CHISUM ON PATENTS § 16.02 [1][a] (2007).

⁵⁴ The *Atlas Powder* case, *supra* text accompanying notes 50-51, did actually discuss enablement of the claims in the original patent and decided that the enablement requirement was satisfied for them. The improvement did not literally infringe those claims, however. Instead, the court found infringement under the doctrine of equivalents, and it ruled that the enablement requirement was not applicable to infringement under the doctrine of equivalents. 750 F.2d at 1581. Therefore, the court did not address whether the defendant’s improvement was enabled by the specification in the original patent.

significant limitations on the scope of claims in an original patent, and the nonobviousness requirement may limit the validity of an improvement patent. Consequently, these requirements may affect whether an improvement patent infringes an original patent. The following section discusses the enablement, written description nonobviousness requirements for blocking patents.

III. The Enablement, Written Description and Nonobviousness Requirements

The requirement that a patent specification must include a description sufficient to enable a person skilled in the art to make and use the invention has been a part of the patent law since the first patent statute of 1790.⁵⁵ In 1847, the Supreme Court ruled that as a result of this requirement, a patent for a new composition of matter would be void if the specification only identified the substances that were to be combined without stating their relative proportions, or if it stated the proportions ambiguously.⁵⁶ Otherwise, “no one could use the invention without first ascertaining by experiment the exact proportion of the different ingredients required to produce the result intended to be obtained.”⁵⁷

Several years later, the Supreme Court applied the enablement requirement to limit the permissible scope of patent claims in *O'Reilly v. Morse*,⁵⁸ which involved Samuel Morse's patent for the telegraph. The Supreme Court upheld the patent's first seven claims, which referenced the description of the invention in the specification, and it affirmed the lower court's injunction for infringement of them. The Court also decided, however, that the eighth claim was void for failure to satisfy the enablement requirement. In this last claim, the patent sought to

⁵⁵ Act of April 10, 1790, ch. 7, § 2, 1 Stat. 109, 110.

⁵⁶ *Wood v. Underhill*, 46 U.S. (5 How.) 1 (1847).

⁵⁷ *Id.* at 6.

⁵⁸ 56 U.S. (15 How.) 62 (1853).

cover not only the particular invention described in the specification, *i.e.*, the telegraph, but also all improvements on it. The claim read:

Eighth. I do not propose to limit myself to the specific machinery, or parts of machinery, described in the foregoing specifications and claims; the essence of my invention being the use of the motive power of the electric or galvanic current, which I call electro-magnetism, however developed, for making or printing intelligible characters, letters, or signs, at any distances, being a new application of that power, of which I claim to be the first inventor or discovered.⁵⁹

This claim would have covered future technologies, such as radio and television, which Morse had not invented. The Court held that the patentee claimed “what he has not described in the manner required by law,” and that “a patent for such a claim is as strongly forbidden by the act of Congress, as if some other person had invented it before him.”⁶⁰

The enablement requirement also limited the permissible scope of claims in *Consolidated Electric Light Co. v. McKeesport Light Co.*,⁶¹ which involved a patent for incandescent lights issued to William E. Sawyer and Albon Man. The specification described the invention as using an incandescent conductor consisting “of carbon made from a vegetable fibrous material” inside a transparent sealed vessel from which oxygen was excluded. The patent had four claims. The first claim was for “[a]n incandescing conductor for an electric lamp, of carbonized fibrous or textile material, and of an arch or horseshoe shape, substantially as hereinbefore set forth.” The third claim was for “[t]he incandescing conductor for an electric lamp, formed of carbonized paper, substantially as described.”⁶² The specification also said that in the practice of the invention, the inventors had used carbonized paper and wood carbon of varying shapes and contours.

⁵⁹ *Id.* at 86.

⁶⁰ *Id.* at 120.

⁶¹ 159 U.S. 465 (1895).

⁶² *Id.* at 468.

The plaintiff alleged that the defendant infringed the first claim by using an incandescent light bulb supplied by the Edison Electric Company that had an incandescent conductor made of bamboo. The Supreme Court decided that the first claim violated the enablement requirement because it was overbroad. It reasoned that the permissible scope of a claim depended on how generic the relevant characteristic was over the range of the claim. The Court explained:

If, for instance, minerals or porcelains had always been used for a particular purpose, and a person should take out a patent for a similar article of wood, and woods generally were adapted to that purpose, the claim might not be too broad, though defendant used wood of a different kind from that of the patentee. But if woods generally were not adapted to the purpose, and yet the patentee had discovered a wood possessing certain qualities, which gave it a peculiar fitness for such purpose, it would not constitute an infringement for another to discover and use a different kind of wood, which was found to contain similar or superior qualities.⁶³

The Court pointed out that Thomas Edison had discovered that a particular species of bamboo was optimal for serving as an incandescent conductor in a light bulb only after testing many types of plants over a period of several months. It concluded that the specification did not enable persons skilled in the art to practice the invention over the range of the first claim without a substantial amount of experimentation, because the specification did not disclose which fibrous or textile materials were suitable for use as an incandescent conductor.⁶⁴

The issue of the permissible scope of claims often arises with respect to patents on chemical compositions where an inventor has discovered one or more particular compositions (*i.e.*, species) and seeks to obtain a broader patent on a category (*i.e.*, a genus) of chemical compositions. For example, in *Corona Cord Tire Co. v. Dovan Chemical Corp.*,⁶⁵ the patented invention was for a process for vulcanizing rubber more rapidly using a particular chemical,

⁶³ *Id.* at 472.

⁶⁴ *Id.* at 475.

⁶⁵ 276 U.S. 358 (1928).

diphenylguanidine. The patent included claims involving not only diphenylguanidine, but also the class of chemicals called disubstituted guanidines, which included not only diphenylguanidine but also between fifty and one hundred other chemicals. Following the *Consolidated Electric Light Co.* case, the Supreme Court held that the claims for the class of disubstituted guanidines was invalid, because the patentee had made no showing that there was “any general quality common to disubstituted guanidines which made them all effective” for use in the process of the invention.⁶⁶ The decision pointed out that it had been established that a number of the chemicals in the class that was claimed were not effective. In addition, other members of the class had been discovered and been used to accelerate the process of vulcanizing rubber before the filing of the patent application.

The *Corona Cord Tire Co.* case suggests that a patentee must show that every species in a class must have the characteristics needed for use in the invention in order for the patentee to claim the genus. The lower courts have not required such a showing, however, as long as the specification is sufficient to enable a person of ordinary skill in the art to make and use the invention over the range of the claim without undue experimentation. *In re Ellis*⁶⁷ provides an example. The invention was for paint removers that contained solvents belonging to a class of chemicals called ketonic derivatives of cyclic CH₂hydrocarbons. The Patent Office sought to limit the claims to a particular solvent within the class, but the Court of Appeals for the District of Columbia allowed the patent to extend to the entire class. The court held that the specification with its enumeration of numerous chemicals in the class was “sufficient to convey to one skilled

⁶⁶ *Id.* at 385.

⁶⁷ 37 App. D.C. 203 (1911). For additional discussion of *Ellis*, see C. H. Bisesterfeld, *Breadth and Scope of Chemical Claims*, 2 J. PAT. OFF. SOC'Y 598, 602-05 (1919).

in the art the nature of the chemicals which will accomplish the desired result.”⁶⁸ It distinguished the *Consolidated Electric Light Co.* case by explaining that the chemicals in the designated class had the common quality of being solvents and were suitable for use in the invention.⁶⁹

Similarly, in *In re Angstadt*,⁷⁰ the Court of Customs and Patent Appeals upheld a claim for a process that involved using catalysts selected from a class of chemicals. The specification disclosed forty examples of species that were tested out of thousands of species of chemicals within the genus, and the specification also stated that some of the species would not work in the process. The court explained that the process in the invention was not complicated, and therefore, a person skilled in the particular art could take the specification with its forty examples and readily determine which of the species within the scope of the claims would work and which would not.⁷¹ The court held that a person of ordinary skill in the art could thus practice the invention over the range of the claims without undue experimentation, and that the key word was “undue,” rather than “experimentation.”⁷²

In contrast, the Court of Appeals for the Federal Circuit decided in *Amgen, Inc. v. Chugai Pharmaceutical Co., Ltd.*,⁷³ that a claim for the genus of all the DNA sequences for proteins that were sufficiently duplicative of a particular protein with 165 amino acids, was invalid for lack of enablement. The court noted that the patentee had made only fifty to eighty examples of the millions of possible DNA sequences that could be within the genus, and after five years of

⁶⁸ *Id.* at 207.

⁶⁹ *Id.* at 208-09.

⁷⁰ 537 F.2d 498 (C.C.P.A. 1976).

⁷¹ *Id.* at 503.

⁷² *Id.* at 504.

⁷³ 927 F.2d 1200 (Fed. Cir. 1991).

experimentation, the plaintiff was not able to determine which of the millions of possible DNA sequences actually were within the claim. The Court distinguished *Angstadt* on the grounds that the patentee had not provided “a disclosure sufficient to enable one skilled in the art to carry out the invention commensurate with the scope of his claims,” which in the context of DNA sequences meant “disclosing how to make and use enough sequences to justify grant of the claims sought.”⁷⁴

As the court explained in *Genentech v. Novo Nordisk*,⁷⁵ enablement requires more than “[t]ossing out the mere germ of an idea” or “vague intimations of general ideas that may or may not be workable.”⁷⁶ The specification does not have to include a working example⁷⁷ or disclose what would already be known to those skilled in the art,⁷⁸ but it does need to provide enough information to enable persons skilled in the art to carry out the invention without undue experimentation. The Federal Circuit has noted that whether a specification requires undue experimentation to practice an invention depends on the following factors:

(1) the quantity of experimentation necessary, (2) the amount of direction or guidance presented, (3) the presence or absence of working examples, (4) the nature of the invention, (5) the state of the prior art, (6) the relative skill of those in the art, (7) the predictability or unpredictability of the art, and (8) the breadth of the claims.⁷⁹

⁷⁴ *Id.* at 1213. *See also* *In re Goodman*, 22 F.3d 1046, 1050 (Fed. Cir. 1993) (single example in specification for producing one mammalian protein in one plant species did not provide sufficient information to enable broad claims for producing any type of mammalian protein in any plant species); *In re Vacek*, 947 F.2d 488, 495-96 (Fed. Cir. 1991) (disclosure of nine genera of cyanobacteria in specification with working example for only one species did not enable claim for all 150 genera of cyanobacteria).

⁷⁵ 108 F.3d 1361, 1366 (Fed. Cir. 1997).

⁷⁶ *Id.* at 1366.

⁷⁷ *Application of Borkowski*, 422 F.2d 904, 909 (C.C.P.A. 1970).

⁷⁸ 108 F.3d at 1366.

⁷⁹ *In re Wands*, 858 F.2d 731, 737 (Fed. Cir. 1988).

In addition to requiring a patent specification to enable a person of skill in the art to make and use the invention as claimed, the Federal Circuit also requires the specification to include a written description of the invention.⁸⁰ One major purpose of the written description requirement is to establish that the patent applicant had possession of what the applicant claimed as the invention on the date of filing the application.⁸¹ Another purpose is to prevent an applicant from amending claims and have the claims relate back to an earlier filing date in order to gain priority of invention over competing applicant.⁸²

There is a large amount of overlap between the written description and enablement requirements, because a written description of the invention will often enable a person of skill in the art to make and use the invention. Nevertheless, the Federal Circuit has noted distinctions between the two requirements, as follows:

[A]n invention may be described without an enabling disclosure of how to make and use it. A description of a chemical compound without a description of how to make and use it, unless within the skill of one of ordinary skill in the art, is an example. Moreover, an invention may be enabled even though it has not been described. Such can occur when enablement of a closely related invention A that is both described and enabled would similarly enable an invention B if B were

⁸⁰ For a summary of the historical background of the written description requirement, see *Application of Barker*, 559 F.2d 588, 591-93 (C.C.P.A. 1977).

⁸¹ *Falko-Gunter Falkner v. Inglis*, 448 F.3d 1357, 1366 (Fed. Cir. 2006); *Capon v. Eshhar*, 418 F.3d 1349, 1357 (Fed. Cir. 2005); *Enzo-BiChem, Inc. v. Gen-Probe Inc.*, 323 F.3d 956, 969 (Fed. Cir. 2002); *Vas-Cath Inc. v. Mahurkar*, 935 F.2d 1555, (Fed. Cir. 1991); *Application of Ruschig*, 379 F.2d 990, 996 (C.C.P.A. 1967). *But see* Timothy R. Holbrook, *Possession in Patent Law*, 59 SMU L. Rev. 123 (2006) (arguing that possession of the invention should be established through proof of enablement rather than the written description requirement).

⁸² *Chiron Corp. v. Genentech, Inc.*, 363 F.3d 1247, 1255 (Fed. Cir. 2004) (“The written description requirement prevents applicants from using the amendment process to update their disclosures (claims or specifications) during their pendency before the patent office.”); *Gentry Gallery, Inc. v. Berkline Corp.*, 134 F.3d 1473, 1479 (Fed. Cir. 1998). *See also* Robert P. Merges, *Software And Patent Scope: A Report From The Middle Innings*, 85 Tex. L. Rev. 1627, 1652 (2007) (urging that the written description requirement should be limited to “misappropriation by amendment” cases such as *Gentry Gallery*).

described. A specification can likewise describe an invention without enabling the practice of the full breadth of its claims.⁸³

Because the enablement requirement relies on what would be apparent to persons skilled in the art, it closely parallels the modern standard for nonobviousness. Section 103 of Title 35 provides that an invention is not patentable “if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.”⁸⁴

Before section 103 was adopted in 1952, however, the standard for patentability revolved around the concept of invention, which was described as “inherently elusive,”⁸⁵ and it appeared to evolve over time.⁸⁶ In an early case, *Hotchkiss v. Greenwood*,⁸⁷ the Supreme Court ruled that a patent for an improved doorknob made of clay, rather than wood or metal, was invalid because it involved merely the substitution of a known material for others. It held:

[U]nless more ingenuity and skill . . . were required . . . than were possessed by an ordinary mechanic acquainted with the business, there was an absence of that degree of skill and ingenuity which constitute essential elements of every invention. In other words, the improvement is the work of the skilful [sic] mechanic, not that of the inventor.⁸⁸

⁸³ University of Rochester v. G.D. Searle & Co., Inc., 358 F.3d 916, 921 (Fed. Cir. 2004).

⁸⁴ 35 U.S.C. § 103(a) (2000).

⁸⁵ Great Atl. & Pac. Tea Co. v. Supermarket Equip. Corp., 340 U.S. 147, 151 (1950). See also Giles S. Rich, *The Vague Concept of “Invention” as Replaced by Sec. 103 of the 1952 Patent Act*, 46 J. Pat. Off. Soc’y 855, 859-62 (1964) (noting vagueness of the “requirement for invention” that evolved out of *Hotchkiss v. Greenwood*).

⁸⁶ Edmond W. Kitch, *Graham v. John Deere Co.: New Standards for Patents*, 1966 SUP. CT. REV. 293, 303 (1966).

⁸⁷ 52 U.S. (11 How.) 248 (1850).

⁸⁸ *Id.* at 267.

The emphasis in *Hotchkiss* on “invention” as a requirement for patentability caused confusion in the courts and created uncertainty in the applicability of this standard for patentability.⁸⁹

The uncertainty of the invention requirement may have obscured its relationship to the enablement requirement and accounted for many of the early decisions that upheld blocking patents. For example, the Storrie patent for the improvement to the Thompsons’ shock absorbers in the *Temco* case⁹⁰ was probably within the scope of enablement of the Thompson patent. A person skilled in the art of automotive design would probably have been able to figure out that inserting an additional pivot between the guide for the coiled spring and the leaf spring would prevent the coiled spring from wearing out by rubbing against its casing when the vehicle body was tilted because of weight imbalance within the vehicle. If so, the Storrie patent would have been invalid under the modern nonobviousness standard in section 103, but it might not have been invalid under the invention standard that preceded the adoption of section 103. The Supreme Court did not need to reach the issue of the Storrie patent’s validity, however, because it was not raised by the parties. Instead, the Court simply ruled that “the Storrie patent was really an appropriation of the Thompson patent.”⁹¹

⁸⁹ See *McClain v. Ortmyer*, 141 U.S. 419, 427 (1891) (“The truth is the word [invention] cannot be defined in such a manner as to afford any substantial aid in determining whether a particular device involves an exercise of the inventive faculty or not.”); *Monroe Auto Equip. Co. v. Heckethorn Mfg. & Supply Co.*, 332 F.2d 406, 410 (6th Cir. 1964) (“It is virtually a practical impossibility to define adequately that abstraction which we call invention.”); *Trabon Eng’g Corp. v. Dirkes*, 136 F.2d 24, 27 (6th Cir. 1943) (“Long experience with assailed inventions in trial and on review led us in humility to the conclusion that the inventive concept is an abstraction impossible to define. . . .”); *Picard v. United Aircraft Corp.*, 128 F.2d 632, 639 (2d Cir. 1942) (“ ‘Invention,’ for patent purposes, has been difficult to define. Efforts to cage the concept in words have proved almost as unsuccessful as attempts verbally to imprison the concept ‘beautiful.’ ”); *Warren Telechron Co. v. Waltham Watch Co.*, 91 F.2d 472, 473 (1st Cir. 1937) (“The quality which constitutes invention is indefinable, as has often been said. . . . It is a matter of feeling rather than of logic.”).

⁹⁰ *Temco Elec. Motor Co. v. Apco Mfg. Co.*, 275 U.S. 319 (1928).

⁹¹ *Id.* at 328.

In contrast, the modern standard for nonobviousness in section 103 is directly tied to the knowledge of a person having ordinary skill in the art. In order for a patent on an improvement to meet the nonobviousness requirement, the improvement must not have been obvious to a person having ordinary skill in the art at the time of its invention. Since a person having ordinary skill in the art is presumed to have known of the specification for the original invention,⁹² if the improvement was nonobvious, then the specification could not have enabled the person of ordinary skill to practice the original invention, and therefore, the improvement could not be within the scope of the original patent. Thus, it would appear that the adoption of section 103 in 1952 has eliminated the possibility of blocking patents for improvements.

There are several qualifications to this conclusion, however. The first relates to the doctrine of equivalents, which may expand the scope of a patent beyond the literal scope of its claims. The second relates to the timing of enablement, which allows a patentee to dominate future developments with a broad claim to a genus that has a species, which is enabled at the time of filing, and also includes species that are not developed until later. Another relates to the differing scope of claims for machines, manufactures, and compositions of matter than for processes for making or using machines, manufactures, and compositions of matter.⁹³

The doctrine of equivalents arose to prevent a fraud on a patent by a copyist making insubstantial changes to a patented invention to take it outside of the literal scope of its claims.⁹⁴

⁹² See, e.g., *In re GPAC Inc.*, 57 F.3d 1573, 1579 (Fed. Cir. 1995) (“The person of ordinary skill in the art is a hypothetical person who is presumed to know the relevant prior art.”); *Kimberly-Clark Corp. v. Johnson & Johnson*, 745 F.2d 1437, 1453 (Fed. Cir. 1985) (“[I]t is the *hypothetical person of ordinary skill in the art* who is referred to in § 103 of the 1952 Patent Act who must be presumed to have, or is charged with having, knowledge of all material prior art.”) (emphasis in original).

⁹³ For a discussion of this last qualification, see *infra* text accompanying notes 237-244.

⁹⁴ See *Graver Tank & Mfg. Co. v. Linde Air Prods. Co.*, 339 U.S. 605, 607 (1950).

A device is infringing under the doctrine of equivalents if it “performs substantially the same function in substantially the same way to obtain the same result” as a patented invention even though the device and patented invention may “differ in name, form, or shape.”⁹⁵ “An important factor” in determining equivalency “is whether persons reasonably skilled in the art would have known of the interchangeability of an ingredient not contained in the patent with one that was.”⁹⁶

Even with the doctrine of equivalents, though, the scope of patent protection for an original invention generally should not extend to cover nonobvious improvements. The purpose of the doctrine of equivalents is to cover insignificant modifications of the original invention that do not substantially affect its function or the way the invention as modified accomplishes its results. Generally, an improvement based upon such changes would be obvious to persons of skill in the art and would therefore not qualify for a patent. For example, in finding that the defendant’s substitution of manganese for magnesium in the patented welding flux was infringing under the doctrine of equivalents in *Graver Tank & Manufacturing Co. v. Linde Air Products Co.*,⁹⁷ the Court emphasized that persons familiar with welding fluxes were aware, and the chemical literature confirmed, that manganese could be substituted for magnesium in welding fluxes.⁹⁸ It is therefore inconceivable that the defendant in *Graver Tank* could have obtained a patent for a welding flux with manganese that would have satisfied the nonobviousness requirement.

⁹⁵ *Id.* at 608 (quoting *Union Paper-Bag Mach. Co. v. Murphy*, 97 U.S. 120, 125 (1877)).

⁹⁶ *Id.* at 609 (quoted in *Warner-Jenkinson Co. v. Hilton Davis Chem. Co.*, 520 U.S. 17, 25 (1997)).

⁹⁷ 339 U.S. 605 (1950).

⁹⁸ *Id.* at 612.

The doctrine of equivalents may extend the scope of patent protection, however, to cover not only unclaimed variations of an original invention that were well known at the time the patent was filed, such as the welding flux in *Graver Tank*, but also after-arising technologies.⁹⁹ Although after-arising technologies may not be within the present grasp of persons of ordinary skill in the art, persons of ordinary skill in the art may have the capability of adapting present inventions to after-arising technologies when they eventually come on-line.

For example, the Federal Circuit upheld claims to reach after-arising technology in *Superguide Corp. v. DirectTV Enterprises, Inc.*¹⁰⁰ The claims in issue were for interactive program guides for televisions that allowed viewers to search through a large volume of broadcasted television information without having to wait for the information to scroll down to them on their television screens. The claims involved mixing “regularly received television signals” with search instructions from television viewers through a remote control system and a microprocessor.¹⁰¹ The claims did not specify whether the television signals were in analog or digital format, but the trial court ruled that the claims were limited to analog television signals, because analog television signals were the only type of television signals that were broadcast at

⁹⁹ See *Smithkline Beecham Corp. v. Excel Pharmaceuticals, Inc.*, 356 F.3d 1357, 1364 (Fed. Cir. 2000) (designating after-arising technologies as “the quintessential example of an enforceable equivalent”).

¹⁰⁰ 358 F.3d 870 (Fed. Cir. 2004). For additional decisions stating that claims may cover after-arising technology, see *Innogenetics, N.V. v Abbott Labs.*, 512 F.3d 1363, 1371 (Fed. Cir. 2008) (“Our case law allows for after-arising technology to be captured within the literal scope of valid claims that are drafted broadly enough.”); *Board of Trustees of Leland Stanford Junior Univ. v. Roche Molecular Sys., Inc.*, 528 F.Supp.2d 967, 981 (N.D. Cal. 2007) (“The claims can therefore be construed to cover later developed technology that was unavailable but known at the time of the invention.”). See also *Laser Alignment, Inc. v. Woodruff & Sons, Inc.*, 491 F.2d 866, 873 (7th Cir. 1974) (patent for using a narrow collimated beam of light to lay sewer pipe was infringed by a device that used a laser even though lasers did not exist when the patent application was filed).

¹⁰¹ 358 F.3d at 875-76.

the time the patent was filed.¹⁰² The Federal Circuit reversed, giving the claims a broad construction that included both analog and digital signals, combinations of them, and even signals in other formats. The Federal Circuit observed that although analog was the dominant format for television signals at the time of filing, persons of skill in the art were aware then that video data could be communicated in either analog or digital format.¹⁰³ While the *Superguide* decision was concerned with claim interpretation and did not expressly address enablement, it would seem that the enablement requirement would also have been satisfied, since the specification would have enabled persons of ordinary skill in the art to adapt the invention to a digital format.

In an analogous manner, in *Hughes Aircraft Co. v. United States*,¹⁰⁴ the Federal Circuit ruled that a patent for an apparatus for controlling the velocity and orientation of a satellite was infringed under the doctrine of equivalents. The claims stated that the apparatus included means for sending data of the satellite's location and orientation to an external source and means for receiving control signals from the external source to alter the satellite's velocity and orientation. At the time of filing of the patent application, computers were too large to be placed on satellites. Nevertheless, the Federal Circuit held that a satellite using a later developed on-board computer for controlling the satellite's velocity and orientation was infringing, because it performed "the same function in substantially the same way to obtain the same result" as the apparatus described

¹⁰² *Id.* at 876-77.

¹⁰³ *Id.* at 879. The specification also did not differentiate between analog and digital signals, but instead referred to regular received television signals as "video data." *Id.*

¹⁰⁴ 717 F.2d 1351 (Fed. Cir. 1983).

in the patent.¹⁰⁵ The Federal Circuit noted that once on-board computers became available, any intelligent engineer could adapt the apparatus described in the patent to using them for controlling the satellite.¹⁰⁶ The improvement of using an on-board computer in the original patent would not have been patentable, because the improvement would have been obvious to a person of ordinary skill in the art once on-board computers became available, and therefore, there could not be blocking patents between the original invention and the improvement.

Thus, even though the doctrine of equivalents permits a finding of infringement beyond the scope of a patent's claims, it will not provide an opportunity for blocking patents to arise because improvements within the range of the doctrine of equivalents will not be patentable. The range of the doctrine of equivalents is limited to variations that must perform the same function in substantially the same way to obtain the same result, and even with respect to after-arising technology, these variations would be obvious to persons of ordinary skill in the art.¹⁰⁷

The second qualification to the conclusion that blocking patents for improvements are no longer possible on account of the nonobviousness requirement involves the timing of

¹⁰⁵ *Id.* at 1365. *See also* Datascope Corp. v. SMEC, Inc., 776 F.2d 320, 326 (Fed. Cir. 1985) (“ [A]n embellishment” made possible by technological advances may not permit an accused device to escape ‘the web of infringement.’ ”).

¹⁰⁶ *Id.* at 1364-65.

¹⁰⁷ The Federal Circuit ruled in *Atlas Powder Co. v. E.I. du Pont De Nemours & Co.*, 750 F.2d 1569, 1581 (Fed. Cir. 2000): “It is not a requirement of equivalence, however, that those skilled in the art know of the equivalence when the patent application is filed or the patent issues. That question is determined as of the time infringement takes place.” The court did not suggest, however, that an improvement within the range of the doctrine of equivalents would satisfy the nonobviousness requirement for patentability at the time that the improvement was first developed. Its ruling only addressed whether the improvement would have been known to those skilled in the art at the times that the patent was filed and issued.

enablement.¹⁰⁸ A series of cases have held that the enablement requirement will be satisfied with respect to species that are within the scope of a claim to a genus, if the species were unknown at the time of the filing of a patent application, and the specification enabled all the species in the genus that were known at the time of filing.¹⁰⁹ These cases produced the paradigm example of blocking patents in recent times. They arose out of the invention of crystalline polypropylene in the early 1950's and the epic litigation that came in its wake. The next section examines the polypropylene litigation and the paradoxical principle¹¹⁰ that permits unknown species within a genus to be deemed enabled even though the patent's specification does not enable a person of ordinary skill in the art to find them.

IV. The Polypropylene Litigation

Polypropylene is one of the three most widely used plastics.¹¹¹ Approximately 41.5 million metric tons of polypropylene are produced annually worldwide with an estimated value of \$66 billion.¹¹² The United States consumes 16% of the world's supply and has the second

¹⁰⁸ See Hugh McTavish, *Enabling Genus Patent Claims to DNA*, 2 MINN. INTELL. PROP. REV. 121, 139 n.118 (2001) (“Blocking patents arise because of point [sic] in time at which enablement is judged.”), available at <http://mipr.unm.edu/archive/v2n1/mctavish.pdf>.

¹⁰⁹ *United States Steel Corp. v. Phillips Petroleum Co.*, 865 F.2d 1247 (Fed. Cir. 1989); *Standard Oil v. Montedison S.p.A.*, 664 F.2d 356 (3rd Cir. 1981); *Application of Hogan*, 559 F.2d 595 (C.C.P.A. 1977); *Phillips Petroleum Corp. v. United States Steel Corp.*, 673 F. Supp. 1278 (D. Del. 1987); *Standard Oil v. Montedison S.p.A.*, 494 F. Supp. 370 (D. Del. 1980).

¹¹⁰ See ROBERT P. MERGES & JOHN F. DUFFY, *PATENT LAW AND POLICY: CASES AND MATERIALS* 295 (4th ed. 2007) (discussing “enablement and the temporal paradox”).

¹¹¹ CHARLES E. CARRAHER JR., *INTRODUCTION TO POLYMER CHEMISTRY* 199 (2007). The others are polyethylene and polyvinyl chloride. *Id.* at 12. See also *Phillips Petroleum Corp. v. United States Steel Corp.*, 673 F. Supp. 1278, 1317 (D. Del. 1987) (“Crystalline polypropylene is one of the most widely used chemical compositions in commerce today.”).

¹¹² Andrea Borruso, *SEPTEMBER 2007 PLASTICS AND RESINS BY THE CHEMICAL ECONOMICS HANDBOOK-SRI, CONSULTING CEH MARKETING RESEARCH REPORT*

largest share of the market after China.¹¹³ Its many desirable properties account for the large amount of its production. Polypropylene is not only inexpensive but it is also rugged, fairly lightweight, easily molded, translucent, retains its shape after being deformed, resistant to many chemical solvents and acids, and has a relatively high melting point compared to other plastics of around 320° F. Polypropylene has its own resin identification code for recycling:



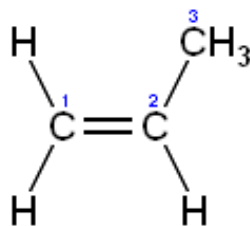
Like other plastics, polypropylene is made up of large chain-like molecules called polymers, which are formed by bonding together many (poly is derived from the Greek word for many) smaller molecules called monomers. Polypropylene is formed from molecules of propylene, which is a colorless odorless gas that is highly flammable and an asphyxiant. Propylene is found in coal gas but is mostly produced during the oil refining process. Although it has some use as a fuel gas and also for producing other chemicals, propylene's primary use today is in producing polypropylene.¹¹⁴ Propylene is composed entirely of carbon (C) and hydrogen (H) atoms, and its chemical formula is C₃H₆.¹¹⁵ The chemical structure for propylene is represented as follows:

POLYPROPYLENE RESINS, *Abstract*, available at <http://www.sriconsulting.com/cgi-bin/search.pl> . This amounts to over 12 pounds for every person on Earth.

¹¹³ *Id.*

¹¹⁴ WIKIPEDIA, THE FREE ENCYCLOPEDIA, *Propene*, at <http://en.wikipedia.org/wiki/Propylene>.

¹¹⁵ Phillips Petroleum Corp. v. United States Steel Corp., 673 F. Supp. 1278, 1284-85 (D. Del. 1987).

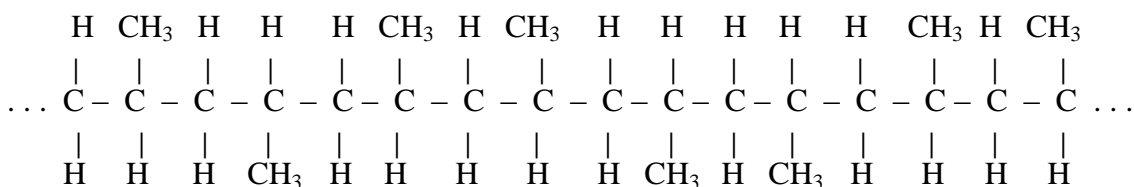


Propylene Structure

The double line between the carbon atoms (labeled 1 and 2) represents a double bond, while the single lines between the other parts of the structure represent single bonds. The unit labeled CH₃ is called a methyl group (CH₄ is methane), and like the hydrogen atoms, the methyl group has a single bond with a carbon atom. Double bonds are more reactive than single bonds, and so chemical reactions are more likely to occur in molecules with double bonds.¹¹⁶

Polymerization of propylene to form polypropylene is accomplished by replacing the double bond between the carbon atoms with a single bond between them and a released bond which may then attach to other molecular units to form a polymer chain as shown below.

Usually, a catalyst is used to induce the chemical reactions for the formation of polymers.

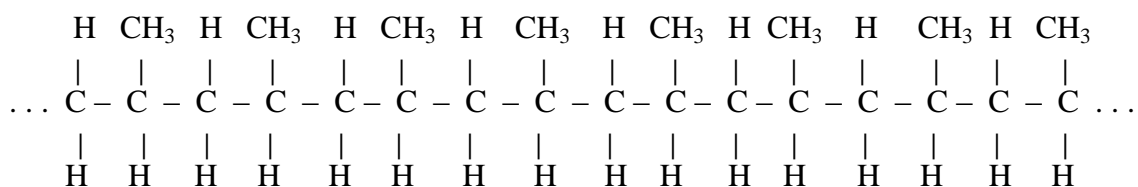


Atactic Polypropylene

¹¹⁶ *Id.* at 1285.

It should be noted that every two carbon atoms in the chain have three hydrogen atoms and one methyl group attached to them so that together they form C₃H₆. In addition, some of the methyl groups lie above the central carbon chain, while some of them are below the chain. Molecules of polypropylene in which the methyl groups are randomly arranged above and below the carbon chain are called atactic polypropylene.¹¹⁷ Prior to the early 1950's, the only form of polypropylene that had been produced was amorphous polypropylene, which is formed from atactic molecules of polypropylene.¹¹⁸ Amorphous polypropylene is a liquid at room temperature,¹¹⁹ and therefore does not exhibit the useful qualities of polypropylene as we know it today.

In isotactic polypropylene all the methyl groups are arranged on the same side of the central carbon atom chain, as shown below. Formation of isotactic polypropylene is achieved through the use of particular catalysts that control the orientation of the propylene molecules as they are lined up in the polymer chain. With all the methyl groups on the same side of the



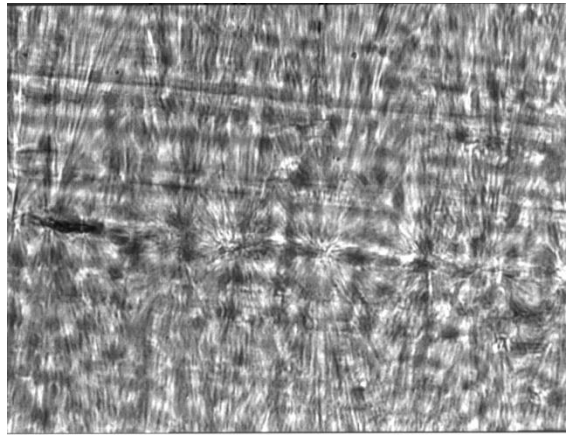
Isotactic Polypropylene

¹¹⁷ The terms “atactic” and “isotactic” originated with Giulio Natta’s wife, Rosita Natta, who happened to be a language scholar and semanticist. Karl Ziegler, *Consequences and Development of an Invention*, 12, *Nobel Lecture* (1963), available at http://nobelprize.org/nobel_prizes/chemistry/laureates/1963/ziegler-lecture.pdf ; FRANK M. McMILLAN, *THE CHAIN STRAIGHTENERS* 127 (1979).

¹¹⁸ *Id.* at 1287, 1316. The amorphous polypropylene was also tree-branched, rather than arranged in a linear chain. *Id.*

¹¹⁹ *Standard Oil v. Montedison S.p.A.*, 494 F. Supp. 370, 416 (D. Del. 1980).

central carbon chain, the molecules coil up into helices and then the molecules are able to form crystals as shown in the microphotograph of crystalline polypropylene below.¹²⁰ When the crystals form, the polypropylene molecules pack together into a tight, regular array called a crystal lattice.



Microphotograph of Polypropylene

The formation of the crystal lattice has a profound effect on the physical properties of the polypropylene.¹²¹ The ordered arrangement of the crystal lattice causes the polypropylene to become a solid up to its melting point of 320° F and imparts strength to the material. The attractive forces in the crystal lattice also make the polypropylene impervious to solvents and acids that would otherwise cause it to dissolve.¹²²

The synthesis of crystalline polypropylene was a major scientific achievement. The discovery is described in the *Encyclopedia Britannica* as follows:

¹²⁰ WIKIPEDIA, THE FREE ENCYCLOPEDIA, *Propene*, at <http://en.wikipedia.org/wiki/Propylene>.

¹²¹ Phillips Petroleum Corp. v. United States Steel Corp., 673 F. Supp. 1278, 1286 (D. Del. 1987).

¹²² *Id.*

It is generally accepted that isotactic polypropylene was discovered in 1954 by the Italian chemist Giulio Natta and his assistant Paolo Chini, working in association with Montecatini (now Montedison SpA) and employing catalysts of the type recently invented by Karl Ziegler for synthesizing polyethylene. (Partly in recognition of this achievement, Natta was awarded the Nobel Prize for Chemistry in 1963 along with Ziegler.)¹²³

Karl Ziegler was a prominent German professor who was the director of the Max Planck Institute for Coal Research in Mülheim, Germany.¹²⁴ After two decades of research on organic compounds of metals, Professor Ziegler discovered during World War II an Aufbau (“growth”) reaction in which a particular metal-organic compound induced the growth of linear chains of ethylene molecules.¹²⁵ This research eventually led to his synthesis of polyethylene, another major plastic, in 1953.¹²⁶

Giulio Natta was professor and director of the Department of Industrial Chemistry at the Milan Polytechnic, and his area of research was in hydrocarbon chemistry. After hearing a lecture by Professor Ziegler in 1952, Professor Natta realized that the catalysts that Ziegler had discovered could be used to produce linear chains from other organic compounds.¹²⁷ Natta arranged with the Montecatini Chemical Company, Italy’s largest chemical company, to invite

¹²³ ENCYCLOPEDIA BRITANNICA, *Industrial Polymers, Major*, 315 (2007). See also WIKIPEDIA, THE FREE ENCYCLOPEDIA, *Polypropylene*, available at <http://en.wikipedia.org/wiki/Polypropylene> (“Polypropylene was first polymerized on March 11 1954 by Giulio Natta.”).

¹²⁴ NOBEL LECTURES, CHEMISTRY 1963-1970, *Karl Ziegler, Biography*, available at http://nobelprize.org/nobel_prizes/chemistry/laureates/1963/ziegler-bio.html.

¹²⁵ FRANK M. McMILLAN, THE CHAIN STRAIGHTENERS 38-39 (1979); PETER J.T. MORRIS, POLYMER PIONEERS 22, 79 (1986).

¹²⁶ Professor Zeigler drafted his own patent application for producing polyethylene, entitled “Process of the Polymerization of Ehylene,” and he filed it with the German Patent Office on November 17, 1953. HEINZ MARTIN, POLYMERS, PATENTS, PROFITS 14 (2007).

¹²⁷ PETER J.T. MORRIS, POLYMER PIONEERS 82 (1986); Giulio Natta, *From the Stereospecific Polymerization to the Asymmetric Autocatalytic Synthesis of Macromolecules*, 28, Noble Lecture (1963), available at http://nobelprize.org/nobel_prizes/chemistry/laureates/1963/natta-lecture.pdf.

Ziegler to a meeting in Milan to discuss his research, and that meeting led to an agreement in which Montecatini purchased rights for the commercial development of Ziegler's research in Italy and Natta was given access to Ziegler's research. The research and licensing agreement between Ziegler and Montecatini also provided for three of Natta's research assistants (nicknamed the "Three Bright Boys") to visit Ziegler's laboratory in Mülheim, Germany beginning in February, 1953.¹²⁸ Natta's research assistants followed the synthesis of polyethylene in Professor Zeigler's laboratory in 1953.¹²⁹

Paolo Chini was one of these research assistants. After returning to Milan, he repeated certain of the experiments that Zeigler had described in his German patent, and he was struck by the ease with which he was able to polymerize ethylene using a particular mixture of catalysts (which are now known as the Zeigler-Natta catalysts).¹³⁰ On March 11, 1954, Natta instructed Mr. Chini to use the same catalysts with propylene, and Mr. Chini reported that he had produced solid polypropylene.¹³¹ Further experiments were conducted in the spring of 1954, and Natta forwarded them to the Patent Department at Montecatini. On June 8, 1954, Montecatini filed a patent application claiming the polymerization of propylene with the Italian Patent Office that named Natta as the sole inventor.¹³² On December 10, 1954, Natta submitted a paper describing

¹²⁸ FRANK M. MCMILLAN, *THE CHAIN STRAIGHTENERS* 38-39 (1979).

¹²⁹ HEINZ MARTIN, *POLYMERS, PATENTS, PROFITS* 13-14 (2007). Professor Zeigler drafted his own patent application, entitled "Process of the Polymerization of Ehylene," and he filed it with the German patent office on November 17, 1953. *Id.* at 14.

¹³⁰ The Zeigler-Natta catalysts are a mixture of various chemicals, which include titanium tetrachloride and triethyl aluminum. WIKIPEDIA, *THE FREE ENCYCLOPEDIA, Ziegler-Natta Catalysts*, available at http://en.wikipedia.org/wiki/Ziegler-Natta_catalyst .

¹³¹ HEINZ MARTIN, *POLYMERS, PATENTS, PROFITS* 21 (2007); FRANK M. MCMILLAN, *THE CHAIN STRAIGHTENERS* 95 (1979).

¹³² HEINZ MARTIN, *POLYMERS, PATENTS, PROFITS* 23 (2007). Professor Zeigler's laboratory produced polypropylene shortly afterwards, and Professor Zeigler sent Professor Natta a sample of it on July 24. Professor Zeigler was shocked to learn a few days later that

his discovery of crystalline polypropylene to the *Journal of the American Chemical Society*, and the paper was published on March 20, 1955.¹³³

Although Zeigler and Natta were the first to synthesize polypropylene, and shared the 1963 Nobel prize for doing so, the Phillips Petroleum Company was awarded a blocking patent in the United States that was given priority over Montecatini's patent.¹³⁴ In 1951, J. Paul Hogan and Robert L. Banks were chemists working in the research laboratory at Phillips Petroleum on converting petroleum gases into gasoline. One of their experiments involved passing propylene through a one inch tube packed with a catalyst to which a chromium salt had been added. The experiment failed because their tube became clogged with a waxy substance.¹³⁵ A similar effect had been observed by chemists at Shell Development Corporation who were trying to develop synthetic rubber during World War II, but the Shell chemists thought the substance they observed was a nuisance, and they abandoned their experiment.¹³⁶ In contrast, Hogan and Banks were able to persuade Phillips' management to allow them to investigate the mysterious

Professor Natta's laboratory had already polymerized propylene. *Id.*; FRANK M. MCMILLAN, THE CHAIN STRAIGHTENERS 104 (1979). A compromise was eventually worked out in which Professor Zeigler and Montecatini divided the licensing royalties from polypropylene 70/30. FRANK M. MCMILLAN, THE CHAIN STRAIGHTENERS 105 (1979).

¹³³ Giulio Natta *et al.*, *Crystalline High Polymers of α -Olefins*, 77 J. AM. CHEM. SOC'Y 1708 (1955); Phillips Petroleum Corp. v. United States Steel Corp., 673 F. Supp. 1278, 1338 (D. Del. 1987).

¹³⁴ PETER J.T. MORRIS, POLYMER PIONEERS 23 (1986) (“[W]hile legal priority for the discovery of stereoregular polypropylene has been granted to Phillips Petroleum, the scientific honors—as evidenced by the joint award of the 1963 Noble Prize—belong to Karl Ziegler and Giulio Natta.”).

¹³⁵ FRANK M. MCMILLAN, THE CHAIN STRAIGHTENERS 69 (1979). Hogan and Banks described the substance as a “heavy waxy polymer” and a “unique solid material” with a “tacky, latex-like nature.” Phillips Petroleum Corp. v. United States Steel Corp., 673 F. Supp. 1278, 1337 (D. Del. 1987).

¹³⁶ FRANK M. MCMILLAN, THE CHAIN STRAIGHTENERS 69-70 (1979).

substance.¹³⁷ Hogan and Banks conducted a series of experiments in their laboratory using a catalyst composed of a support of silica and alumina impregnated with chromium oxide that eventually became known as the Marlex catalyst. On March 14, 1952, they submitted a Disclosure of Invention form to the Phillips Patent Department describing their invention as “a ‘process for the production of propylene polymers’, ‘improved polymer products from propylene, 1-butene and other monoalkylethylenes’ and a ‘new catalyst for polymerization.’”¹³⁸ On November 26, 1952, in response to a request for information from the Patent Department, Hogan provided the characteristics for the solid polypropylene that he had produced:

melting point °F:	240 - 280
density:	0.90 - 0.95
intrinsic viscosity:	0.2 - 1.0
weight average molecular weight:	5,000 - 20,000. ¹³⁹

The Hogan and Banks patent application, entitled “Solid Polymers of Olefins”¹⁴⁰ was filed on January 27, 1953. The application contained the information that Hogan had provided concerning melting point and average molecular weight, but unlike Natta’s patent application, it did not identify the polypropylene as crystalline or describe the mechanism for the formation of isotactic polypropylene in terms of aligning the methyl groups on the same side of the central carbon chain.

¹³⁷ See CHARLES E. CARRAHER JR., INTRODUCTION TO POLYMER CHEMISTRY 199 (2007).

¹³⁸ Phillips Petroleum Corp. v. United States Steel Corp., 673 F. Supp. 1278, 1337 (D. Del. 1987).

¹³⁹ *Id.*

¹⁴⁰ An olefin is an archaic term widely used in the petrochemical industry for alkenes, which are chemical compounds having at least one carbon to carbon double bond. The simplest olefins have the formula (C_nH_{2n}) and include ethylene (C₂H₄), propylene (C₃H₆), and butylene (C₄H₈). WIKIPEDIA, THE FREE ENCYCLOPEDIA, *Alkene*, available at <http://en.wikipedia.org/wiki/Olefin>.

The Assistant Director of Research at Phillips, Dr. William Reynolds, became aware of Natta's article in the *Journal of the American Chemical Society* shortly after its publication. Although the article did not identify the catalysts that Natta used, Reynolds was able to speculate what they were, and he suggested that Phillips should investigate the Ziegler-Natta process. Chemists at Phillips conducted experiments with the Ziegler-Natta catalysts in the spring of 1955, and succeeded in producing crystalline polypropylene in May and June. While these experiments were being conducted, Reynolds observed: "The more I see of the so called Ziegler polymerization the more I am of the opinion that this process represents one of the most basic catalytic process discoveries in many years. The process is undoubtedly far more general and versatile than demonstrated for MARLEX."¹⁴¹ Meanwhile in the summer and fall of 1955, other chemists at Phillips were studying the polypropylene produced with the Marlex catalyst that Hogan and Banks had used. They determined that it was an isotactic polymer, but that it was brittle, because its highest molecular weight was around 30,000, and molecular weights above 50,000 were required for the polypropylene to be flexible.¹⁴²

The Phillips chemists advised the Patent Department of their conclusions and also that others, including Natta, were claiming that they had invented crystalline polypropylene. Phillips then decided to file a new application¹⁴³ in order to provoke an interference¹⁴⁴ so that the United States Patent Office would determine which company had priority for the invention. While

¹⁴¹ Phillips Petroleum Corp. v. United States Steel Corp., 673 F. Supp. 1278, 1339 (D. Del. 1987).

¹⁴² *Id.*

¹⁴³ Under 35 U.S.C. § 120 (2000), an inventor who has previously filed a patent application may file a new application while the first application is pending and obtain the benefit of the filing date of the first application for the new application if it contains a reference to the first application.

¹⁴⁴ Interferences are governed by 35 U.S.C. § 135 (2000).

Phillips thought that its 1953 application did describe crystalline polypropylene, it was concerned that the word “crystalline” did not appear anywhere in the application. And so, on January 11, 1956, Phillips filed its continuation-in-part application¹⁴⁵ in which it included the claim: “Normally solid polypropylene consisting essentially of recurring propylene units, having a substantial crystalline polypropylene content.”¹⁴⁶ The 1956 application differed significantly from the 1953 application. In addition to adding references to crystalline polymers and crystalline polypropylenes, Phillips broadened the ranges of melting points from 240-280 °F to 240-320 °F and the range of weight average molecular weights from 5,000-20,000 to 900-50,000 and higher. In addition, Phillips added four descriptive examples of the invention to the application; the last example called for the use of the Ziegler-Natta catalysts – triethyl aluminum and titanium tetrachloride.¹⁴⁷

On September 9, 1958, the United States Patent Office instituted and declared an interference to authorize the Board of Patent Interferences to determine which of five competing

¹⁴⁵ A continuation-in-part application “may disclose and claim subject matter not disclosed in the prior application.” 35 C.F.R. § 1.53(b)(2) (2008). Any new matter in the continuation-in-part application will not receive the priority date for the original application. *See Augustine Med., Inc. v. Gaymar Indus., Inc.*, 181 F.3d 1291, 1302 (Fed. Cir. 1999):

Subject matter that arises for the first time in the CIP [continuation-in-part] application does not receive the benefit of the filing date of the parent application. . . . Thus, the decision on the proper priority date - the parent application date or the CIP application date - for subject matter claimed in a CIP application depends on when that subject matter first appeared in the patent disclosures. To decide this question, a court must examine whether the “disclosure of the application relied upon reasonably convey[s] to the artisan that the inventor had possession at that time of the later claimed subject matter.”

¹⁴⁶ *Phillips Petroleum Corp. v. United States Steel Corp.*, 673 F. Supp. 1278, 1286 (D. Del. 1987).

¹⁴⁷ *See id.* at 1340.

companies was entitled to priority of invention for crystalline polypropylene.¹⁴⁸ Three decades of massive litigation then ensued. The 1960's were spent "in an incredibly involved program of discovery."¹⁴⁹ Finally, on November 29, 1971, after hearing testimony from 126 witnesses, the Board issued a 113 page decision¹⁵⁰ awarding priority to Montedison for Natta's patent.¹⁵¹ The litigation continued with the three losing parties¹⁵² filing civil actions to challenge the Board's decision. If anything, the litigation seemed to become more acrimonious as the plaintiffs were permitted to amend their complaints to add new charges, which had not been raised in the interference, that Montedison had committed fraud by deliberately misrepresenting and failing to disclose material facts in the filing and prosecution of its patent applications.¹⁵³

After an 85 day trial, the district court issued a 91 page decision awarding priority to Phillips for the invention of crystalline polypropylene.¹⁵⁴ The district court determined the date

¹⁴⁸ Standard Oil Co. v. Montedison, S.p.A., 540 F.2d 611, 613 (3rd Cir. 1976). The five companies were Phillips Petroleum Company, Montedison, S.p.A. (the successor to Montecatini Chemical Company), E. I. DuPont de Nemours & Company, Standard Oil Company and Hercules, Inc. *Id.* at 614. The Board rendered judgment on the issue of priority against Hercules, Inc. on October 9, 1964. *Id.* n.4.

¹⁴⁹ Standard Oil Co. v. Montedison, S.p.A., 398 F. Supp. 420, 423 (D. Del. 1975), *order vacated by*, 540 F.2d 611 (3rd Cir. 1976). The numerous reported decisions included: Montecatini Edison S.p.A. v. E. I. Du Pont de Nemours & Co., 434 F.2d 70 (3d Cir. 1970); Natta v. Zletz, 418 F.2d 633 (7th Cir. 1969); *In re Natta*, 410 F.2d 187 (3d Cir. 1969); Natta v. Zletz, 405 F.2d 99 (7th Cir. 1968); Natta v. Hogan, 392 F.2d 686 (10th Cir. 1968); *In re Natta*, 388 F.2d 215 (3d Cir. 1968); Natta v. Zletz, 379 F.2d 615 (7th Cir. 1967); *In re Hogan*, 309 F. Supp. 945 (D. Del. 1970); *In re Natta*, 48 F.R.D. 319 (D. Del. 1969); *In re Natta*, 264 F. Supp. 734 (D. Del. 1967); *In re Natta*, 259 F. Supp. 922 (D. Del. 1966); and Hogan v. Zletz, 43 F.R.D. 308 (N.D. Okla. 1967).

¹⁵⁰ Standard Oil Co. v. Montedison, S.p.A., 494 F. Supp. 370, 375 (D. Del. 1980).

¹⁵¹ Standard Oil Co. v. Montedison, S.p.A., 540 F.2d 611, 614 (3rd Cir. 1976).

¹⁵² Standard Oil, DuPont and Philips.

¹⁵³ Standard Oil Co. v. Montedison, S.p.A., 431 F. Supp. 1064, 1072 (D. Del. 1977). They were not allowed to add allegations of Montedison's "brainwashing" or exerting improper influence on patent examiners, however. *Id.* at 1071.

¹⁵⁴ Standard Oil Co. v. Montedison, S.p.A., 494 F. Supp. 370 (D. Del. 1980).

of priority for Montedison to be June 8, 1954, which was the date that Natta filed his patent application with the Italian Patent Office. Although Natta did not file his United States patent application until June 8, 1955, the United States patent application related back to the filing of the Italian patent application pursuant to Section 119 of Title 35, because Natta filed the United States patent application within one year of the filing of the Italian patent application.¹⁵⁵

The district court based the date of priority for Phillips on the original filing of the Hogan and Banks patent application on January 27, 1953. While Phillips had abandoned the 1953 patent application when it filed its continuation-in-part application on January 11, 1956, the date of priority for the continuation-in-part application related back to the date of the original patent application under Section 120 of Title 35 with respect to any disclosures made in the original patent application.¹⁵⁶ In order for the 1956 continuation-in-part application to relate back to 1953, though, the 1953 disclosure would have to satisfy the enablement requirement for the invention.¹⁵⁷ The Board of Patent Interferences had rejected the earlier date on the grounds that the 1953 patent application had failed to disclose crystalline polypropylene and had failed to disclose a utility for the material.¹⁵⁸ The district court ruled, however, that the 1953 application satisfied the requirements for the 1956 continuation-in-part application to relate back to 1953,¹⁵⁹

¹⁵⁵ See 35 U.S.C. § 119 (2000).

¹⁵⁶ See 35 U.S.C. § 120 (2000) and *supra* note 143.

¹⁵⁷ See, e.g., *Frazer v. Schlegel*, 498 F.3d 1283, 1287 (Fed. Cir. 2007) (“[W]hen reliance is on a patent document already filed, the question is whether the document discloses the invention of the count by meeting the written description and enablement requirements of 35 U.S.C. § 112 ¶ 1, for a filed application serves as a constructive reduction to practice of its content.”).

¹⁵⁸ *Standard Oil Co. v. Montedison, S.p.A.*, 494 F. Supp. 370, 411 (D. Del. 1980).

¹⁵⁹ *Id.* at 411. The district court stated that the 1953 application was an adequate constructive reduction to practice. This is equivalent to saying that it satisfied the enablement requirement. See *Yasuko Kawai v. Metlesics*, 480 F.2d 880, 866 (C.C.P.A. 1973) (“It goes

because the 1953 application disclosed four experiments that Hogan and Banks had conducted which produced solid propylene polymers with a substantially crystalline polypropylene content.¹⁶⁰

On appeal, the Third Circuit affirmed.¹⁶¹ The appellate court began its analysis with the description of the invention in the interference count: “Normally solid polypropylene, consisting essentially of recurring propylene units, having a substantial crystalline polypropylene content.”¹⁶² It then parsed the phrases in the interference count one at a time. Montedison and the other appellants conceded that the 1953 application disclosed a solid polypropylene, but they challenged whether the polypropylene it disclosed consisted essentially of recurring propylene units and whether the polypropylene had a substantial crystalline content. The 1953 application did not expressly state that the material produced in Hogan and Banks’ experiments consisted of recurring propylene units, but the district court concluded that the application inherently disclosed this. The appellate court decided that this conclusion was supported by expert testimony in the record that a polymer chemist in 1953 would have recognized that polypropylene produced under the conditions of their experiments would consist of essentially recurring propylene units.¹⁶³ Similarly, the appellate court agreed with the district court’s conclusion that the 1953 application inherently disclosed that the polypropylene was crystalline.

without saying that proof of a constructive reduction to practice would also require that the specification be sufficient to enable anyone skilled in the art to make the invention, i. e., the “how to make” requirement of section 112 should also be met by the specification.”). The district also ruled that the 1953 satisfied the utility requirement for patentability because Phillips recognized that its crystalline polypropylene could be used as a wax modifier. 494 F. Supp. at 411.

¹⁶⁰ *Id.* at 412-18.

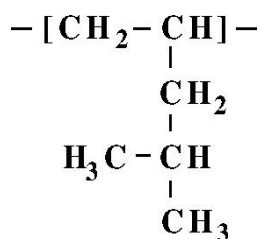
¹⁶¹ *Standard Oil Co. v. Montedison, S.p.A.*, 664 F.2d 356 (3rd Cir. 1981).

¹⁶² *Id.* at 363.

¹⁶³ *Id.* at 365-57.

It ruled that this conclusion was supported by expert testimony that a skilled polymer chemist would have concluded the material was crystalline after reading the information in the disclosure that the material was not soluble in pentane at room temperature as well as the data provided concerning the material's melting temperature, viscosity, density, and molecular weight.¹⁶⁴

While the courts were reviewing the massive interference over the invention of polypropylene, a significant ruling was being made on a related patent. The original patent application included claims for not only polypropylene but also for a solid polymer of another hydrocarbon called 4-methyl-1-pentene (C₆H₁₂), which has the repeating chemical structure shown below. After the action to review the interference was filed in the district court, Phillips



decided to divide the claims for polypropylene and 4-methyl-1-pentene into separate patent applications by filing divisional applications pursuant to Section 121 of Title 35 for the separate inventions.¹⁶⁵ The Patent and Trademark Office (“PTO”) rejected claims 13-15 in the successor to the divisional application for 4-methyl-1-pentene.¹⁶⁶ Claim 13 was for “[a] normally solid homopolymer of 4-methyl-1-pentene,” and claims 14 and 15 were narrower dependent claims that incorporated claim 13 by reference.¹⁶⁷ Among the grounds that the patent examiner gave for rejecting the claims was that the claims for the polymer were broader than the scope of

¹⁶⁴ *Id.* at 367-71.

¹⁶⁵ Application of Hogan, 559 F.2d 595, 597 n.3 (C.C.P.A. 1977).

¹⁶⁶ After filing the divisional application in 1967, Phillips filed a continuation application to the divisional in 1971. *Id.* at 597. The rejected claims were actually in the 1971 continuation application, rather than the 1967 divisional application.

¹⁶⁷ *See id.* at 597-98.

enablement, because they included other species of the polymer that were the subjects of subsequent patents.¹⁶⁸ The Board of Patent Appeals affirmed the PTO's rejection of the claims. Among the reasons given by the Board was that the disclosure in the original 1953 Hogan and Banks application was not enabling, because the disclosure was limited to making crystalline polymers but the claims the Board was rejecting “ ‘encompasse[d] an amorphous polymer as well, which is manifestly outside the scope of the enabling teaching present in the case.’ ”¹⁶⁹

On appeal to the Court of Custom and Patent Appeals,¹⁷⁰ the court reversed the decision of the Board of Patent Appeals. The court ruled that the patent examiner and board erred by considering a later start of the art (*i.e.*, patents filed after the filing of the 1953 application) to decide whether the claims satisfied the enablement requirement.¹⁷¹ The court reasoned:

The PTO has not challenged appellants' assertion that their 1953 application enabled those skilled in the art in 1953 to make and use “a solid polymer” as described in claim 13. Appellants disclosed, as the only then

¹⁶⁸ *Id.* at 600.

¹⁶⁹ *Id.* at 601. The board's decision appears factually incorrect. Amorphous polymers were known in the prior art, and therefore, they did not need to be disclosed to enable a person of ordinary skill in the art to make them. The original 1953 application included references to patents from 1937 and 1945 for processes for producing amorphous polymers (see U.S. Patent No. 2,085,525 (issued Oct. 30, 1945) and No. 2,387,784 (issued June 29, 1937)). In addition, its specification identifies amorphous polymers as the prior art. The specification states:

A further characteristic of polymers according to this invention is that they have relatively high densities as compared with the predominantly amorphous polymers produced by the prior art. Another characteristic of the polymers according to this invention is that they have relatively high melting points in comparison with prior art amorphous polymers.

U.S. Patent No. 4,342,854, col. 1 (issued Aug. 3, 1982).

¹⁷⁰ Prior to the creation of the Court of Appeals for the Federal Circuit in 1984, the Court of Customs and Patent Appeals handled appeals from the Board of Patent Appeals. See *Brenner v. Manson*, 383 U.S. 519, 527 (1966) (“Determinations of the Patent Office may be challenged either by appeal to the CCPA or by suit instituted in the United States District Court for the District of Columbia.”) (describing the process of appellate review before the creation of the Court of Appeals for the Federal Circuit).

¹⁷¹ *Application of Hogan*, 559 F.2d 595, 604-05 (C.C.P.A. 1977).

existing way to make such a polymer, a method of making the crystalline form. To now say that appellants should have disclosed in 1953 the amorphous form which on this record did not exist until 1962, would be to impose an impossible burden on inventors and thus on the patent system. There cannot, in an effective patent system, be such a burden placed on the right to broad claims. To restrict appellants to the crystalline form disclosed, under such circumstances, would be a poor way to stimulate invention, and particularly to encourage its early disclosure. To demand such restriction is merely to state a policy against broad protection for pioneer inventions, a policy both shortsighted and unsound from the standpoint of promoting progress in the useful arts, the constitutional purpose of the patent laws.¹⁷²

The court appears to have envisioned the situation that claim 13 for a solid polymer covered two forms for it: a crystalline form that was enabled by the specification of the 1953 application and an amorphous form that was not enabled because it was discovered later.¹⁷³ Since it seemed to the court that the amorphous form did not exist at the time of the patent application, the patentee could not have been expected to claim the amorphous form at that time.

The circumstances thus were distinguishable from those in *Consolidated Electric Light Co. v. McKeesport Light Co.*,¹⁷⁴ because the patentees in the latter case were aware when they filed their application that some types of carbon made from vegetable fibrous materials would not work in their invention as well as the carbonized paper that they described in the specification and also that there were other vegetable fibrous materials that they had not tested. In the *Consolidated Electric Light Co.* case, the broad claim for carbon made from a vegetable fibrous material did not satisfy the enablement requirement under the state of the art as that was known at the time of the filing of the patent application. In contrast, under the court's view of

¹⁷² *Id.* at 606.

¹⁷³ As pointed out *supra* note 169, however, the amorphous forms of polymers were the prior art in 1953. Consequently, the amorphous form of 4-methyl-1-pentene did not have to be disclosed in the specification. It was disclosed in the references in the 1953 application, though. Thus, the court appears to have been mistaken as to the state of the art in 1953. This does not affect the authoritativeness of its decision as precedent, however.

¹⁷⁴ 159 U.S. 465 (1895).

the circumstances in the *Hogan* case, the broad claim for a solid polymer did satisfy the enablement requirement under the state of the art as that was known at the time of the filing of the patent application, because the amorphous form was not known at that time. It is not clear, however, why this distinction should make a difference. While Phillips may not have known that there was any difference between a claim for a solid polymer and a crystalline form for a solid polymer, because the existence of an amorphous polymer was not known at that time under the court's view of the state of the art in 1953, Phillips could have limited its claim to the crystalline form for the solid polymer, if that is what it disclosed in the specification.

The *Hogan* decision continued:

Consideration of a later existing state of the art in testing for compliance with § 112, first paragraph, would not only preclude the grant of broad claims, but would wreak havoc in other ways as well. The use of a subsequently-existing improvement to show lack of enablement in an earlier-filed application on the basic invention would preclude issuance of a patent to the inventor of the thing improved, and in the case of issued patents, would invalidate all claims (even some "picture claims") therein. Patents are and should be granted to later inventors upon unobvious improvements. Indeed, encouragement of improvements on prior inventions is a major contribution of the patent system and the vast majority of patents are issued on improvements. It is quite another thing, however, to utilize the patenting or publication of later existing improvements to "reach back" and preclude or invalidate a patent on the underlying invention.¹⁷⁵

The references to "broad claims" in this and the previously quoted paragraph suggest approval of Professor Kitch's prospect theory of patents.¹⁷⁶ The court did not explain, however, why restricting the scope of protection to the disclosure in the specification "would be a poor way to stimulate invention, and particularly to encourage its early disclosure."¹⁷⁷ As the concurring opinion by Judge Miller pointed out, the majority's decision to extend the scope of protection to

¹⁷⁵ *Hogan*, 559 F.2d at 606.

¹⁷⁶ See *supra* text accompanying notes 18-19.

¹⁷⁷ *Hogan*, 559 F.2d at 606.

future technology would arguably impede rather than advance progress. Judge Miller explained that the effect of the majority's decision was to relegate future inventions to a subservient position with respect to the original invention merely because the inventor used a term that the inventor thought was limited to a single species, but later turned out to have a broader meaning.¹⁷⁸ In addition, the court did not explain why patent protection should extend to forms of materials that are unknown at the time of the filing of a patent, but not to any other forms of materials that a patentee might want to claim under a prospect theory of patents.

Next, the court addressed concerns with invalidating a patent on enablement grounds because of the subsequent discovery of a product that it did not enable:

If applications were to be tested for enablement under § 112 in the light of a later existing state of the art, the question would arise over how much later. An examiner could never safely call a halt and pass an application to issue. One who had slavishly copied the disclosed and claimed invention of a patent issued in 1965, for example, could resist an infringement action by insisting that a court hold the patent invalid because it was not enabling with respect to some third product which first came into existence, and thus came within the purview of the claim, in 1975.

The answer to this concern is that if future developments caused a claim to be overbroad, the patentee could obtain reissuance of the patent under Section 251 and restrict the claim to the scope of enablement.¹⁷⁹

¹⁷⁸ *Id.* at 610 (Miller, J., concurring).

¹⁷⁹ *See* 35 U.S.C. § 251 (2000):

Whenever any patent is, through error without any deceptive intention, deemed wholly or partly inoperative or invalid, . . . by reason of the patentee claiming more or less than he had a right to claim in the patent, the Director shall, . . . reissue the patent for the invention disclosed in the original patent, . . . for the unexpired part of the term of the original patent.

See also O'Reilly v. Morse, 56 U.S. (15 How.) 62, 121 (1853) (permitting patentee to disclaim claim that did not satisfy the enablement requirement).

Lastly, the court responded to the PTO's concern about the possibility of subsequent infringement actions against later inventors as follows:

The PTO position, that claim 13 is of sufficient breadth to cover the later state of the art (amorphous polymers) shown in the "references," reflects a concern that allowance of claim 13 might lead to enforcement efforts against the later developers. Any such conjecture, if it exists, is both irrelevant and unwarranted. The business of the PTO is patentability, not infringement. Like the judicially-developed doctrine of equivalents, designed to protect the patentee with respect to later-developed variations of the claimed invention, the judicially-developed "reverse doctrine of equivalents," requiring interpretation of claims in light of the specification, may be safely relied upon to preclude *improper* enforcement against later developers. The courts have consistently considered subsequently existing states of the art as raising questions of infringement, but never of validity. It is, of course, a major and infinitely important function of the PTO to insure that those skilled in the art are enabled, as of the filing date, to practice the invention claimed. If, in the light of all proper evidence, the invention claimed be clearly enabled as of that date, the inquiry under § 112, first paragraph, is at an end.¹⁸⁰

In his concurring opinion, Judge Miller characterized the majority as applying a double standard by interpreting claims in light of the state of the art at the time of filing for purposes of enablement, but interpreting them in light of the later state of the art for purposes of infringement. He urged that instead of employing a double standard, the PTO should simply interpret the claims in light of the state of the art at the time of filing to determine whether they satisfy the enablement requirement. Judge Miller reasoned that in the case of a claim for a solid homopolymer, if a person of ordinary skill in the art at the time of filing would have interpreted it to include both amorphous and crystalline forms, and only the crystalline form was enabled, then the claim should be rejected for extending beyond the scope of enablement. On the other hand, if a person of ordinary skill in the art would have interpreted the claim to include only the crystalline form, the claim should be allowed and limited to the crystalline form.¹⁸¹

¹⁸⁰ *Hogan*, 559 F.2d at 607 (footnotes omitted, emphasis in original).

¹⁸¹ *Id.* at 610-11 (Miller, J., concurring).

The majority's reliance on the reverse doctrine of equivalents to protect later developers from "improper enforcement"¹⁸² is problematic. The reverse doctrine of equivalents arose in case law as a defense to an infringement action where a device came within the literal scope of a claim, but it was "so far changed in principle from a patented article that it perform[ed] the same or a similar function in a substantially different way."¹⁸³ The Federal Circuit has described this defense, however, as an "anachronistic exception, long mentioned but rarely applied," and it has never affirmed a decision in which the defense had succeeded at trial.¹⁸⁴ Moreover, the courts have not demarcated the limits of this defense clearly, if it actually still exists. Consequently, later developers cannot expect the same protection from the reverse doctrine of equivalents as they could expect from rigorous enforcement of the enablement requirement to limit the scope of claims to the disclosure in the specification as understood by a person of ordinary skill in the art.

The Court of Customs and Patent Appeals relied on the *Hogan* decision three years later in *Application of Koller*.¹⁸⁵ In *Koller*, the patent examiner rejected a claim for a process of producing a desired chemical from a precursor chemical in which one of the steps involved mixing the precursor chemical with metal salts in a "liquid medium." Whether the claim was valid depended upon its priority date, and this issue turned on whether the patent application related back to the filing of the grandparent application, which also referred to mixing in a "liquid medium." The patent examiner based the claim's rejection on the failure of the disclosure to enable a person of ordinary skill in the art to use solvents that were not miscible

¹⁸² *Id.* at 607 (emphasis in original).

¹⁸³ *Graver Tank & Mfg. Co. v. Linde Air Prods. Co.*, 339 U.S. 605, 608 (1950).

¹⁸⁴ *Roche Palo Alto LLC v. Apotex, Inc.*, --- F.3d ----, 2008 WL 2669287 *4 (Fed. Cir.); *Tate Access Floors, Inc. v. Interface Architectural Resources, Inc.*, 279 F.3d 1357, 1368 (Fed. Cir. 2002).

¹⁸⁵ 613 F.2d 819 (Fed. Cir. 1980).

(i.e., capable of being mixed to form a single homogeneous substance) with water at the time the grandparent application was filed.¹⁸⁶ The court decided that the case paralleled *Hogan* because at the time the grandparent application was filed, a person of ordinary skill in the art would not have recognized that solvents which were not miscible with water would be suitable for the patented process. Therefore, such a person would not have included them within the scope of the term “liquid medium.” Consequently, under *Hogan*, the enablement requirement was satisfied, because the disclosure enabled mixing with the only types of solvents that were recognized at the time—*i.e.*, solvents that would mix with water.¹⁸⁷ Consequently, the court reversed the decision of the Board of Appeals to affirm the examiner’s rejection of the claim.

After the Third Circuit’s decision on the polypropylene interference proceeding, the Hogan and Banks patent issued on March 15, 1983, over 27 years after the application was filed, and the enforcement phase of the litigation began. Phillips filed infringement actions against a number of companies. After settling the infringement actions with Phillips, the infringement defendants filed an action against Phillips seeking declaratory relief that the Hogan and Banks patent was invalid, not infringed and unenforceable.¹⁸⁸ In an 81 page opinion, the district court held that the patent was valid and infringed.

On the issue of enablement, the court observed that the infringement defendants did not dispute that the 1953 application enabled a person of ordinary skill in the art to make polypropylene that satisfied all the elements of its single claim: “Normally solid polypropylene consisting essentially of recurring propylene units, having a substantial crystalline polypropylene

¹⁸⁶ *Id.* at 821-22.

¹⁸⁷ *Id.* at 824.

¹⁸⁸ *Phillips Petroleum Corp. v. United States Steel Corp.*, 673 F. Supp. 1278, 1283 (D. Del. 1987). The declaratory relief action was consolidated with the original infringement actions against Hercules, Inc. and U.S. Steel. *Id.*

content.”¹⁸⁹ The defendants argued, though, that the application did not describe or enable the entire class of compounds that came within the claim. Focusing on the intrinsic viscosity of 0.2 to 1.0 and the weight average molecular weight of 5,000 to 20,000 given in the specification,¹⁹⁰ the defendants asserted that the application disclosed only polypropylene that was useless as a plastic for commercial applications and “was little more than a low molecular weight, brittle laboratory curiosity.”¹⁹¹ They also contended that the 1953 application did “not enable one to produce the high molecular weight, tough polypropylene of commerce.”¹⁹² Although the district court acknowledged that “some of the market success of crystalline polypropylene can be credited to higher molecular weights not attributable to the Hogan and Banks invention,”¹⁹³ it ruled that the 1953 application satisfied the written description and enablement requirements. It said that the defendants missed the point of the inquiry under section 112, which was to determine whether the *claimed* invention was described and enabled, and that it was not necessary for a patent applicant “to predict every possible variation, improvement or commercial embodiment of his invention.”¹⁹⁴ The court explained that since the claim did not include any limitations regarding intrinsic viscosity or molecular weight, these factors were not relevant to the written description and enablement requirements.¹⁹⁵ It concluded that regardless of whether

¹⁸⁹ *Id.* at 1286, 1292.

¹⁹⁰ *See supra* text accompanying note 139.

¹⁹¹ *Phillips*, 673 F. Supp. at 1290, 1318.

¹⁹² *Id.* at 1292.

¹⁹³ *Id.* at 1318.

¹⁹⁴ *Id.* at 1291, 1292 (emphasis by the court).

¹⁹⁵ *See id.*

the defendants had a superior product to the polypropylene described in the 1953 application, it was still crystalline polypropylene that came within the claims of the patents.¹⁹⁶

On appeal, the Federal Circuit affirmed the district court.¹⁹⁷ The defendants argued that the claim was too broad because it embraced subject matter that lacked an adequate basis in the 1953 application. Relying on the *Hogan* and *Koller* cases, the Federal Circuit rejected the defendants' arguments:

Defendants' misdirected approach here is the same as that improperly relied upon by the PTO in *Hogan*. Defendants do not, as they cannot, argue that the 1953 specification fails to enable one skilled in the art to practice the claimed invention. That the '851 claim may cover a later version of the claimed composition (crystalline polypropylene [sic] with higher intrinsic viscosity and average molecular weight) relates to infringement, not to patentability. To hold differently would, in the words of *Hogan*, "impose an impossible burden on inventors and thus on the patent system."¹⁹⁸

The appellate court continued that the central flaw with the defendants' argument was "that it was directed to a later state of the art."¹⁹⁹ The appellate court also rejected the defendants' argument under the reverse doctrine of equivalents, saying that the defendants provided no legal basis or equitable grounds, and it saw none "for restricting the coverage of the claim to less than its admitted literal scope."²⁰⁰ With the Federal Circuit's decision, more than thirty years of polypropylene litigation came to an end.

¹⁹⁶ *Id.* at 1357.

¹⁹⁷ *United States Steel Corp. v. Phillips Petroleum Co.*, 865 F.2d 1247 (Fed. Cir. 1989).

¹⁹⁸ *Id.* at 1251-52 (citations and footnote omitted).

¹⁹⁹ *Id.* at 1252.

²⁰⁰ *Id.* at 1253.

Even today, most polypropylene is produced using the Zeigler-Natta catalysts.²⁰¹ Because of its high molecular weight, the polypropylene produced with Zeigler-Natta catalysts has the toughness, flexibility, and other desirable characteristics that have made it a success in the marketplace. In contrast, the polypropylene produced with the Marlex catalysts described in the Hogan and Banks patent is brittle and has never been a successful commercial product.²⁰² Also, the synthesis by Hogan and Banks of their crystalline polypropylene in 1953 did not contribute to Natta's discovery in 1954 using the Zeigler-Natta catalysts, because Natta was not aware of Hogan and Banks' work until later. In addition, there is no indication that Hogan and Banks or the other chemists at Phillips understood the mechanism for the production of crystalline polypropylene through the lining up of the methyl groups on the same side of the carbon chain until after Natta's publication of his experimental results and theoretical explanation in the *Journal of the American Chemical Society* in 1955. Moreover, Phillips claimed crystalline polypropylene only after learning of Natta's publication. In spite of all this the Hogan and Banks patent was awarded priority over Natta's patent. Consequently, Phillips was able to collect \$300 million in licensing revenues from polypropylene manufacturers through 1995,²⁰³ even though the manufacturers used the Zeigler-Natta catalysts, instead of the Marlex catalysts described in the 1953 Hogan and Banks application, because the Zeigler-Natta

²⁰¹ HEINZ MARTIN, POLYMERS, PATENTS, PROFITS 31 (2007) ("Up to this day, polypropylene is produced on an industrial scale exclusively with the use of Ziegler catalysts."); WIKIPEDIA, THE FREE ENCYCLOPEDIA, *Polypropylene*, available at <http://en.wikipedia.org/wiki/Polypropylene> ("Most commercially available polypropylene is made with . . . Ziegler-Natta catalysts. . .").

²⁰² Phillips Petroleum Corp. v. United States Steel Corp., 673 F. Supp. 1278, 1318 (D. Del. 1987).

²⁰³ Dana Rohrabacher and Paul Crilly, *The Case for a Strong Patent System*, HARV. J.L. & TECH. 263, 266 (1995).

catalysts produced superior quality polypropylene than could be produced using the Marlex catalysts.

The polypropylene litigation also spawned a peculiar legal precedent for the enablement requirement that made the outcome of the litigation possible. Under this precedent, a patentee may claim a genus that includes unknown species that are discovered in the future if the specification describes and enables all the species that are known at the time of filing the patent application. This result is achieved through what Professors Merges and Duffy characterize as the temporal paradox in which the description and enablement requirements for the genus are determined as of the date of filing the patent, and the patentee gets the benefit of any additions to the genus that are discovered later.²⁰⁴ A line of Federal Circuit decisions from the past several years indicate that this peculiar precedent has been eroded, however. The next section of the article discusses these cases.

V. Recent Federal Circuit Case Law

As discussed previously, the Court of Customs and Patent Appeals held in *Application of Hogan*,²⁰⁵ that a patent application that disclosed and enabled a method of making the crystalline form of a polymer, was entitled to a claim for the method of making a solid polymer, because the only known method for making a solid polymer at the time was the application's method of making the crystalline form. While the Court of Custom and Patent Appeals followed *Hogan* in *Application of Koller* and the Federal Circuit followed it in *United States Steel Corp v. Phillips Petroleum Co.*, the Federal Circuit has limited *Hogan* in *Plant Genetic System, N.V. v. DeKalb*

²⁰⁴ See ROBERT P. MERGES & JOHN F. DUFFY, PATENT LAW AND POLICY: CASES AND MATERIALS 295 (4th ed. 2007).

²⁰⁵ 559 F.2d 595 (C.C.P.A. 1977).

*Genetics Corp.*²⁰⁶ and has virtually eliminated *Hogan*'s effect in *Chiron Corp. v. Genentech, Inc.*²⁰⁷ Since *Chiron*, the Federal Circuit has not referred to *Hogan* in any of its cases that involved claims to a genus where only a single species was enabled.²⁰⁸

The *Plant Genetic System* case was concerned with genetically engineered corn. The plaintiff had a patent for plants that were genetically engineered to resist a type of herbicide that killed other plants by blocking an essential biochemical process in them. The specification provided working examples of tomato, potato, and tobacco plants that were genetically engineered to resist the herbicides. Generally, flowering plants are categorized as either monocotyledons (“monocots” for short), dicotyledons (“dicots”), or polycotyledons (“polycots”), depending on whether they have one, two, or more than two leaves in their initial growth from seeds.²⁰⁹ All of the working examples in the specification were for plants that were dicots, but the claims were not limited to dicots and broadly covered all plants instead. The defendant's accused product was corn that had been genetically engineered to resist the herbicides, which the patent was concerned with, and corn is a monocot. The district court heard extensive testimony on the state of the art of genetic engineering at the time of filing of the patent and found clear and convincing evidence of a “monocot barrier,” which would have prevented a person of ordinary skill in the art from making genetically engineered monocots without undue experimentation.

²⁰⁶ 315 F.3d 1335 (Fed. Cir. 2003).

²⁰⁷ 363 F.3d 1247 (Fed. Cir. 2004).

²⁰⁸ See *Sitrick v. Dreamworks, LLC*, 516 F.3d 993 (Fed. Cir. 2008); *Auto. Techs. Int'l, Inc. v. BMW of N. Am., Inc.*, 501 F.3d 1274 (Fed. Cir. 2007); *Liebel-Flarsheim Co. v. Medrad, Inc.*, 481 F.3d 1371 (Fed. Cir. 2007); *Lizardtech, Inc. v. Earth Resource Mapping, Inc.*, 424 F.3d 1336 (Fed. Cir. 2005).

²⁰⁹ *Plant Genetic Sys., N.V. v. DeKalb Genetics Corp.*, 175 F. Supp. 2d 246, 252 (D. Conn. 2001).

Accordingly, the district court ruled that patent's broad claims were invalid for failure to satisfy the enablement requirement, because they were not limited to dicots.²¹⁰

On appeal, the Federal Circuit affirmed the district court's decision.²¹¹ The patentee argued that *Hogan* required reversal, but the Federal Circuit ruled that *Hogan* did not apply:

We do not read *Hogan* as allowing an inventor to claim what was specifically desired but difficult to obtain at the time the application was filed, unless the patent discloses how to make and use it. In *Hogan*, amorphous propylene [sic], on the record before the court, was not known or in existence when the application was filed. In the present case, however, monocots existed in 1987 and stably-transformed monocot cells were highly desirable. PGS indeed asserts that monocot cells were already being stably transformed. Thus, monocots and stably transformed monocot cells were not an unknown concept that came into existence only after 1987. But stably transformed monocot cells were difficult to produce, and the '236 patent gave no instruction how.²¹²

The court's statement that in *Hogan* "amorphous propylene . . . was not known" is inaccurate for several reasons. First of all, propylene is a gas at room temperature, and therefore, it surely was amorphous, rather than crystalline, and of course, propylene was well known when the 1953 *Hogan* and Banks application was filed.²¹³ If the court was referring to polypropylene, rather than propylene, the court's statement is still incorrect, because *Hogan* dealt with a divisional patent application for 4-methyl-1-pentene, rather than the patent for polypropylene.²¹⁴ Finally, the patent specification in *Hogan* characterized amorphous polymers as prior art, and therefore, they were not unknown at the time the application was filed.²¹⁵ Because of all these factual errors, it is difficult to understand exactly what distinction the *Plant Genetic* court was trying to

²¹⁰ *Id.* at 261-62.

²¹¹ *Plant Genetic Sys. N.V. v. DeKalb Genetics Corp.*, 315 F.3d 1335 (Fed. Cir. 2003).

²¹² *Id.* at 1340.

²¹³ *See supra* note 114 and accompanying text.

²¹⁴ *Hogan*, 559 F.2d at 597.

²¹⁵ *See supra* note 169.

make between *Hogan* and the case before it. Certainly, monocots and stably transformed monocot cells were not an unknown concept in 1987, but neither was “amorphous propylene” (or whatever the *Plant Genetic* court meant to refer to) an unknown concept in 1953. If the *Plant Genetic* court intended to limit the reach of *Hogan* to species that were not only not in existence but unknown even as a concept at the time of filing of a patent application, then *Hogan* would be a very narrow precedent indeed.

The last case in which the Federal Circuit has referred to *Hogan* is *Chiron Corp. v. Genentech, Inc.*²¹⁶ The *Chiron* case involved a patent for an antibody that bound itself to the human antigen associated with breast cancer cells; by binding to the antigen, the antibody facilitated the detection and treatment of breast cancer. The antibody was the subject of an original patent application filed in 1984 and two continuation-in-part applications filed in 1985 and 1986. The first application disclosed a type of antibody called a murine antibody, which was derived from mouse cells by cloning them. Murine antibodies have the disadvantage that they are not suitable for long-term treatment of humans, because they create a risk of an immunological response that can cause toxic shock or even death on account of the antibodies having been derived from animal cells.

Recombinant DNA technology has been used to produce other types of antibodies that include chimeric antibodies and humanized antibodies in which part of the DNA encoding regions come from humans.²¹⁷ Chimeric antibodies and humanized antibodies are more suitable for long-term treatment of humans than murine antibodies, because they have less non-human

²¹⁶ 363 F.3d 1247 (Fed. Cir. 2004).

²¹⁷ Antibodies have primarily two regions: a constant region and a variable region. Both chimeric antibodies and humanized antibodies may have a completely human constant region, but unlike chimeric antibodies, humanized antibodies have a variable region that is partially derived from a human. *Id.* at 1250.

content. The first publication to disclose chimeric antibodies appeared four months after the filing of the first application in 1984, and the first publication to disclose humanized antibodies appeared in 1986.

The two continuation-in-part applications were filed after chimeric antibody technology and humanized antibody technology, respectively, had become known in the biotechnology field. Although neither of the continuation-in-part applications disclosed chimeric or humanized antibodies, they included a broad definition of “antibody,” not found in the 1984 application, which stated that it was “not intended to be limited as regards the source of the antibody or the manner in which it is made.”²¹⁸

When the patent finally issued, Chiron sued Genentech on account of Genentech’s sales of a humanized antibody that was used in the long-term treatment of breast cancer. The case was tried to a jury, which determined that neither the original nor continuation-in-part applications satisfied the written description and enablement requirements with respect to a claim for chimeric or humanized antibodies. The verdict form did not specify which of the two requirements was not satisfied, however.

On appeal, the Federal Circuit broke the enablement requirement into three categories based on the knowledge available at the time of the filing of a patent application. It said that at one end of the spectrum, a patent application preferably should not disclose routine technology that was well known to one of ordinary skill in the art. Citing *Hogan*, the court said that at the other end of the spectrum, a patent application is not required to enable technology that arises after its filing, because that would be impossible. Next, the court said that an enabling disclosure is required only for nascent technology for which a person of ordinary skill in the art

²¹⁸ *Id.* at 1252.

would need instruction from the application to practice the invention.²¹⁹ The court then applied these principles to the three patent applications. It ruled that the 1984 application was outside of the bounds of the enablement requirement, because the technology for making chimeric antibodies did not arise until after the filing of the application. In contrast, by the time of the filing of the 1985 and 1986 continuation-in-part applications, the technology for making chimeric antibodies had become nascent technology. Consequently, the continuation-in-part applications were subject to the enablement requirement, and the court found that substantial evidence supported the jury's decision that their specifications did not enable the claims for chimeric and humanized antibodies without undue experimentation.²²⁰

Although the *Chiron* majority decided that the 1984 application was not subject to the enablement requirement, it nevertheless affirmed the verdict on account of the written description requirement. The court noted that the function of the written description requirement is to ensure that the inventor had possession of the subject matter of the patent when the application was filed, and that the Chiron scientists could not have had possession of chimeric antibodies because they were not developed until later.²²¹ A concurring opinion by Judge Bryson urged that the jury verdict should have been upheld with respect to the original 1984 application as well as the 1985 and 1986 continuation-in-part applications for lack of enablement.²²²

Chiron's ruling with respect to the written description requirement appears to negate the effect of *Hogan* entirely. Whenever it would be impossible for a patent application to enable an

²¹⁹ *Id.* at 1254.

²²⁰ *Id.* at 1256-57.

²²¹ *Id.* at 1255.

²²² *Id.* at 1262-63.

unknown species of a genus, so that *Hogan* would take the disclosure out of the enablement requirement, then it would also be impossible for the patent application to describe the unknown species. Thus, the written description places the same impossible burden on a patent applicant seeking to claim a genus that includes an unknown species that an enablement requirement would have, were it not for *Hogan*. While *Hogan* provides relief from this impossible burden with respect to the enablement requirement, *Chiron* provides no such relief with respect to the written description requirement. Thus, *Chiron* renders claims that extend to unknown species invalid for failure to satisfy the written description requirement, rather than the enablement requirement. Whether a patent is invalid for failure to satisfy one requirement or the other, the end result is the same.

The Federal Circuit next addressed the issue of the validity of a claim to a genus based on the disclosure of a species within the genus in *Lizardtech, Inc. v. Earth Resource Mapping, Inc.*²²³ Lizardtech had a patent for data compression software for digital images that included a claim for a method for creating a seamless digital wave transform (“DWT”) of the data for the image and then processing the data to permit the transformed image to be stored in a computer with a limited memory.²²⁴ The specification disclosed one way to create the seamless DWT, which was by “maintaining updated sums” of DWT coefficients calculated from the image data. Nevertheless, the claim in issue did not specify how the seamless DWT was created, and therefore, it purported to cover all ways of creating the seamless DWT.²²⁵

²²³ 424 F.3d 1336 (Fed. Cir. 2005).

²²⁴ For a thorough and insightful description of the factual background of the case, see Robert P. Merges, *Software And Patent Scope: A Report From The Middle Innings*, 85 TEX. L. REV. 1627 (2007).

²²⁵ Another of the claims included the “maintaining updated sums” limitation, but the court had ruled that the defendant had not infringed that claim because the defendant used an

The Federal Circuit decided that there was no support for such a broad claim in the specification, because the specification failed to demonstrate that the inventor possessed the full scope of the claim and failed to enable the full breadth of the claim. It explained:

By analogy, suppose that an inventor created a particular fuel-efficient automobile engine and described the engine in such detail in the specification that a person of ordinary skill in the art would be able to build the engine. Although the specification would meet the requirements of section 112 with respect to a claim directed to that particular engine, it would not necessarily support a broad claim to every possible type of fuel-efficient engine, no matter how different in structure or operation from the inventor's engine. The single embodiment would support such a generic claim only if the specification would “reasonably convey to a person skilled in the art that [the inventor] had possession of the claimed subject matter at the time of filing,” and would “enable one of ordinary skill to practice ‘the full scope of the claimed invention,’ ” To hold otherwise would violate the Supreme Court's directive that “[i]t seems to us that nothing can be more just and fair, both to the patentee and the public, than that the former should understand, and correctly describe, just what he has invented, and for what he claims a patent.” Thus, a patentee cannot always satisfy the requirements of section 112, in supporting expansive claim language, merely by clearly describing one embodiment of the thing claimed. For that reason, we hold that the description of one method for creating a seamless DWT does not entitle the inventor of the '835 patent to claim any and all means for achieving that objective.²²⁶

It is significant that the court did not address whether the alternate ways to create a seamless DWT were known at the time of filing of the patent application, and the decision did not refer to either the *Hogan* or *Plant Genetic* cases.

*Liebel-Flarsheim Co. v. Medrad, Inc.*²²⁷ is another case in which the Federal Circuit held claims invalid for lack of enablement because they were not supported by the specification. The patent was for powered fluid injectors that were used to inject fluids into patients during medical procedures. Although all the examples in the specification included a pressure jacket on the

alternative method for creating the seamless DWT. *Id.* at 1340-41. Lizardtech then argued that the defendant infringed the broader claim. *See id.* at 1343.

²²⁶ *Id.* at 1346 (citations omitted).

²²⁷ 481 F.3d 1371 (Fed. Cir. 2007).

injectors, the claims did not require the injectors to have a pressure jacket.²²⁸ The district court determined that the claims were invalid for lack of enablement of injectors without a pressure jacket, and the Federal Circuit affirmed. The appellate court explained:

[I]n this case, the asserted claims read on, and the full scope of the claimed invention includes, an injector system with and without a pressure jacket. There must be “reasonable enablement of the scope of the range” which, in this case, includes both injector systems with and without a pressure jacket.²²⁹

The Federal Circuit also found claims invalid for lack of enablement because they extended beyond the specification in *Automotive Technologies International, Inc. v. BMW of North America, Inc.*²³⁰ The case involved crash sensors for use in deploying airbags during side impact car accidents which were triggered by velocity changes in vehicles that exceeded a threshold value. The claims did not specify the particular types of sensors to be used in the invention, but the specification had a detailed description of a mechanical velocity sensor and a briefer description of an electronic sensor. The district court decided that the claims were invalid with respect to electronic sensors, because the description of them in the specification was not sufficiently detailed to enable a person of ordinary skill in the art to make them.²³¹

The Federal Circuit affirmed. It explained:

We also reject ATI's argument that because the specification enables one mode of practicing the invention, *viz.*, mechanical side impact sensors, the enablement requirement is satisfied. We addressed and rejected a similar

²²⁸ When the original patent application was filed, the claims included the limitation of a pressure jacket on the injectors, but the patentee removed this limitation from the claims during patent prosecution after learning that the defendant was making a jacketless injector system. *Id.* at 1374.

²²⁹ *Id.* at 1380. The court also pointed out that it was ironic that the plaintiff had successfully argued that the claims encompassed injectors with no pressure jackets, but lost the case in the end because the broad claims were invalid for lack of enablement. *Id.*

²³⁰ 501 F.3d 1274 (Fed. Cir. 2007).

²³¹ *Id.* at 1280.

argument made in *Liebel-Flarsheim Co. v. Medrad, Inc.*, 481 F.3d 1371 (Fed.Cir.2007). . . .

Similarly, in this case, the claim construction of the relevant claim limitation resulted in the scope of the claims including both mechanical and electronic side impact sensors. Disclosure of only mechanical side impact sensors does not permit one skilled in the art to make and use the invention as broadly as it was claimed, which includes electronic side impact sensors. Electronic side impact sensors are not just another known species of a genus consisting of sensors, but are a distinctly different sensor compared with the well-enabled mechanical side impact sensor that is fully discussed in the specification. Thus, in order to fulfill the enablement requirement, the specification must enable the full scope of the claims that includes both electronic and mechanical side impact sensors, which the specification fails to do.²³²

The Federal Circuit’s most recent case on the enablement of a claim to a genus is *Sitrick v. Dreamworks, LLC*.²³³ Sitrick had two patents for integrating a user’s audio signal or visual image into a pre-existing video game or movie. Sitrick sued Dreamworks for infringement of these patents on account of Dreamworks’ including in the DVD’s it made and distributed a feature called ReVoice Studio that allowed users to add their own voices to the movies on the DVD’s. Sitrick’s patents included claims for the integration or substitution of a visual or audio user image in place of a predefined image in a presentation. The specifications described the integration or substitution as being performed by an Intercept Adapter Interface System (“IAIS”), which is used in a video game system to intercept address signals between the video game apparatus and the game card or storage card. The claims were not restricted to video games, however, and the specification of one of the patents began: “This invention relates to predefined video and audiovisual presentations such as movies and video games.”²³⁴

The district court found all the claims invalid for lack of enablement as to movies, because the patent specifications did not explain how the IAIS from a video game system would

²³² *Id.* at 1285.

²³³ 516 F.3d 993 (Fed. Cir. 2008).

²³⁴ *Id.* at 996.

work for movies. It noted that Dreamworks' experts had testified that video games differed significantly from movies, because in video games the images of the various characters in the story were retrieved by discrete address signals, while the images of the characters in pre-existing movies were inseparable from the surrounding images. Consequently, the techniques for intercepting address signals for video games had no relevance to movies, and the disclosure did not enable use of the IAIS for movies.²³⁵

In affirming the district court, the Federal Circuit held:

The full scope of the claimed invention must be enabled. The rationale for this statutory requirement is straightforward. Enabling the full scope of each claim is “part of the *quid pro quo* of the patent bargain.” A patentee who chooses broad claim language must make sure the broad claims are fully enabled. “The scope of the claims must be less than or equal to the scope of the enablement” to “ensure[] that the public knowledge is enriched by the patent specification to a degree at least commensurate with the scope of the claims.”²³⁶

The *Lizardtech*, *Liebel-Flarsheim*, *Automotive Technologies*, and *Sitrick* cases each dealt with a claim to a genus based on a specification that enabled only one species in the genus. In each case, the Federal Circuit emphasized that a claim to a genus would not satisfy the enablement requirement if the specification enabled only a single species; instead, the specification was required to enable the full scope of the claim. None of these cases referred to *Hogan* or addressed whether the enablement requirement was not applicable on account of the existence of a species within the genus that was unknown at the time of filing and therefore was impossible to enable then. In light of the severe limitation on *Hogan* in the *Plant Genetic* case that a species must have been an “unknown concept” to avoid the enablement requirement, and the holding in the *Chiron* case that a claim to a genus would not satisfy the written description

²³⁵ *Id.* at 998, 1000.

²³⁶ *Id.* at 999 (citations omitted).

requirement with respect to an unknown species, it appears that there is little left of *Hogan* as a precedent.

As a result of the erosion of *Hogan* as a precedent, it appears that blocking patents on improvements would not be possible, because a patent on an improvement could not satisfy the nonobviousness requirement and at the same time satisfy the written description requirement and be within the scope of enablement of the original invention. Nevertheless, there are limited circumstances where blocking patents may still be possible, and these are described in the next section of the article.

VI. Possibilities for Blocking Patents

Blocking patents appear to be restricted to two possibilities. The first is where a process, machine, manufacture, or composition of matter involves the combination of two or more component processes, machines, manufactures, or compositions of matter, each of which is subject to a valid patent. The second is where there is one patent on a machine, manufacture, or composition of matter and there is another patent for a process for making or using the machine, manufacture, or composition of matter.

The first possibility for blocking patents arises from combining components to produce a whole that requires all of them. An automobile would be an example. Many of its components (engine, battery, brakes, etc.) might be the subject of a separate patent, and making an automobile would require licenses from all the patentees. What differentiates an improvement from a component is the relationship between the original and second inventions. If the second invention can stand alone from the original invention and combining the original and second invention would be obvious to a person of ordinary skill in the art, then the second invention

would be a component. On the other hand, if the second invention would not be useful on its own, the second invention would be an improvement of the original invention. While patents on components could block each other, patents on improvements could not be blocking because the improvements could not be both nonobvious and enabled by the original invention.

The other possibility for blocking patents arises from the disjunctive elements for infringement in Section 271(a) of Title 35: “[W]henever without authority makes, uses, offers to sell, or sells any patented invention . . . during the term of the patent therefor, infringes the patent.”²³⁷ An inventor of a novel, useful and nonobvious process for using or making a machine, manufacture, or composition of matter would be entitled to a patent for the process,²³⁸ but if the machine, manufacture, or composition of matter was subject to its own patent, the patent on the process would be subject to the patent on the machine, manufacture, or composition of matter. The inventor of a novel, useful and nonobvious process for making a machine would not infringe a patent on the machine by making it in a way that was not enabled by the patent on the machine, but the inventor would infringe the patent on the machine by using it, or offering to sell or selling it. Similarly, the inventor of a novel, useful and nonobvious process for using a machine would not infringe a patent on the machine by using it in a way that was not enabled by the patent on the machine, but the inventor would infringe the patent on the

²³⁷ 35 U.S.C. § 271(a) (2000).

²³⁸ See 35 U.S.C. § 103(b) (2000) (“The term ‘process’ . . . includes a new use of a known process, machine, manufacture, composition of matter, or material.”). Before the adoption of this provision in 1952, a new use of an old product or composition was held to be not patentable. *Roberts v. Ryer*, 91 U.S. 150, 157 (1875) (“It is no new invention to use an old machine for a new purpose. The inventor of a machine is entitled to the benefit of all the uses to which it can be put, no matter whether he had conceived the idea of the use or not.”); *In re Thuau*, 135 F.2d 344, (C.C.P.A. 1943) (“[A] patent for a new use for an old substance quite unchanged is not authorized by the patent laws because such use is not the invention or discovery of ‘any new and useful art, machine, manufacture, or composition of matter, or any new and useful improvements thereof.’ ”); Paul H. Eggert, *Uses, New Uses and Chemical Patents – A Proposal*, 51 J. PAT. OFF. SOC’Y 768, 775-80 (1969).

machine by making it, unless the inventor also made the machine in a way that was not enabled by the patent on the machine.

Judge Rader provided the following hypothetical illustrating blocking patents on a composition for shoe polish and a process for using the composition to grow hair in *Catalina Marketing International, Inc. v. Coolsavings.com, Inc.*:²³⁹

Inventor A invents a shoe polish for shining shoes (which, for the sake of example, is novel, useful, and nonobvious). Inventor A receives a patent having composition claims for shoe polish. Indeed, the preamble of these hypothetical claims recites “a composition for polishing shoes.” Clearly, Inventor B could not later secure a patent with composition claims on the same composition because it would not be novel. Likewise, Inventor B could not secure claims on the method of using the composition for shining shoes because the use is not a “new use” of the composition but, rather, the same use shining shoes.

Suppose Inventor B discovers that the polish also repels water when rubbed onto shoes. Inventor B could not likely claim a method of using the polish to repel water on shoes because repelling water is inherent in the normal use of the polish to shine shoes. In other words, Inventor B has not invented a “new” use by rubbing polish on shoes to repel water. Upon discovering, however, that the polish composition grows hair when rubbed on bare human skin, Inventor B can likely obtain method claims directed to the new use of the composition to grow hair. Hence, while Inventor B may obtain a blocking patent on the use of Inventor A's composition to grow hair, this method patent does not bestow on Inventor B any right with respect to the patented composition. Even though Inventor A's claim recites “a composition for polishing shoes,” Inventor B cannot invoke this use limitation to limit Inventor A's composition claim because that preamble phrase states a use or purpose of the composition and does not impose a limit on Inventor A's claim.²⁴⁰

Thus, a patent for a composition or product will dominate patents for processes for making or using the composition or product.

The standard of enablement for a patent for a composition or product is satisfied by a specification that discloses a single method of making the composition or product. In contrast, a specification that discloses a process for making or using a composition or product will not be

²³⁹ 289 F.3d 801 (Fed. Cir. 2002).

²⁴⁰ *Id.* at 809.

enabling for other processes for making or using the composition or product. This distinction between patents for compositions or products and patents for processes was highlighted in *Invitrogen Corp. v. Clontech Laboratories, Inc.*²⁴¹ The patents involved in the case were for an enzyme known as reverse transcriptase (“RT”) that had been genetically modified so that it would be useful for cloning DNA efficiently. The defendant argued that the patents were invalid for failure to satisfy the enablement requirement, because they disclosed only a single process (*i.e.*, deletion mutation) for genetically modifying the RT, but they failed to disclose any of the other processes for doing so, including the process that the defendant used (*i.e.*, point mutation) for genetically modifying the RT.²⁴² The Federal Circuit conceded that the defendant’s argument would have been well taken if the patents had claimed the other processes for genetically modifying the RT without disclosing them.²⁴³ The court pointed out, though, that the claims in the patents were for the genetically modified RT composition, rather than the processes for genetically modifying the RT, and thus they were not limited to any process for genetically modifying the RT.²⁴⁴

²⁴¹ 429 F.3d 1052 (Fed. Cir. 2005).

²⁴² *Id.* at 1070.

²⁴³ *Id.* at 1071. The argument would then have been supported by cases such as *National Recovery Technologies, Inc. v. Magnetic Separation Systems, Inc.*, 166 F.3d 1190, 1194 (Fed.Cir.1999).

²⁴⁴ *Invitrogen*, 429 F.3d at 1071. *See also* *Amgen Inc. v. Hoechst Marion Roussel, Inc.*, 314 F.3d 1313, 1335 (Fed. Cir. 2003) (“[T]he law makes clear that the specification need teach only one mode of making and using a claimed composition.”); *Johns Hopkins Univ. v. CellPro, Inc.*, 152 F.3d 1342, 1361 (Fed. Cir. 1998); *Engel Indus., Inc. v. Lockformer Co.*, 946 F.2d 1528, 1533 (Fed. Cir. 1991) (“The enablement requirement is met if the description enables any mode of making and using the claimed invention.”).

VII. Conclusion

It is unclear whether blocking patents on improvements promote or retard technological progress. By requiring permission from both the patentee for the original invention and the patentee for the improvement in order for either patentee to make, use or sell the improvement, blocking patents create the possibility of an impasse in which neither patentee can exploit a valuable improvement. On the other hand, under Professor Kitch's prospect theory of patents, blocking patents may promote technological progress by providing inventors with substantial incentives to produce pioneer inventions and then control their development.

Blocking patents were expressly authorized by statute for a short period, but since the repeal of the authorizing statute in 1832, they have been widely recognized in the patent case law. The adoption of the nonobviousness requirement for patentability in 1952 appears to have substantially eliminated the possibilities for blocking patents, however. The nonobviousness requirement is complementary to the enablement requirement, because both are based on the standard of the person having ordinary skill in the art. If an improvement is nonobvious, so that it satisfies the standard for patentability, then it is beyond the ken of a person who has both knowledge of the original invention and ordinary skill in the art, and therefore the improvement is outside the scope of a patent for the original invention. Likewise, if the improvement is within the scope of a patent for the original invention, because the patent enabled a person of ordinary skill in the art to make and use the improvement, then the improvement could not be patentable, because it would not satisfy the nonobviousness requirement.

A line of cases beginning with *Application of Hogan*²⁴⁵ have held, however, that an improvement could both satisfy the enablement requirement with respect to the original

²⁴⁵ 559 F.2d 595 (C.C.P.A. 1977).

invention and the nonobviousness requirement. These cases have focused on the possibility of a difference in the ordinary skill of art between the time of filing the patent for the original invention (when the enablement requirement applies) and the time of the invention of the improvement (when the nonobviousness requirement applies). Under these cases, a claim for a genus that covers the original invention would satisfy the enablement requirement with respect to species within the genus that are unknown at the time of filing the patent for the original invention, and these species could satisfy the nonobviousness requirement and therefore be patentable when they were eventually discovered. As a result, there could be blocking patents for the original invention and the improvement.

The holdings of the *Hogan* line of cases appear to have been eroded by recent Federal Circuit decisions, though. First, the Federal Circuit limited *Hogan* in *Plant Genetic System, N.V. v. DeKalb Genetics Corp.*²⁴⁶ to circumstances where the improvement was not merely difficult to produce, but was instead an unknown concept. Then, in *Chiron Corp. v. Genentech, Inc.*,²⁴⁷ the Federal Circuit held that even if a claim to a genus could satisfy the enablement requirement with respect to unknown species, the claim would nevertheless be invalid because it could not satisfy the written description requirement. Since *Chiron* was decided, *Hogan* has not been cited in any of the four cases where the Federal Circuit has ruled that patents with broad claims did not satisfy the enablement and written description requirements because their patent specifications did not support the full range of the claims. Consequently, the possibilities for blocking patents have been substantially restricted.

Nevertheless, there are two circumstances where blocking patents may continue to arise. The first is where there are separate patents on components that may be combined with each

²⁴⁶ 315 F.3d 1335 (Fed. Cir. 2003).

²⁴⁷ 363 F.3d 1247 (Fed. Cir. 2004).

other. When this occurs, permission to combine the components will have to be obtained from each patentee. The second is where there is a patent for a novel, useful and nonobvious method for making or using a product that is separately patented. While the patent on the product would not block the patented method for making or using it, it would block sales of the product as well as processes for making or using the product that were enabled by the patent on the product.