Patent Infringement Prevention and the Advancement of Technology: Application of 35 U.S.C. § 271(f) to Software and "Virtual Components"

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J.D. Candidate, 2006, Fordham University School of Law.

PATENT INFRINGEMENT PREVENTION AND THE ADVANCEMENT OF TECHNOLOGY: APPLICATION OF 35 U.S.C. § 271(f) TO SOFTWARE AND "VIRTUAL COMPONENTS"

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INTRODUCTION

Obtaining a patent has relatively little value unless it is enforceable against infringers. A patent does not bestow a right to practice an invention, but rather only a right to exclude others from practicing the invention.[1] Therefore, patent holders need to be able to stop others from infringing their patents by preventing the copying and selling of their inventions. However, prior to the enactment of 35 U.S.C. § 271(f),[2] a loophole had developed in patent law allowing domestic manufacturers to avoid infringement liability by simply having the components of a patented invention made in the United States and then assembled in a foreign country.[3] Even though § 271(f) was enacted to prevent this practice,[4] a similar loophole may be developing with respect to software and "virtual component" technologies.[5]

Part I of this Note contains the necessary background information, which includes the history and development of § 271(f) as well as a definition and description of software and virtual component technology. Part II discusses recent cases, the development of the controversy, and the current state of the law, including the recent U.S. Court of Appeals for the Federal Circuit decision in *Eolas Technologies Inc. v. Microsoft Corp.*[6] Part III discusses what possible

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* J.D. Candidate, 2006, Fordham University School of Law.

1. *See* 35 U.S.C. § 154(a)(1) (2000) (indicating that a patent grants the "right to exclude others from making, using, offering for sale, or selling the invention").

2. Patent Law Amendments of 1984, Pub. L. No. 98-622, § 101, 98 Stat. 3383 (codified at 35 U.S.C. § 271(f)); *see infra* note 21 and accompanying text (quoting text of statute).

3. *See* Deepsouth Packing Co. v. Laitram Corp., 406 U.S. 518 (1972).

4. *See infra* Part I.A.1 (discussing the legislative history of § 271(f)).

5. Virtual components are parts that are created on a computer using computer design software. For a more detailed discussion of "software" and "virtual component" technology as they relate to this Note, see *infra* Part I.B.2.

6. No. 04-1234, 2005 WL 475391 (Fed. Cir. Mar. 2, 2005).

effects the *Eolas* decision may have on the application of § 271(f) to software and virtual components, and then urges the adoption of an interpretation of § 271(f) that would encompass these technologies.[7]

I. DEVELOPMENT OF THE LAW AND TECHNOLOGY

A. *Development of the Law*

1. Enactment of § 271(f)

A discussion of § 271(f) jurisprudence begins with a discussion of *Deepsouth Packing Co. v. Laitram Corp.*,[8] the Supreme Court case that prompted Congress to enact § 271(f).[9] In this case, Deepsouth was manufacturing parts of a patented shrimp-deveining machine and then shipping them to customers as parts of a kit that could later be assembled in a foreign country.[10]

As this case preceded the enactment of § 271(f), the Court was left to analyze Deepsouth's actions under 35 U.S.C. § 271(a).[11] At the time *Deepsouth* was decided, § 271(a) provided as follows: "'Except as otherwise provided in this title, whoever without authority makes, uses or sells any patented invention, within the United States during the term of the patent therefor, [directly] infringes the patent.'"[12]

Evaluating Deepsouth's actions under § 271(a), the focus of the Court's inquiry was, "did Deepsouth 'make' (and then sell) something cognizable under the patent law as the patented invention, or did it 'make' (and then sell) something that fell short of infringement?"[13] The Supreme Court refused to interpret the term "make" to include a substantial manufacture of the parts, as the Fifth Circuit did below.[14] Instead, the Court, finding that Deepsouth's actions did not infringe, reaffirmed a Second Circuit holding that "unassembled export of the elements of an invention did not infringe the patent."[15]

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7. *See infra* Part III.

8. 406 U.S. at 518.

9. *See infra* note 20 and accompanying text.

10. *See Deepsouth*, 406 U.S. at 523-24.

11. *See id.* at 527 (indicating that, in order to prevail, Laitram had to prove direct infringement under 35 U.S.C. § 271(a) (2000)).

12. *Id.* at 522 (quoting 35 U.S.C. § 271(a)). Section 271(a) was later amended "by inserting 'offers to sell,' after 'uses'" and "by inserting 'or imports into the United States any patented invention' after 'the United States'." Uruguay Round Agreements Act, Pub. L. No. 103-465, § 533(a), 108 Stat. 4988 (1994) (codified as amended at 35 U.S.C. § 271(f)).

13. *Deepsouth*, 406 U.S. at 527.

14. *See id.* at 527-28; *see also* Laitram Corp. v. Deepsouth Packing Co., 443 F.2d 936, 938-39 (5th Cir. 1971).

15. *Deepsouth*, 406 U.S. at 529 (citing Radio Corp. of America v. Andrea, 79 F.2d 626, 628 (2d Cir. 1935)).

The Court did not agree with the criticism that its "conclusion [was] derived from too narrow and technical an interpretation of the statute" and that the statute should be read more broadly.[16] The Court stated that it would require "a clear and certain signal from Congress" before expanding the patent law.[17] However, Justice Blackmun, with whom three other Justices joined in dissent, noted that this narrow reading "has opened the way to deny the holder of [a] United States combination patent the benefits of his invention with respect to sales to foreign purchasers."[18] The dissent agreed with the Court of Appeals' opinion, which expressed concern that the conclusion reached in the present case created a loophole that would

> allow an infringer to set up shop next door to a patent-protected inventor whose product enjoys a substantial foreign market and deprive him of this valuable business. If this Constitutional protection is to be fully effectuated, it must extend to an infringer who manufactures in the United States and then captures the foreign markets from the patentee. The Constitutional mandate cannot be limited to just manufacturing and selling within the United States. The infringer would then be allowed to reap the fruits of the American economy—technology, labor, materials, etc.—but would not be subject to the responsibilities of the American patent laws. We cannot permit an infringer to enjoy these benefits and then be allowed to strip away a portion of the patentee's protection.[19]

In fact, it was the creation of this loophole that prompted Congress to enact § 271(f) to close it.[20] Section 271(f) provides as follows:

> (1) Whoever without authority supplies or causes to be supplied in or from the United States all or a substantial portion of the components of a patented invention, where such components are uncombined in whole or in part, in such manner as to actively induce the combination of such components outside of the United States in a manner that would infringe the patent if such combination occurred within the United States, shall be liable as an infringer.
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> (2) Whoever without authority supplies or causes to be supplied in or from the United States any component of a patented invention

16. *Id.* at 529-30.
17. *Id.* at 531.
18. *Id.* at 533 (Blackmun, J., dissenting).
19. *Id.* at 534 (quoting *Laitram*, 443 F.2d at 939).
20. *See* Section-By-Section Analysis: Patent Law Amendments of 1984, 130 Cong. Rec. 28,065, 28,069 (submission of Rep. Kastenmeier) ("This proposal responds to the United States Supreme Court decision in *Deepsouth Packing Co. v. Laitram Corp.*, 406 U.S. 518 (1972), concerning the need for a legislative solution to close a loophole in patent law."), *reprinted in* 1984 U.S.C.C.A.N. 5827, 5828. In addition to making oral statements, Representative Kastenmeier submitted a section-by-section analysis of H.R. 6286, which became the Patent Law Amendments of 1984, in lieu of a lengthy statement detailing the bill's contents. *See* 130 Cong. Rec. 28,065, 28,069 (statement of Rep. Kastenmeier).

that is especially made or especially adapted for use in the invention and not a staple article or commodity of commerce suitable for substantial noninfringing use, where such component is uncombined in whole or in part, knowing that such component is so made or adapted and intending that such component will be combined outside of the United States in a manner that would infringe the patent if such combination occurred within the United States, shall be liable as an infringer.[21]

According to the legislative history, this change in the patent law is in line with the constitutional mandate of the patent system.[22] The legislative history of § 271(f) reads in pertinent part:

> Part of the [Subcommittee on Courts, Civil Liberties, and the Administration of Justice of the Committee on the Judiciary's] job is to secure for the owners of intellectual property, including patent holders, a workable, efficient, and vigorous set of laws to protect their creations. It is only through implementation of the constitutional mandate of encouraging the sciences and the useful arts that we will be able to spur the inventive spirit that has made our country a world leader. Indeed, our ability to foster innovation is a central element to our national security . . . .
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> . . . .
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> . . . However, without enactment of these housekeeping-oriented measures, the patent system would not be responsive to the challenges of a changing world and the public would not benefit from the release of creative genius.[23]

The section-by-section analysis of the bill stated that

> Section 101 makes two major changes in the patent law to avoid encouraging manufacturing outside the United States.
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> . . . .
>
> The second major change made by section 101[, the addition of § 271(f),] will prevent copiers from avoiding U.S. patents by supplying components of a patented product in this country so that the assembly of the components may be completed abroad. This proposal responds to the United States Supreme Court decision in [Deepsouth], concerning the need for a legislative solution to close a loophole in patent law.[24]

The legislative history reveals that the objectives of the amendments were to make the patent system more "responsive to the

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21. 35 U.S.C. § 271(f) (2000).
22. *See* 130 Cong. Rec. 28,065, 28,069 (statement of Rep. Kastenmeier).
23. *Id.*
24. *Id.*

challenges of a changing world"[25] and to "avoid encouraging manufacturing outside the United States."[26]

2. Early Application of § 271(f)

Some of the earliest cases to address the scope of § 271(f) dealt with mechanical devices.[27] One such case is *Smith International, Inc. v. Hughes Tool Co.*,[28] which concerned the sale of O-ring drill bits to foreign customers.[29] The issue facing the *Smith* court was whether the exportation of O-rings and manufacturing specifications for the drill bits constituted infringement under § 271(f).[30] However, the court declined to rule on this issue because it found that there was no evidence that any shipments had occurred after November 8, 1984, the date on which § 271(f) became effective.[31]

Another early case, *T.D. Williamson, Inc. v. Laymon*, involved the export of a pipeline inspector, which is a mechanical device.[32] The district court concluded with relatively little difficulty that § 271(f) was applicable.[33] The statute's applicability to mechanical devices should be obvious[34] because Congress enacted § 271(f) in direct response to *Deepsouth*, a case involving mechanical devices.[35]

3. The Metes and Bounds of § 271(f): Attempts to Define the Scope of Coverage

Later cases tested the limits of § 271(f) by attempting to apply the statute to technologies[36] and types of patents[37] different from those at

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25. *Id.*

26. *Id.* (submission of Rep. Kastenmeier).

27. *See, e.g.*, T.D. Williamson, Inc. v. Laymon, 723 F. Supp. 587 (N.D. Okla. 1989); Smith Int'l, Inc. v. Hughes Tool Co., No. CV 72-1231, 1986 WL 4795, at *1 (C.D. Cal. Mar. 12, 1986), *vacated as moot*, 839 F.2d 663 (Fed. Cir. 1988).

28. 1986 WL 4795, at *1.

29. *Id.* at *31.

30. *Id.* (discussing whether the "provision of plans" occurred after enactment of § 271(f) in order to determine if § 271(f) was implicated).

31. *Id.*

32. *See T.D. Williamson*, 723 F. Supp. at 590.

33. *See id.* at 592-93.

34. *See* Alan M. Fisch & Brent H. Allen, *The Application of Domestic Patent Law to Exported Software: 35 U.S.C. § 271(f)*, 25 U. Pa. J. Int'l Econ. L. 557, 567 (2004) (noting that application of § 271(f) to mechanical devices should be "straightforward").

35. *See* Deepsouth Packing Co. v. Laitram Corp., 406 U.S. 518, 519 (1972) (involving shrimp-deveining equipment); *supra* note 24 and accompanying text.

36. *See, e.g.*, W.R. Grace & Co.—Conn. v. Intercat, Inc., 60 F. Supp. 2d 316, 319 (D. Del. 1999) (involving chemical compounds).

37. *See, e.g.*, Standard Havens Prods., Inc. v. Gencor Indus., Inc., 953 F.2d 1360, 1374 (Fed. Cir. 1991) (involving a process patent); Aerogroup Int'l, Inc. v. Marlboro Footworks, Ltd., 955 F. Supp. 220, 232 (S.D.N.Y. 1997) (involving a design patent).

issue in *Deepsouth*.[38] The statute itself limits coverage to "components of a patented invention."[39] However, it was unclear what could be considered a component.[40] With no clear definition in place, it was uncertain whether § 271(f) applied to chemical components or design or process patents.[41] Therefore, the courts were left to determine the proper scope of coverage.

The issue of whether chemical compounds could be considered components arose in *W.R. Grace & Co.—Conn. v. Intercat, Inc.*, a case involving patented chemical compounds used for reducing sulfur oxide emissions.[42] The defendant in this case argued that § 271(f) was inapplicable to chemical compounds because it was enacted specifically to overrule *Deepsouth*, a case that involved mechanical components.[43] However, the court rejected this argument, ruling that

> [t]he plain language of the statute limits its application only to a "component of a patented invention." Nowhere in the statute or its legislative history is there a limitation to components of machines and other structural combinations. A contrary holding, refusing to apply the statute to chemical compositions, would be tantamount to legislating additional language to a statute. That simply is not warranted.[44]

The district court, refusing to read in such a limitation, found that § 271(f) included chemical compounds as components.[45] Another district court found that § 271(f) similarly applied to components of drug compounds.[46]

However, while some courts have been willing to readily apply § 271(f) to patents for machines[47] and broadly interpret it to include chemical compounds,[48] other courts have refused to expand § 271(f) to include design[49] and process patents within its scope.[50] A design

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38. *Deepsouth* concerned a composition patent for a mechanical shrimp-deveining machine. *See supra* note 35.

39. 35 U.S.C. § 271(f)(1) (2000).

40. *See, e.g.,* Bristol-Myers Squibb Co. v. Rhone-Poulenc Rorer, Inc., No. 95 CIV 8833, 2001 WL 1263299, at *2 (S.D.N.Y. Oct. 19, 2001); *W.R. Grace*, 60 F. Supp. 2d at 320.

41. *See, e.g., Standard Havens Prods.,* 953 F.2d at 1374 (involving a process patent); *W.R. Grace,* 60 F. Supp. 2d at 320 (involving a chemical compound); *Aerogroup,* 955 F. Supp. at 232 (involving a design patent).

42. *W.R. Grace,* 60 F. Supp. 2d at 319.

43. *Id.* at 320.

44. *Id.* at 321.

45. *Id.*

46. *See* Bristol-Myers Squibb Co. v. Rhone-Poulenc Rorer, Inc., No. 95 CIV 8833, 2001 WL 1263299, at *3 (S.D.N.Y. Oct. 19, 2001).

47. *See, e.g.,* T.D. Williamson, Inc. v. Laymon, 723 F. Supp. 587, 592-93 (N.D. Okla. 1989).

48. *See W.R. Grace,* 60 F. Supp. 2d at 320-21.

49. *See* Aerogroup Int'l, Inc. v. Marlboro Footworks, Ltd., 955 F. Supp. 220, 232 (S.D.N.Y. 1997) (declining to apply § 271(f) to a design patent).

patent only covers the "look" or outer appearance of an object; that is, it only covers the configuration and ornamentation of the outer surfaces of the object rather than its function.[51]   A process patent covers a process for achieving a desired result.[52]   A common reasoning adopted by the courts for not applying § 271(f) to design and process patents is that these types of patents by their nature lack components.[53]

In *Standard Havens Products, Inc. v. Gencor Industries, Inc.*,[54] a case involving a patent for a method of asphalt production, the Federal Circuit indicated simply and with little discussion that it "[did] not find the provisions of 35 U.S.C. § 271(f) (1988) implicated."[55]   However, the district court in *Enpat, Inc. v. Microsoft Corp.*[56] provided some reasoning as to why § 271(f) does not apply to process patents.[57]   Another case, *Synaptic Pharmaceutical Corp. v. MDS Panlabs, Inc.*, cited *Enpat* and stated the following:

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50. *See* Enpat, Inc. v. Microsoft Corp., 6 F. Supp. 2d 537, 539 (E.D. Va. 1998) (declining to apply § 271(f) to a process patent).

51. *See* 35 U.S.C. § 171 (2000) ("Whoever invents any new, original and ornamental design for an article of manufacture may obtain a patent therefor, subject to the conditions and requirements of this title.").

52. *See id.* § 100(b) ("The term 'process' means process, art or method, and includes a new use of a known process, machine, manufacture, composition of matter, or material."); *id.* § 101 ("Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.").

53. *See* Enpat, 6 F. Supp. 2d at 539 (indicating that the method patent "[had] no 'components' for purposes of § 271(f)"); Aerogroup, 955 F. Supp. at 232 (noting that the design patent "[had] no 'component parts,'" and therefore, is not covered by § 271(f)); *see also* AT & T Corp. v. Microsoft Corp., No. 01 Civ.4872, 2004 WL 406640, at *5 (S.D.N.Y. Mar. 5, 2004) (indicating that design and method patents do not have components and therefore do not implicate § 271(f)); Fisch & Allen, *supra* note 34, at 571-72 & n.69 ("Courts have refused to apply § 271(f) to such design and method patents because courts believe that design and method patents lack the requisite 'component' parts that typically are present in mechanical inventions."). *But see* Eolas Techs. Inc. v. Microsoft Corp., No. 04-1234, 2005 WL 475391, at *13 (Fed. Cir. Mar. 2, 2005) (indicating that a process patent could be covered by § 271(f)).

54. 953 F.2d 1360 (Fed. Cir. 1991) (involving U.S. Patent 4,787,938 (issued Nov. 29, 1988)); *see also* U.S. Patent 4,787,938 (issued Nov. 29, 1988) ("[Claim] 1. A method for continuously producing an asphaltic composition from asphalt and aggregates, the steps of said method comprising . . . .").

55. *Standard Havens Prods.*,953 F.2d at 1374.

56. 6 F. Supp. 2d at 537.

57. *See id.* at 539. In support of its conclusion, the court stated that
   [l]ike the asphalt process in Standard Havens or the shoe design in Aerogroup, plaintiffs' patent describes the steps required to accomplish a particular task rather than the composition of a patented physical product. While it is true that any process involves the use of physical objects, this alone is not enough to bring a method patent within the purview of § 271(f), as the above cases illustrate. We conclude that plaintiffs' patent has no "components" for purposes of § 271(f).
Id.

In *Enpat*, the District Court reasoned that the express language singling out process patents for protection in *§ 271(g)* indicated that "Congress knew how to protect against foreign use of process patents, and chose to limit such protection to uses which result in the introduction of products into the United States." The Court went on to note that because processes were not explicitly included in the text of the statute, "the language and legislative history of *§ 271(f)* demonstrate an exclusive focus on the sale of components patented in the United States for combination into a finished product, apparatus, or invention abroad." Anticipating . . . arguments that a process also involves the combination of materials, the court stated that "[w]hile it is true that any process involves the use of physical objects, this alone is not enough to bring a method patent within the purview of *§ 271(f)*."[58]

Thus, based on a lack of language in § 271(f) indicating applicability to process patents, together with express process patent language in § 271(g), courts have refused to include process patents within the scope of § 271(f).[59]

Unlike the issue facing the court in *W.R. Grace*—whether a chemical could be considered a "component"[60]—courts were faced with the fundamental question of whether design and process patents have components.[61] While a process patent may involve the use of some components, the patent only gives protection to the process itself and not the components used to facilitate it, and therefore, the *Enpat* court reasoned that § 271(f) does not apply.[62] Courts have

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58. Synaptic Pharm. Corp. v. MDS Panlabs, Inc., 265 F. Supp. 2d 452, 464 (D.N.J. 2002) (citations omitted) (alteration in original) (quoting *Enpat*, 6 F. Supp. 2d at 539). Section 271(g) states the following:

> Whoever without authority imports into the United States or offers to sell, sells, or uses within the United States a product which is made by a process patented in the United States shall be liable as an infringer, if the importation, offer to sell, sale, or use of the product occurs during the term of such process patent. In an action for infringement of a process patent, no remedy may be granted for infringement on account of the noncommercial use or retail sale of a product unless there is no adequate remedy under this title for infringement on account of the importation or other use, offer to sell, or sale of that product. A product which is made by a patented process will, for purposes of this title, not be considered to be so made after—
> (1) it is materially changed by subsequent processes; or
> (2) it becomes a trivial and nonessential component of another product.

35 U.S.C. § 271(g) (2000).

59. *See Synaptic Pharm.*, 265 F. Supp. 2d at 464; *Enpat*, 6 F. Supp. 2d at 539. *But see* Eolas Techs. Inc. v. Microsoft Corp., No. 04-1234, 2005 WL 475391, at *13 (Fed. Cir. Mar. 2, 2005) (indicating that a process patent could be covered by § 271(f)).

60. *See supra* note 42 and accompanying text.

61. *See supra* note 53.

62. *See Enpat*, 6 F. Supp. 2d at 539 ("While it is true that any process involves the use of physical objects, this alone is not enough to bring a method patent within the purview of § 271(f) . . . ."). The *Enpat* court also indicated that "had Congress intended to prohibit U.S. companies from exporting products which allow foreign

similarly found that § 271(f) does not apply to design patents because they do not have the requisite "components."[63]

B. *Technological Analysis of Software and Virtual Components*

1. Software

Generally, the exportation of software for copying is accomplished using two mediums: "golden masters" and encrypted electronic transmission.[64] A golden master is, in essence, a CD containing software.[65] Once the software is developed, it is burned onto a disk using a laser, and it is this single disk, called a golden master, that is shipped abroad and used to create copies of the software that are later installed on computers.[66] Another method for exporting the software skips the process of burning it onto a disk and simply sends the software in the form of an encrypted electronic transmission.[67] This electronic transmission is received, decrypted, and then used to make copies of the software abroad.[68]

2. Virtual Components

While a case involving § 271(f) and virtual components—parts that are created on a computer using computer design software[69]—has not

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companies to make unauthorized use of patented methods. it could have done so in clear, unambiguous language like that found in § 271(g)." *Id.*

63. Aerogroup Int'l, Inc. v. Marlboro Footworks, Ltd., 955 F. Supp. 220, 232 (S.D.N.Y. 1997) (finding no liability for infringing a shoe sole design patent because, according to the court, design patents do not have components, and therefore are not covered by § 271(f)).

64. *See* AT & T Corp. v. Microsoft Corp., No. 01 Civ.4872, 2004 WL 406640, at *4 (S.D.N.Y. Mar. 5, 2004).

65. *See id.* at *1 n.5.

66. *See id.* at *1.

67. *Id.*

68. *Id.*

69. "Virtual component" is actually used in the integrated circuit industry, which happens to be the technology involved in *Pellegrini*, the case that was the motivation for writing this Note. *See* Pellegrini v. Analog Devices, Inc., 375 F.3d 1113, 1114-15 (Fed. Cir.), *cert. denied*, 125 S. Ct. 642 (2004); *see also* Richard Goering, *Giga Scale Tweaks IC Prototyping*, Electronic Engineering Times, Apr. 26, 2004, at 32; Kathy Werner & Tom Anderson, *Specs Eye Functional Verification, Quality*, Electronic Engineering Times, July 12, 2004, at 45. So called "virtual component exchanges" have been created, which facilitate the sale of intellectual property ("IP") associated with integrated circuit design, also know as an intellectual property exchange. *See* Goering, *supra*; Werner & Anderson, *supra*. In many respects, virtual components as used in the integrated circuit context are similar to virtual components as defined in this Note and would fall under this Note's broader definition. However, because of the author's background in mechanical engineering and hands-on experience with three-dimensional printing technology to create physical mechanical parts (or, more appropriately, hands-off experience, because the only thing the author used his hands

yet come before the courts,[70] the technology involved is in some respects similar to that involved in software cases.[71] The technology of virtual components blurs the line between software and traditional mechanical devices.[72] The problem arises because of advances in both computer-aided design ("CAD") software and manufacturing technology, which are bringing the processes of design and manufacturing closer to full and seamless integration.[73]

Under the current state of the technology, it is now possible for an engineer to design a component on a computer using CAD software and then print out a three-dimensional part.[74] First, the engineer "manufactures" the part on a computer by drilling holes and cutting features on the virtual component using the software functions.[75] Once the part is finished on the computer, the file is sent to a special

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for in the process was to control a mouse to create and then e-mail the virtual parts from a computer), this Note focuses on using computers to create mechanical parts.

70. Arguably, *Pellegrini* may have involved some form of virtual component because it involved designs for integrated circuit chips; however, the court did not address the issue in depth. *See Pellegrini*, 375 F.3d at 1114-15; *see also* supra note 69.

71. *See infra* notes 72, 75, 79-80, 122, 136, 234 and accompanying text (discussing how both software and virtual components can be "manufactured" on computers and how they can be sent vast distances via electronic transmission for replication).

72. *See CNC Software: Keeping Everything Virtual*, Architecture, May 2003, at 109, 109 ("If a computer model is built with a program that is compatible with milling software, the project can go straight from design development to physical output."); *see also infra* note 76 (describing computer numerical control ("CNC") machining and three-dimensional printing, two main processes that are used to convert virtual components into physical parts).

73. Julia Mandell, *CNC State of Mind: CNC and Other Manufacturing Technologies Allow for a Smooth Transition from 3-D Computer Modeling to Finished Product*, Architecture, May 2003, at 108, 109 ("'With CNC, we are compressing design-to-build into one seamless efficiency,' [says William Massie, a New York City-based architect who has been working intensively with CNC technology since 1991]."); *see also* Stephen Ellerin, *The Art and Science of "3D Printing*,*"* Emedia— The Digital Studio Mag., May 2004, at 14, 14 (indicating that "[n]ow 'rapid prototyping'—or '3D printing'—has drastically shortened the path from mind to matter"). It has also been indicated that rapid prototyping technology eliminates the "need for human intervention between the 3-D architectural model and the final product." Mandell, *supra*, at 108.

74. *See* Ellerin, *supra* note 73, at 14 (describing how CAD files can be sent to a 3D printer, which turns the file into a working three-dimensional model). The models that are "printed out" are functional, meaning that, in complex designs, the "screws turn, pistons slide, and you can test" the designs. *Id.*

75. This process is done using computer-aided design ("CAD") software on a computer and then the part is saved as a file. *See* Lawrence S. Gould, *A Couple of Cool Tools for Designers*, Automotive Design & Production, May 2004, at 66, 66 (describing how parts are created using their geometric descriptions, such as how a shaft is created by extruding a circle along a line or how a spring is created by extruding a cross section along a helix); *see also CAD/CAM Software & Control Systems*, Tooling & Production, Aug. 2004, at 72, 74 (explaining that with CAD/CAM software a user can "machine" a model by simply using a computer mouse); Sara Tambascio, *The Virtual World Meets the Factory*, Tooling & Production, Apr. 2004, at 38, 38 (describing how "digital manufacturing" can be used to discover and correct any problems with designs before "any metal is cut").

machine that can "print out" the part.[76] The "printed" parts can be made out of various materials, including rigid plastics and metals.[77]

As technology advances, the creation of the physical part will require less input and will become a more trivial task.[78] As such, the process of creating the part on the computer and turning it into a physical part can be separated by vast distances.[79] Much like what is being done with software, computer files containing the parts that were created in the United States can be sent abroad using a golden

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76. One method of creating parts, which is more traditional, involves sending a file containing a digital representation of a part to a machine that removes excess material from a solid block of raw material until only the desired part remains. *See* Patrick Waurzyniak, *Rapid Metal*, Manufacturing Engineering, Nov. 2003, at 49, 50 (discussing CNC machining, which is a method of creating parts using traditional machines, such as mills and lathes, that are controlled by computers). Another method involves sending a file containing a digital representation of a part to a machine that adds raw material layer by layer until the desired part is created. This process is sometimes known as three-dimensional printing, and could be seen as a great advancement over traditional manufacturing techniques. *See id.* at 53 (describing rapid prototyping processes, which, among others, includes using ink-jet printer technology where, instead of using ink, the machine prints with metal).

77. *See id.* at 49, 54 (indicating that materials available for rapid prototyping range from plastics to metals such as "high-strength [metal] alloys, including titanium and Inconel").

78. One company offers a service called "From CAD to Steel Directly," where a three-dimensional model created on any CAD software can be inputted directly into its machines and transformed from a digital part to a physical part. *See id.* at 53 (describing one company's "direct manufacturing" process, which is like rapid prototyping except that the parts are made from the material that is desired for final production, rather than a nonfunctional prototype material); *see also supra* note 73 (indicating that need for human intervention in the manufacturing process is nearly eliminated). Additionally, the development of simulation software is an advance in CNC manufacturing technology that allows designers to determine if their parts are physically capable of being created using CNC machines, allowing a smoother transition from CAD file to physical part. *See* Jeff Werner, *Simulation Ensures Machining Accuracy: Saves Programming Time, Frees Up Machines*, Tooling & Production, July 2004, at 30, 32 (describing creating "virtual manufacturing models" and using software to run simulations of the machining process, which can also be used to "check the capabilities and limitations of the machine" that will be used to create the part); *see also* Tambascio, *supra* note 75, at 38-39 (indicating that simulations can be used to determine if there will be problems in the final manufacturing stage so that changes can be made while still in the "virtual stage" before any physical machining takes place, thereby saving time and money). It is also possible to conduct advanced analysis simulations using CAD software, including interference checking to determine if assemblies will fit together properly; stress, heat, and vibration simulations to locate weaknesses in the components; and kinematics studies that animate the models to determine how they will operate, which will allow engineers to perfect the components, all before a single part is ever physically created. *See* Andrew Anagnost, *Redesigning the Design Department*, Machine Design, July 8, 2004, at 84, 84-85.

79. *See* Glenn Kennedy, *Web-Based Services for MCAD: Internet Makes Training, File Translation, and Prototyping More Accessible*, CADalyst, Feb. 2003, at 43, 44 (describing that, after CAD files are provided over the internet, one rapid prototyping company provides a service such that, "[w]hen you're ready to order click a button, and your model is delivered the next day at no extra charge").

master or an encrypted electronic transfer, allowing the parts to be replicated abroad.[80]

This background information is helpful in facilitating an understanding of how patent law and technology relate to each other. The next part of this Note discusses how the courts have already begun to apply the law to some of these new technologies.[81]

II. RECENT DEVELOPMENTS IN THE CASE LAW

While the case law applying § 271(f) to software and virtual component technology is certainly sparse, controversy over whether § 271(f) should apply to software has begun to appear in the federal district courts.[82] Over the last two years, at least three district courts have considered whether the exportation of software gives rise to infringement liability under § 271(f).[83] The Federal Circuit has also very recently weighed in on the debate over whether § 271(f) should apply to software in its opinion in *Eolas Technologies Inc. v. Microsoft Corp.*[84] While the Federal Circuit held that § 271(f) applies to software,[85] the opinion may have left some issues unresolved.

However, in order to fully understand and resolve the issues surrounding the application of § 271(f) to software and virtual components, it is necessary first to examine the federal district court cases that have applied § 271(f) to software. In addition to the district court cases, the Federal Circuit decision in *Pellegrini v. Analog Devices, Inc.*[86] requires some discussion because it may have an impact on how § 271(f) is applied to software and virtual components. With a background discussion of *Pellegrini* and the district court cases provided in Parts II.A-D, Part II.E then discusses arguments both in support of, and in opposition to, the application of § 271(f) to software and virtual components. Lastly, Part II.F examines the Federal

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80. *See id.* at 43-44 (indicating that, once a CAD file is received, a physical part can be created).

81. *See infra* Parts II.A-D.

82. *See* AT & T Corp. v. Microsoft Corp., No. 01 Civ.4872, 2004 WL 406640, at *1 (S.D.N.Y. Mar. 5, 2004); Imagexpo, L.L.C. v. Microsoft Corp., 299 F. Supp. 2d 550 (E.D. Va. 2003); Eolas Techs., Inc. v. Microsoft Corp., 274 F. Supp. 2d 972 (N.D. Ill. 2003), *aff'd*, Eolas Techs. Inc. v. Microsoft Corp., No. 04-1234, 2005 WL 475391, at *1 (Fed. Cir. Mar. 2, 2005). The district court in *NTP, Inc. v. Research in Motion, Ltd.* held under one theory of liability that memory and application programs are components and that the combination of those components with a processor outside the United States is infringement under § 271(f). NTP, Inc. v. Research in Motion, Ltd., 261 F. Supp. 2d 423, 431 (E.D. Va. 2002). On appeal, however, the Federal Circuit found infringement under § 271(a), and therefore, did not find it necessary to address the § 271(f) issue. NTP, Inc. v. Research in Motion, Ltd., 392 F.3d 1336, 1366-67 (Fed. Cir. 2004).

83. *See supra* note 82.

84. No. 04-1234, 2005 WL 475391, at *1 (Fed. Cir. Mar. 2, 2005).

85. *Id.* at *14.

86. 375 F.3d 1113 (Fed. Cir.), *cert. denied*, 125 S. Ct. 642 (2004).

Circuit opinion in *Eolas*, followed by an analysis of its implications in Part III.A.[87]

A. Eolas Technologies, Inc. v. Microsoft Corp. *(The District Court Case)*

In *Eolas Technologies, Inc. v. Microsoft Corp.*,[88] Eolas sued Microsoft for patent infringement, claiming that Microsoft had incorporated Eolas's invention into units of Windows with Internet Explorer.[89] Microsoft then moved to prevent the units that were produced and sold outside of the United States from being included in the damage assessment.[90]

The court first concluded that the final assembly, when Internet Explorer was installed onto the hard drive of a computer, occurred outside of the United States, and that, therefore, there was no liability under § 271(a).[91] The court then analyzed Microsoft's actions under § 271(f).[92]

Microsoft was shipping Windows source code on computer disks known as golden masters to foreign original equipment manufacturers ("OEMs").[93] The OEMs were then replicating new units of Windows using the single golden master.[94] The replicated code was then installed on a computer disk or hard drive, which was supplied by the foreign OEMs.[95] Microsoft argued that the golden master, which itself was not installed on any computer system, was not a component of the patented invention within the meaning of § 271(f).[96]

The court began its analysis by analogizing this case to the chemical compound case of *W.R. Grace*.[97] Microsoft argued that the golden master is more like a chemical formula than the ingredients used for making a chemical compound.[98] However, the court disagreed, holding that source code is more like an ingredient, because the desired result is a "compound product of the programmable machine (a computer) and Windows code[, which] is made from code and

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87. *See infra* Part III.A.
88. 274 F. Supp. 2d 972 (N.D. Ill. 2003), *aff'd*, Eolas Techs. Inc. v. Microsoft Corp., No. 04-1234, 2005 WL 475391, at *1 (Fed. Cir. Mar. 2, 2005).
89. *Id.* at 973.
90. *Id.*
91. *Id.*
92. *Id.*
93. *Id.*
94. *Id.*
95. *Id.*
96. *Id.*
97. *Id.* (discussing W.R. Grace & Co.—Conn. v. Intercat, Inc., 60 F. Supp. 2d 316 (D. Del. 1999)); *see also supra* notes 41-45.
98. *Eolas Techs., Inc.*, 274 F. Supp. 2d at 973-74.

hardware together."[99]   The court held that Microsoft's actions could give rise to infringement liability under § 271(f).[100]

After a verdict in Eolas's favor, Microsoft asserted, in a motion for JMOL, that the Federal Circuit's newly issued opinion in *Bayer A.G. v. Housey Pharmaceuticals, Inc.* required a modification of the court's decision to allow the foreign sales of software to be included in the damages calculation.[101]   *Bayer* involved patents covering methods of identifying substances that had an effect on particular proteins, which could in turn be used to develop new drugs.[102] The *Eolas* district court noted, "[i]n *Bayer*, the Federal Circuit found that the process patent at issue did not fall within the parameters of 35 U.S.C. Section 271(g) because it yielded only intangible information and not a physical product."[103]   Microsoft maintained that the "physical" requirement of *Bayer* should apply and, because the source code is intangible information, the court should reverse its decision.[104]   The judge rejected this argument, stating as follows:

> For the reasons laid out in my August 1, 2003 opinion, I disagree. The source code contained on the "golden master" is not intangible information but is instead a real and substantial part of the final product. Because I find that the source code present on the "golden master" is not intangible information, *Bayer* does not affect my decision.[105]

The court denied Microsoft's motions to exclude foreign sales from the calculation of damages.[106]

B. Imagexpo, L.L.C. v. Microsoft Corp.

In *Imagexpo, L.L.C. v. Microsoft Corp.*,[107] a case very similar to *Eolas*, Microsoft again moved to exclude units of software replicated outside of the United States from being included in a damages calculation.[108]   Imagexpo accused Microsoft of exporting infringing NetMeeting software.[109]   The software was first developed in the

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99. *Id.* at 974.
100. *Id.*
101. Bayer A.G. v. Housey Pharmaceuticals, Inc., 340 F.3d 1367 (Fed. Cir. 2003); Eolas Techs. Inc. v. Microsoft Corp., No. 99 C 0626, 2004 WL 170334, at *4 (N.D. Ill. Jan. 15, 2004), *aff'd in part, vacated in part*, Eolas Techs. Inc. v. Microsoft Corp., No. 04-1234, 2005 WL 475391, at *1 (Fed. Cir. Mar. 2, 2005) (challenging the district court's interpretation in *Eolas* of § 271(f) based on the Federal Circuit's decision in *Bayer*).
102. *See Bayer*, 340 F.3d at 1369.
103. *Eolas*, 2004 WL 170334, at *4.
104. *Id.*
105. *Id.*
106. *Id.* at *9.
107. 299 F. Supp. 2d 550 (E.D. Va. 2003).
108. *Id.* at 551; *see supra* Part II.A (discussing the facts of *Eolas*).
109. *Imagexpo*, 299 F. Supp. 2d at 551.

United States and then, as in *Eolas*, it was sent to foreign-based replicators on golden masters.[110]

The court addressed Microsoft's assertion that it could not be held liable under § 271(f) because software could not be considered a component.[111] Microsoft, relying on the decision in *Enpat*, maintained that "the term 'component' denotes a tangible, physical element of a patented device, commonly associated with an apparatus claim."[112] In Microsoft's view, the "exported software code is a template" and "it merely exports the template itself and not some tangible, physical object."[113] Microsoft therefore claimed it could not be held liable for infringement under § 271(f).[114]

Imagexpo first challenged Microsoft's arguments by asserting that there was "no legal basis for Microsoft's attempt to engraft a tangibility requirement into the definition of 'component.'"[115] Imagexpo further argued that the computer code contained on the golden master is the "functional nucleus of the finished computer product."[116]

The court ultimately disagreed with Microsoft and denied its motion to bar damages under § 271(f).[117] In the court's opinion, "the 'golden master' and the electronic codes supplied by Microsoft to its overseas representatives constitute[d] 'components' under 35 U.S.C. § 271(f)."[118]

C. AT & T Corp. v. Microsoft Corp.

In *AT & T Corp. v. Microsoft Corp.*,[119] AT & T sued Microsoft for infringing an AT & T patent[120] by selling products containing speech signal compression and decompression software.[121] The question before the court was whether foreign-replicated copies of the software, which were created from either a golden master or an encrypted electronic transmission, could be included as part of the damages under § 271(f).[122]

The court first addressed Microsoft's argument that the software was "merely 'intangible information,' and thus not a 'component' as

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110. *Id.* at 551-52; *see supra* Part II.A (discussing the facts of *Eolas*).
111. *Imagexpo*, 299 F. Supp. 2d at 552.
112. *Id.; see supra* notes 53, 56-58, 62 and accompanying text (discussing Enpat, Inc. v. Microsoft Corp., 6 F. Supp. 2d 537 (E.D. Va. 1998)).
113. *Imagexpo*, 299 F. Supp. 2d at 552.
114. *Id.*
115. *Id.* at 553.
116. *Id.*
117. *Id.*
118. *Id.*
119. No. 01 Civ.4872, 2004 WL 406640, at *1 (S.D.N.Y. Mar. 5, 2004).
120. U.S. Reissue Patent No. 32,580 (issued Jan. 19, 1988).
121. *AT & T*, 2004 WL 406640, at *1 n.1.
122. *Id.* at *1.

contemplated by Section 271(f)."[123] However, the court recognized that "[i]t is well-established . . . that software can be a component of a patented invention or infringing device."[124] Next, it considered Microsoft's request that it narrowly construe the term "component" in § 271(f) to exclude software.[125] The court declined to adopt such a narrow interpretation, finding "no limitation of the term 'components,' either in the statutory text or in the legislative history, to machines or other structural combinations."[126] The court cited *W.R. Grace*,[127] which found § 271(f) liability for supplying chemical compounds,[128] and *Moore U.S.A. Inc. v. Standard Register Co.*,[129] which found that paper, glue, and blueprints were components under § 271(f),[130] as support for not reading such a limitation into the statute.[131]

However, in light of the Federal Circuit's decision in *Bayer*, Microsoft urged the court to find a tangibility requirement in § 271(f).[132] In *Bayer*, "the Federal Circuit stated that the term 'component' in section 271(g) 'appears to contemplate a physical product.'"[133] The *AT & T* court first referred to that statement in *Bayer* as dicta and then held that it was not applicable to § 271(f) because "(1) *Bayer* only applies to Section 271(g); and (2) the 'information' or 'data processing' that resulted from a patented process in *Bayer* is completely unrelated to the software or object code at issue here."[134]

The court then dealt with Microsoft's attempt to analogize its software to a "'mold' for tires."[135] The court ultimately found this analogy unpersuasive:

> Microsoft argues that its software, like the foreign-molded tires, cannot be said to be components of the patented combination "supplied" from the United States because Section 271(f) looks to the place from which the "component" in question was made and supplied. Unlike the tires that are manufactured from a mold, however, the software here has already been manufactured in, and

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123. *Id.* at *4.
124. *Id.*
125. *Id.* at *5.
126. *Id.*
127. W.R. Grace & Co.—Conn. v. Intercat, Inc., 60 F. Supp. 2d 316 (D. Del. 1999); *see supra* notes 42-45 and accompanying text.
128. *W.R. Grace*, 60 F. Supp. 2d at 320-21.
129. 144 F. Supp. 2d 188 (W.D.N.Y. 2001); *see infra* notes 209-11 and accompanying text.
130. *Moore*, 144 F. Supp. 2d at 195.
131. *AT & T*, 2004 WL 406640, at *5.
132. *Id.* at *6.
133. *Id.* (citing Bayer AG v. Housey Pharms., Inc., 340 F.3d 1367, 1376-77 (Fed. Cir. 2003)).
134. *Id.* (footnote omitted).
135. *Id.* at *7.

supplied from, the United States and is only copied abroad—the software is not a mold for the creation of another separate type of component.[136]

The court was of the opinion that "the software itself is the component, or the 'tire,' rather than a mold."[137]

D. Pellegrini v. Analog Devices, Inc.

The decision in *Pellegrini v. Analog Devices, Inc.*[138] is one of the more recent Federal Circuit cases to interpret § 271(f).[139] However, *Pellegrini* did not deal with software technology; rather, the matter of first impression before the court was whether instructions or corporate oversight could be a component under § 271(f).[140]

Pellegrini claimed that a line of the defendant's integrated circuit chips called "ADMC" chips infringed on its patent for a brushless motor drive circuit.[141] Pellegrini contended that, among other things, "Analog is incorporated in the United States and has executive, marketing, and product line responsibilities for ADMC products; that Analog conceived and designed the ADMC products; that Analog is the exclusive manufacturer of ADMC products; [and] that Analog makes all development and production decisions for ADMC products."[142] Additionally, Pellegrini asserted that "Analog receives purchase orders from and invoices customers worldwide for ADMC products and increases production levels for ADMC products in response to those purchase orders."[143] However, none of the infringing chips were physically manufactured in the United States.[144]

The question before the court was whether

> components that are manufactured outside the United States and never physically shipped to or from the United States may nonetheless be "supplie[d] or cause[d] to be supplied in or from the United States" within the meaning of 35 U.S.C. § 271(f)(1) if those components are designed within the United States and the instructions for their manufacture and disposition are transmitted from within the United States.[145]

The court ruled that "'[S]uppl[ying] or caus[ing] to be supplied' in § 271(f)(1) clearly refers to physical supply of components, not simply

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136. *Id.*
137. *Id.* (discussing how rubber is added to a mold to create a tire).
138. 375 F.3d 1113 (Fed. Cir.), *cert. denied*, 125 S. Ct. 642 (2004).
139. *Id.* at 1115-16.
140. *Id.* at 1116-18.
141. *Id.* at 1114.
142. *Id.* at 1116.
143. *Id.*
144. *Id.* at 1117.
145. *Id.* at 1115 (alterations in original) (quoting 35 U.S.C. § 271(f)(1) (2000)).

to the supply of instructions or corporate oversight."[146] The court held that, even though Analog may have been "giving instructions from the United States that cause the components of the patented invention to be supplied," the fact that the components were not physically present in the United States prevented liability from attaching under § 271(f)(1).[147]

An examination of the recent cases reveals that courts have attempted to adapt the law to accommodate developments in technology, and some interesting arguments applying § 271(f) have emerged from the opinions.[148] Part II.E explores these and other arguments in further detail to illustrate some of the issues surrounding the application of § 271(f) to new technologies.[149]

E. *Discussion of the Arguments*

This Part II.E provides further development of the arguments both in support of, and in opposition to, extending § 271(f) coverage to include software and virtual components.[150] These arguments, however, are based on the case law prior to the recent Federal Circuit decision in *Eolas*. The implications of *Eolas* for these arguments are discussed in Part III.A.[151]

The discussions of the individual arguments begin with an application of the argument to software technology, followed by an adaptation of the argument to virtual component technology. There is very little case law that directly applies to virtual components.[152] Thus, this Note discusses the arguments regarding software, and then applies those arguments, by analogy, to virtual component technology.[153]

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146. *Id.* at 1118 (alterations in original). The court stated that "Analog does not make, use, sell, or offer to sell ADMC products in the United States.... Analog also does not supply ADMC chips in or from the United States, and does not cause ADMC chips to be supplied in or from the United States. Thus,... § 271(f)(1) is inapplicable." *Id.*

147. *Id.* at 1118-19.

148. *See supra* Parts II.A-D.

149. *See infra* Part II.E.

150. While the Federal Circuit may have adopted some of the arguments with respect to software on "golden masters" in *Eolas*, it is important to examine both sides of the debate to determine whether § 271(f) may be applied to virtual components and how future courts will apply the *Eolas* decision.

151. *See infra* Part III.A.

152. Arguably, *Pellegrini* involved one aspect of virtual component technology; however, the court did not address the issue in its holding. *See supra* notes 69-70.

153. The arguments addressed here are mainly based on the federal district court opinions in *Imagexpo*, *Eolas*, and *AT & T*, which apply § 271(f) to software. *See supra* Parts II.A-C. Any predictions about the implications of the Federal Circuit opinions in *Eolas* and *Pellegrini* are reserved for discussion *infra* Part III.A. For a discussion of additional arguments that may apply to software and § 271(f) infringement liability, see Fisch & Allen, *supra* note 34.

1. Arguments for Limiting Application of § 271(f) to Software and Virtual Components

a. *The Term "Component," Under § 271(f), Contemplates a Physical Part*

One argument that has been made is that "the term 'component' denotes a tangible, physical element of a patented device"[154] and that there needs to be some physical product present.[155] There is, debatably, some support for this argument in the history of the statute.[156] Congress enacted § 271(f) specifically to overrule the Supreme Court's holding in *Deepsouth*.[157] *Deepsouth* involved the export of machine parts—which are physical, tangible elements—for assembly abroad.[158] Therefore, as the reasoning goes, because Congress was only addressing this specific case, it was not contemplating that software—which is intangible information—would be covered by § 271(f).[159]

This argument could withstand the holding of *W.R. Grace*.[160] In *W.R. Grace*, the defendant argued that because *Deepsouth* only involved machine parts, § 271(f) should be limited to cover structural components.[161] The court rejected this argument, finding no reason for distinguishing between machine components and chemical

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154. Imagexpo, L.L.C. v. Microsoft Corp., 299 F. Supp. 2d 550, 552 (E.D. Va. 2003).

155. AT & T Corp. v. Microsoft Corp., No. 01 Civ.4872, 2004 WL 406640, at *4 (S.D.N.Y. Mar. 5, 2004) ("Microsoft argues that its infringing software must be a 'physical product' to constitute a 'component' under Section 271(f)."); *see* Eolas Techs. Inc. v. Microsoft Corp., No. 99 C 0626, 2004 WL 170334, at *4 (N.D. Ill. Jan. 15, 2004), *aff'd in part, vacated in part*, Eolas Techs. Inc. v. Microsoft Corp., No. 04-1234, 2005 WL 475391, at *1 (Fed. Cir. Mar. 2, 2005) (discussing Microsoft's argument that a "physical product" requirement should apply). However, it is worth noting here that the statute uses the phrase "component(s) of a patented invention," 35 U.S.C. § 271(f) (2000), and not "components of a patented product," which is what it seems Microsoft was arguing, *AT & T*, 2004 WL 406640, at *4. The two may not mean the same thing because "invention" is arguably broader than "product." *See infra* notes 247-48 and accompanying text (indicating that the term "invention" is broad).

156. *See* W.R. Grace & Co.—Conn. v. Intercat, Inc., 60 F. Supp. 2d 316, 320-21 (D. Del. 1999) (discussing § 271(f) and its legislative history to determine whether the statute is confined to the specific facts of *Deepsouth*, thereby limiting application only to mechanical or structural components); Fisch & Allen, *supra* note 34, at 576-77 (indicating that there is some support in the legislative history for limiting § 271(f) to tangible components); *see also supra* note 24 and accompanying text (discussing legislative history of § 271(f)).

157. *See supra* note 20 and accompanying text.

158. *See* Deepsouth Packing Co. v. Laitram Corp., 406 U.S. 518, 523-24 (1972).

159. Fisch & Allen, *supra* note 34, at 576-77; *see also AT & T*, 2004 WL 406640, at *5 (citing *W.R. Grace* and considering the legislative history of § 271(f) to determine the statute's applicability to software).

160. *W.R. Grace*, 60 F. Supp. 2d at 321; Fisch & Allen, *supra* note 34, at 576-77.

161. *See W.R. Grace*, 60 F. Supp. 2d at 320.

components.[162]   However, the *W.R. Grace* court merely found no distinction between various tangible components.[163]   It could be argued that the holding does not directly bear on the issue of whether there should be a distinction between tangible and intangible components.[164]

The argument against application to software would also apply in the case of virtual components because of their similar "intangible" nature.[165]   Virtual components are merely digital representations of a physical part.[166]   They are really just intangible information, much like software.[167]   Until the component is "printed out" and converted into physical form, it remains intangible.[168]   Applying the same reasoning for not including software, it could equally be argued that virtual components were not what Congress intended § 271(f) to cover.[169]

b. *Software Sent Abroad Is More Like a Formula and Not a Component*

Another argument is that the golden master, the disk the software is exported on, is more like a formula than a component.[170]   Likening software to a chemical formula, the reasoning is that the disk is only a set of instructions for making a chemical compound, and not the ingredients for that compound.[171]   The code on the disk is not a part of the final product—which is the patented invention—but, like a chemical formula, it is only instructions given to a computer.[172]   Therefore, the golden master containing the code cannot be a component of the patented invention.[173]

Again, because of the similarities in their nature, this chemical formula analogy could also apply in the case of virtual components.[174]

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162. *See id.* at 320-21.
163. *See id.*
164. *See* Fisch & Allen, *supra* note 34, at 577 & n.96 (citing *W.R. Grace* in support of the proposition that "§ 271(f) generally has been applied by courts only to tangible items manufactured in the United States"); *see also AT & T*, 2004 WL 406640, at *5.
165. *See supra* text accompanying note 71. For a discussion of how both software and virtual components can be "manufactured" on computers and how they can be sent vast distances via electronic transmission for replication, see *supra* notes 72, 75, 79-80, 122, 136 and *infra* note 234 and accompanying text.
166. *See supra* Part I.B.2.
167. *See supra* note 75.
168. *See supra* notes 75-76 and accompanying text.
169. *See supra* notes 20, 111-12 and accompanying text.
170. Eolas Techs., Inc. v. Microsoft Corp., 274 F. Supp. 2d 972 (N.D. Ill. 2003), *aff'd*, Eolas Techs. Inc. v. Microsoft Corp., No. 04-1234, 2005 WL 475391, at *1 (Fed. Cir. Mar. 2, 2005).
171. *Id.*
172. *Id.* at 974 (discussing Microsoft's argument analogizing the golden master to a chemical formula). Additionally, the court noted that a "chemical formula . . . is not part of any product." *Id.*
173. *Id.*
174. *See supra* text accompanying note 71. For a discussion of how both software

The computer file containing the virtual component is not a part of the final output, which would be a physical part, but rather, the file is analogous to instructions that are given to the "printer."[175] The printer then uses the file to create the part.[176] Like the golden masters used to create copies of software, the file is not a component of the patented invention; it is only used to create it, and therefore, would not give rise to § 271(f) liability.[177]

c. *Software Sent Abroad Is More Like a Mold for Creating Foreign-Replicated Copies*

The golden master containing the software can also be likened to a template, much like a mold for a tire.[178] When the golden master is sent abroad it is used by the foreign replicators to create additional copies, and it is these copies that are actually incorporated into the computers.[179] The golden master is simply a template from which all other copies are created.[180] It could be argued that there should be no infringement under § 271(f) because, just as a mold is not part of any tire, the golden master is not part of any computer, and therefore, is not a component of a patented invention.[181]

This analogy would also apply to virtual components. The virtual component file is only used to create physical copies of the components, and is not itself a component.[182] Likewise, as with any mold, the virtual component file is not incorporated into the final product, and therefore cannot be a component of the invention.[183]

d. *Policy Dictates that § 271(f) Should Not Apply to Software*

Some opponents have argued that permitting § 271(f) to apply in the case of software exportation would stifle American competition

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and virtual components can be "manufactured" on computers and how they can be sent vast distances via electronic transmission for replication, see *supra* notes 72, 75, 79-80, 122, 136 and *infra* note 234 and accompanying text.

175. *See supra* notes 72, 74, 76 and accompanying text.

176. *See supra* notes 72, 74, 76 and accompanying text.

177. *See supra* notes 72, 74, 76 and accompanying text; *see also supra* notes 170-73 and accompanying text.

178. *See supra* notes 135-37 and accompanying text (discussing the argument Microsoft made in *AT & T*).

179. *See supra* notes 91, 93-95 and accompanying text.

180. *See supra* notes 91, 93-95 and accompanying text.

181. *See* AT & T Corp. v. Microsoft Corp., No. 01 Civ.4872, 2004 WL 406640, at *7 (S.D.N.Y. Mar. 5, 2004).

182. *See supra* notes 72, 74, 76 and accompanying text.

183. *See supra* notes 72, 74, 76 and accompanying text; *see also supra* text accompanying notes 178-81.

and innovation.[184]   Applying § 271(f) in this way would prevent American companies from competing with a patent holder in foreign markets.[185]   In order to compete, companies would either have to move the creation of the golden masters abroad, or in the worst case, the entire development of the software would have to be moved abroad as well.[186] This could potentially have a negative impact on the American job market.[187] The result would be either that American companies simply could not compete in foreign markets once there is a United States patent issued on an invention, or that they would have to move their entire development operations abroad so that the golden master was never in the United States.[188] This prevents domestic manufacturers from competing with a patent holder, while foreign companies can compete without infringing the United States patent.[189]

By analogy, it would seem that § 271(f) liability would also pose the same problem for American companies who develop virtual components. Instead of just having the parts "printed out" abroad, they would have to move the entire development of the virtual components abroad.[190] This would mean moving engineering and design operations abroad.[191] As such, domestic companies would not be able to compete in foreign markets with other American companies who only possess a United States patent.[192]

2. Arguments Supporting Application of § 271(f) to Software and Virtual Components

a. *Section 271(f) Is Not Limited to Tangible Components*

There is no clear indication in the language or the legislative history of § 271(f) that Congress intended to limit its coverage to physical components only.[193] According to one federal district court, "[t]he plain language of the statute limits its application only to a

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184. *See AT & T*, 2004 WL 406640, at *8; *see also* Marc J. Pensabene & Jonathan Berschadsky, *Software Patent Damages for Foreign Sales: Have the District Courts Gone Too Far?*, Computer & Internet Law., July 2004, at 23, 27.

185. *See AT & T*, 2004 WL 406640, at *8.

186. *See id.*; Pensabene & Berschadsky, *supra* note 184, at 27.

187. *See* Pensabene & Berschadsky, *supra* note 184, at 27.

188. *See AT & T*, 2004 WL 406640, at *8 & n.8; Pensabene & Berschadsky, *supra* note 184, at 27.

189. *See AT & T*, 2004 WL 406640, at *8.

190. *See id.*; Pensabene & Berschadsky, *supra* note 184, at 27.

191. *See AT & T*, 2004 WL 406640, at *8 & n.8; Pensabene & Berschadsky, *supra* note 184, at 27.

192. *See AT & T*, 2004 WL 406640, at *8; Pensabene & Berschadsky, *supra* note 184, at 27.

193. *See supra* notes 21-24 and accompanying text.

'component of a patented invention.'"[194]   The legislative history indicates that the addition of § 271(f) was "to avoid encouraging manufacturing outside the United States."[195] Following the logic in *W.R. Grace*, limiting § 271(f)'s application to tangible components "would be tantamount to legislating additional language to a statute."[196] Additionally, in *Diamond v. Diehr*, a case that opened the door for the patenting of software, the Supreme Court stated that, "in dealing with the patent laws, we have more than once cautioned that 'courts should not read into the patent laws limitations and conditions which the legislature has not expressed.'"[197]   Additionally, the legislative history indicates that § 271(f) should be adaptive to changing technologies.[198]

Under this rationale, there is no reason why § 271(f) should not apply to software.[199] The United States Patent & Trademark Office

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194. W.R. Grace & Co.—Conn. v. Intercat, Inc., 60 F. Supp. 2d 316, 321 (D. Del. 1999).

195. Section-By-Section Analysis: Patent Law Amendments of 1984, 130 Cong. Rec. 28,065, 28,069 (submission of Rep. Kastenmeier), *reprinted in* 1984 U.S.C.C.A.N. 5827, 5827.

196. *W.R. Grace*, 60 F. Supp. 2d at 321.

197. Diamond v. Diehr, 450 U.S. 175, 182 (1981) (quoting Diamond v. Chakrabarty, 447 U.S. 303, 308 (1980) (citation omitted)). In 1978, the Supreme Court stated in *Parker v. Flook* that "[i]t is our duty to construe the patent statutes as they now read . . . and we must proceed cautiously when we are asked to extend patent rights into areas wholly unforeseen by Congress." Parker v. Flook, 437 U.S. 584, 596 (1978). Using this cautious approach, the Court determined that the computer program at issue was not patentable subject matter under 35 U.S.C. § 101 (2000). *Flook*, 437 U.S. at 595 n.18. Interestingly, this narrow approach to statutory interpretation was based on the decision in *Deepsouth*, where the Court stated that it would "require a clear and certain signal from Congress" before it would expand patent protection based on "ambiguous statutory language." Deepsouth Packing Co. v. Laitram Corp, 406 U.S. 518, 531 (1972) (adopting a narrow interpretation of 35 U.S.C. § 271(a) and holding that manufacturing the components of an invention was not sufficient for infringement because the defendant did not "make" the patented invention until it was fully assembled). However, in 1980, the Court in *Diehr* retreated from its view in *Flook*, stating that "'courts should not read into the patent laws limitations and conditions which the legislature has not expressed.'" *Diehr*, 450 U.S. at 182, 192-93 (quoting *Chakrabarty*, 447 U.S. at 308 (citation omitted), and then interpreting 35 U.S.C. § 101 broadly enough to allow for the patenting of a computer program); *see also* John T. Soma et al., *Software Patents: A U.S. and E.U. Comparison*, 8 U. Balt. Intell. Prop. L.J. 1, 14-15 (1999). The Court's change in position in *Diehr*, a departure from *Flook* and *Deepsouth*, along with Congress's enactment of § 271(f), which closed the loophole created by the Court's narrow interpretation of § 271(a) in *Deepsouth*, supports the argument that courts should not read limitations and conditions into § 271(f) as well.

198. Section 271(f) was enacted as part of an attempt to make the patent laws more "responsive to the challenges of a changing world." 130 Cong. Rec. 28,065, 28,069 (statement of Rep. Kastenmeier). The court in *AT & T* indicated that excluding software from protection would frustrate this legislative intent. *See* AT & T Corp. v. Microsoft Corp., No. 01 Civ.4872, 2004 WL 406640, at *5 (S.D.N.Y. Mar. 5, 2004).

199. *See AT & T*, 2004 WL 406640, at *5; Fisch & Allen, *supra* note 34, at 580, 582 ("Any attempt to add a 'tangibility' requirement to § 271(f) not only ignores the clear

Manual of Patent Examining Procedure (the "MPEP") treats software as patentable subject matter, indicating that "[w]hen a computer program is recited in conjunction with a physical structure, such as a computer memory, [Patent & Trademark] Office personnel should treat the claim as a product claim."[200] Moreover, merely storing the software on a golden master would seem to be enough to make it patentable.[201] The court in *AT & T* noted that "[i]t is well-established ... that software can be a component of a patented invention or infringing device."[202] Since software is itself a patentable component, it could be argued that it should also be treated as a component under § 271(f), even if it is not necessarily "tangible."[203]

It is somewhat more difficult to make this argument apply to virtual components because, unlike software, there is no explicit provision addressing the patentability of virtual components.[204] However, it is important to realize that virtual components do represent patentable components, just in digital form.[205] Recognizing this aspect of virtual component technology might permit an argument for equal treatment of both software and virtual component technologies under § 271(f). One could argue that because software has qualified for § 271(f) protection, even if it may be "intangible," the similarities between the technologies should lead to similar treatment under § 271(f).[206]

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caselaw holding that an apparatus can encompass a software component, but also effectively 'turns back the clock' on the evolution of patent law.").

200. U.S. Patent & Trademark Office, Manual of Patent Examining Procedure § 2106(IV)(B)(1)(a) (2003) [hereinafter MPEP].

201. In *In re Beauregard*, the Federal Circuit issued a precedential order remanding the case for further proceedings in accordance with the Commissioner of Patents and Trademarks' concession that "'computer programs embodied in a tangible medium, such as floppy diskettes, are patentable subject matter.'" *In re* Beauregard, 53 F.3d 1583, 1584 (Fed. Cir. 1995) (quoting the Commissioner of Patents and Trademarks).

202. *AT & T*, 2004 WL 406640, at *4. However, the court also seemed to indicate that software code stored on a tangible medium might be considered a tangible component for § 271(f) purposes. *See id.*

203. *See supra* notes 123-31 and accompanying text.

204. There is no provision in the Manual of Patent Examining Procedure ("MPEP") for virtual components like there is for software. *See* MPEP, *supra* note 200, § 2106(IV). However, the Patent & Trademark Office has been allowing claims to computer program signals embodied in a carrier wave, which may provide some support for the patentability of virtual components. *See* U.S. Patent No. 6,857,071 (issued Feb. 15, 2005) ("[Claim] 13. A computer program signal embodied in a carrier wave comprising ...."). If claims for programs embodied in carrier waves are statutory, it may be possible to claim a product, which has been modeled as a virtual component, as a signal embodied in a carrier wave. These types of claims are still relatively new and a full analysis of their implications is outside of the scope of this Note. For a more in-depth discussion of the ramifications of allowing "carrier wave" claims in the context of software, see Jeffrey R. Kuester et al., *A New Frontier in Patents: Patent Claims to Propagated Signals*, 17 J. Marshall J. Computer & Info. L. 75 (1998); and Dana M. Wilson, Note, *The Propagated Signal Claim: What Is It and What Are the Infringement Consequences?*, 6 J. Intell. Prop. L. 425 (1999).

205. *See supra* Part I.B.2.

206. There is no explicit tangibility requirement in the statute or legislative history.

However, while it has not been made in direct support of application of § 271(f) to software,[207] there is another argument that could possibly allow § 271(f) to cover both software and virtual components. This argument requires a broad reading of § 271(f) to include detailed designs or blueprints as "components." One of the early cases that discussed § 271(f) indicated that there was a question as to whether § 271(f) covered the "provision of plans."[208] In a more recent case, a federal district court in *Moore U.S.A. Inc. v. Standard Register Co.* considered this issue.[209] The defendant, Standard Register Company ("SRC"), was accused of infringing a patent for a type of mailing envelope because it exported supplies to, and manufactured the envelopes in, Switzerland.[210] The court, finding the defendant liable for infringement, held that "under section 271(f)(1), SRC representatives supplied 'a substantial portion' of the accused forms' components when they brought the necessary paper, glue, and blueprints with them from the United States."[211] The court's inclusion of the "blueprints" seems to indicate that blueprints could be considered a component of the patented invention.[212] Like blueprints, a virtual component is the information necessary to create a physical part.[213] Therefore, under a broad reading of § 271(f) that included blueprints as components, a virtual component could also be considered a component. An argument supporting the inclusion of

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See supra notes 21, 23-24 and accompanying text. These technologies are also very similar because they are both software-based. *See supra* text accompanying note 71. Additionally, even if software is patentable when it is in a tangible medium, when sent by encrypted electronic transmission it may be considered intangible, and therefore may not necessarily qualify for patent protection. *See* Kuester et al., *supra* note 204, at 75-76 (indicating that while a "propagated signal" claim is currently being treated as patentable, there are no statutes or case law supporting the "propagated signal" claim). *But see supra* note 204 (indicating that "carrier wave" claims are being permitted in patents). However, some courts have found that liability may arise when software is sent by electronic transmission, which would make the argument for equal treatment under § 271(f) stronger because there is very little difference between sending software data electronically and sending virtual component data electronically. *See AT & T*, 2004 WL 406640, at *8 (finding that software sent via electronic transmission may give rise to § 271(f) liability); *see also supra* Part I.B (discussing software and virtual component technologies).

207. However, without fully discussing its implications, the court in *AT & T* did cite the holding in *Moore* that "paper, glue and blueprints" were components under § 271(f). *AT & T*, 2004 WL 406640, at *5 (citing Moore U.S.A. Inc. v. Standard Register Co., 144 F. Supp. 2d 188, 195 (W.D.N.Y. 2001)).

208. Smith Int'l, Inc. v. Hughes Tool Co., No. CV 72-1231, 1986 WL 4795, at *31 (C.D. Cal. Mar. 12, 1986), *vacated as moot*, 839 F.2d 663 (Fed. Cir. 1988). However, the court ultimately did not rule on the issue because it found that the shipments occurred before § 271(f) became effective. *See id.*

209. *Moore*, 144 F. Supp. 2d at 195.

210. *Id.*

211. *Id.* at 195-96. The court mentioned the blueprints several times throughout the opinion. *See id.* at 190, 193, 195-96.

212. *See id.*

213. *See supra* Part I.B.2 (describing virtual component technology).

blueprints as components, along with the fact that there is no explicit tangibility requirement in the statute, would seem to enlarge the scope of § 271(f) enough to provide coverage for both software and virtual components.

b. *Software Sent Abroad Is Not a Formula, but Rather an Ingredient*

The counterargument to the chemical formula analogy requires viewing software as an ingredient.[214] Software cannot be used by itself; it has to be "added" to a computer system to achieve the desired result.[215] Another distinction is that a "chemical formula can be memorized (as many complex recipes are) and discarded, [whereas] source code has to be installed, never to be discarded."[216] Therefore, there is a strong argument that software is not like a formula and should be covered by § 271(f).

The argument that a virtual component is not a formula relies on accepting the concept, fully discussed below, that the component has already been manufactured on the computer.[217] Under this reasoning, the virtual component is not the formula for creating the part, because the part is already created.

c. *Software Sent Abroad Is Not Simply a Mold for Creating Foreign-Replicated Copies*

The counter to the tire mold analogy[218] recognizes that the software being sent abroad is more like the tire than the mold.[219] The software is the patented invention and that is exactly what is being exported — the only process being performed abroad is copying.[220] Unlike a tire mold, which requires the addition of rubber to create the patented invention — a tire — the software is complete by itself.[221]

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214. *See supra* Part II.E.1.b.
215. *See* Eolas Techs., Inc. v. Microsoft Corp., 274 F. Supp. 2d 972 (N.D. Ill. 2003), *aff'd*, Eolas Techs. Inc. v. Microsoft Corp., No. 04-1234, 2005 WL 475391, at *1 (Fed. Cir. Mar. 2, 2005); *see also In re* Alappat, 33 F.3d 1526, 1545 (Fed. Cir. 1994) (indicating that the addition of software to a general purpose computer creates a special purpose computer).
216. *Eolas*, 274 F.Supp. 2d at 974.
217. *See infra* Part II.E.2.c.
218. *See supra* Part II.E.1.c.
219. *See supra* notes 135-37 and accompanying text.
220. *See* AT & T Corp. v. Microsoft Corp., No. 01 Civ.4872, 2004 WL 406640, at *7 (S.D.N.Y. Mar. 5, 2004) ("[T]he object code is originally manufactured in the United States . . . .").
221. *See id.* ("Unlike the tires that are manufactured from a mold, however, the software here has already been manufactured in, and supplied from, the United States and is only copied abroad—the software is not a mold for the creation of another separate type of component.").

Some courts have been willing to recognize that software is made first in the United States.[222] Using this rationale, some courts have found that software qualifies for § 271(f) protection.[223] They have also been willing to find infringers liable for foreign-replicated copies, refusing to adopt a rule that would allow infringers to avoid liability by exporting only a few complete copies of the software in order to benefit from the efficiencies of making multiple copies abroad.[224] Under the theory that software is made in the United States, it could be argued that software is not like a mold for a component, but actually is the component, and therefore § 271(f) should apply.[225]

This argument is a little more difficult to make in the case of virtual components. Admittedly, raw material such as plastic needs to be added before a physical part is created from a virtual component, which might indicate that a virtual component is analogous to a mold.[226] However, a virtual component is not really a mold, because a mold is a distinct object separate from the part it creates; it is more like its negative image.[227] A virtual component is more analogous to the "tire" than the mold that is used to create it—the only difference is that it exists as a computer file.[228] This is similar to the copying of software.[229] However, instead of storing the files on a hard drive, the

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222. *See id.* ("[T]he object code is originally manufactured in the United States . . . ."); Eolas Techs., Inc. v. Microsoft Corp., 274 F. Supp. 2d 972 (N.D. Ill. 2003), *aff'd*, Eolas Techs. Inc. v. Microsoft Corp., No. 04-1234, 2005 WL 475391, at *1 (Fed. Cir. Mar. 2, 2005) ("[S]ource code is a made part of a computer product. In contrast, a chemical formula is discovered rather than made, and is not part of any product.").

223. *See AT & T*, 2004 WL 406640, at *7. This approach of focusing on steps completed in the United States may be further supported by the recent Federal Circuit decision in *NTP, Inc. v. Research in Motion, Ltd.*, where the court emphasized the word "wholly" when citing a past decision for the proposition that "'infringement of [a patent right] cannot be predicated on acts *wholly* done in a foreign country.'" NTP, Inc. v. Research in Motion, Ltd., 392 F.3d 1336, 1366 (citing Rotec Indus., Inc. v. Mitsubishi Corp., 215 F.3d 1246, 1251 (Fed. Cir. 2000) (citation omitted)).

224. *See AT & T*, 2004 WL 406640, at *7.

225. *See id.* ("Unlike the tires that are manufactured from a mold, however, the software here has already been manufactured in, and supplied from, the United States and is only copied abroad—the software is not a mold for the creation of another separate type of component.").

226. *See supra* notes 76-77 and accompanying text.

227. *See supra* notes 135-37 and accompanying text (describing how a mold is used to create a separate type of component); *see also AT & T*, 2004 WL 406640, at *7 ("Unlike the tires that are manufactured from a mold, however, the software here has already been manufactured in, and supplied from, the United States and is only copied abroad—the software is not a mold for the creation of another separate type of component.").

228. The virtual component is not a negative image of the part—it is the actual part because the machines print exactly what is modeled in the CAD file. *See supra* notes 74, 78 and accompanying text.

229. *See supra* note 224 and accompanying text.

virtual component is stored in plastic or metal.[230] It is in this crucial respect that a virtual component is not like a mold.

Additionally, under the same theory that software is "made" in the United States, courts may be willing to accept an argument that virtual components are also "made" to some degree in the United States.[231] As noted above, advances in CAD software allow engineers to complete the vast majority of the work involved in creating a component by simply using a computer.[232] Furthermore, advances in manufacturing equipment have made turning a CAD file into a physical part a more trivial task.[233] In essence, the engineer has manufactured the component on a computer.[234] The only difference is that the virtual component is the intangible form of a physical part.[235] Therefore, virtual components could be differentiated from a mold because they are digital representations of the actual component, not a separate and distinct object that is used to create other parts.

d. *Policy Supports Application of § 271(f) to Software*

It could be argued that patent law policy supports the application of § 271(f) to software in order to prevent infringement by the exportation of components of the invention.[236] Preventing this kind of activity arguably would not have any more of a negative impact on innovation than preventing infringement by domestic sales.[237] Infringing is, in essence, copying what has already been invented.[238] The software being exported is infringing on an already patented invention.[239] The purpose of the patent laws is to promote progress by

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230. *See supra* notes 76-77, 79 and accompanying text.
231. *See supra* notes 136, 145-46 and accompanying text (indicating that part of a § 271(f) inquiry focuses on where the components were being made or manufactured).
232. *See supra* Part I.B.2. Running analysis simulations using CAD software allows engineers to refine the components on a computer so that, by the time the parts are "printed out," there is little left to be done and no human intervention is needed to create the physical parts. *See supra* notes 72, 78 and accompanying text.
233. *See supra* notes 72-73, 78 and accompanying text.
234. At least one court has stated that computer code can be "manufactured." *See* AT & T Corp. v. Microsoft Corp., No. 01 Civ.4872, 2004 WL 406640, at *7 (S.D.N.Y. Mar. 5, 2004) (indicating that "the object code is originally manufactured in the United States"). Because computer code is intangible but capable of being "manufactured," it could be argued that, by analogy, a virtual component could also be "manufactured" on a computer. *See supra* Part I.B.2 (describing the amount and type of work that can be completed when creating virtual components using a computer).
235. *See supra* Part I.B.2.
236. *See supra* notes 24, 198 and accompanying text.
237. *See AT & T*, 2004 WL 406640, at *8 (indicating that Microsoft's policy concerns about being able to compete in foreign markets "are better addressed through manufacture of non-infringing goods").
238. *See, e.g.*, Graver Tank & Mfg. Co. v. Linde Air Prods. Co., 339 U.S. 605, 607 (1950) (indicating that copying, even with insubstantial changes, is still infringement).
239. *See supra* Parts II.A-C (discussing the *Eolas*, *Imagexpo*, and *AT & T* cases).

protecting inventors, not copiers.[240]   Without this protection, an infringer would be allowed to "'capture[] the foreign markets from the patentee ... [and] to reap the fruits of the American economy— technology, labor, materials, etc.—but would not be subject to the responsibilities of the American patent laws.'"[241]

The same arguments could also be made in support of virtual components. The policies of the patent laws support extending § 271(f) because otherwise an infringer would be allowed to benefit from the American economy, using skilled labor and technology, such as computers and software, to create the virtual components.[242] However, the infringer could avoid the patent laws by simply having the components "printed out" abroad. This is analogous to simply having components assembled abroad, as was done in *Deepsouth*, a practice prohibited by § 271(f).[243]

F. *The Federal Circuit Resolves Some Questions*

In March 2005, the Federal Circuit issued its opinion in *Eolas Technologies Inc. v. Microsoft Corp.*, which has answered some of the questions regarding § 271(f) liability for the exportation of software.[244] One of the most critical questions addressed was whether software is a component of a patented invention, which the court answered in the affirmative.[245]

To determine whether software is a component for § 271(f) purposes, the court first analyzed the language of the statute.[246] Section 271(f) refers to "components of a patented invention."[247] The court recognized that both the term "patented invention" and the definition of "invention" provided in 35 U.S.C. §§ 100(a), 101, which includes "'any new and useful process, machine, manufacture or composition of matter,'" were "broad and inclusive."[248] From this broad statutory language, it was concluded that § 271(f) was not

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240. Protection is given to innovators in order to comply with the objective of promoting "the Progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries." U.S. Const. art. I, § 8, cl. 8.

241. Deepsouth Packing Co. v. Laitram Corp., 406 U.S. 518, 534 (1972) (Blackmun, J., dissenting) (quoting Laitram Corp. v. Deepsouth Packing Co., 443 F.2d 936, 939 (5th Cir. 1971)).

242. *See supra* notes 74-75 and accompanying text (discussing how engineers use computers to create virtual components).

243. *See supra* notes 15, 20 and accompanying text.

244. Eolas Techs. Inc. v. Microsoft Corp., No. 04-1234, 2005 WL 475391, at *1 (Fed. Cir. Mar. 2, 2005).

245. *Id.* at *14 ("In sum, the language and history of section 271(f)(1) as well as this court's law protecting software inventions support this court's holding that section 271(f)(1)'s 'components' include software code on golden master disks.").

246. *Id.* at *12.

247. 35 U.S.C. § 271(f)(1) (2000).

248. *Eolas*, 2005 WL 475391, at *12 (citing 35 U.S.C. §§ 100(a), 101).

limited to "patented 'machines' or patented 'physical structures'" or to "'machine' components or 'structural or physical' components," but rather, "every form of invention eligible for patenting falls within the protection of section 271(f)" and "every component of every form of invention deserves the protection of section 271(f)."[249]

The court further rejected any argument that the legislative history limited the scope of § 271(f).[250] It was not persuaded to limit § 271(f) to the specific facts of *Deepsouth* merely because § 271(f) was enacted in response to *Deepsouth*, stating the following:

> Microsoft and amici argue that Congress' use of "components" must be identical to the "components" of the patented invention in *Deepsouth*. In other words, since *Deepsouth* dealt with the components of a physical machine, section 271(f)'s "components" are limited to physical machines. This argument finds no support in the language or history of the statute.[251]

The *Eolas* court instead held that the legislative history indicated that the purpose of § 271(f) was to "correct[] a loophole for all forms of patented inventions."[252]

After concluding that § 271(f) applied to "every form of [patentable] invention" and "every component of every form of invention," the court needed to determine whether software was an eligible invention and whether software code was a component.[253] It held that software qualified as a patentable invention, both as a process type and product type invention.[254] Next, in deciding whether software code on a golden master is a "component," the court stated as follows:

> A "component" of a process invention would encompass method steps or acts. A "component" of an article of manufacture invention would encompass a part of that construct. Because a computer program product is a patented invention within the meaning of Title 35, then the "computer readable program code" claimed in [the patent] is a part or component of that patented invention.[255]

Moreover, the court noted that it "accords the same treatment to all forms of invention" and that there is no "principled reason for treating process inventions different than structural products."[256] It recognized that, "[o]n a functioning computer, software morphs into hardware and vice versa at the touch of a button."[257] Therefore, the

249. *Id.*
250. *See id.* at *13.
251. *Id.*
252. *Id.*
253. *Id.* at *12.
254. *Id.*
255. *Id.* (citation omitted).
256. *Id.* at *13.
257. *Id.*

court held that "sound policy... counsels against varying the definition of 'component of a patented invention' according to the particular form of the part under consideration, particularly when those parts change form during operation of the invention as occurs with software code."[258]

Lastly, the court addressed what effect its recent decision in *Pellegrini* would have on applying § 271(f) to software.[259] In *Pellegrini*, the court stated that "'[s]uppl[ying] or caus[ing] to be supplied' in § 271(f)(1) clearly refers to physical supply of components, not simply to the supply of instructions or corporate oversight."[260] Microsoft argued that the holding in *Pellegrini* "imposes a requirement that components in section 271(f) are physical," in effect asking the court "to add the word 'physical' in front of 'components' in section 271(f)."[261]

The *Eolas* court rejected this argument, noting that "the language of section 271(f) does not impose a requirement of 'tangibility' on any component of a patented invention."[262] It reasoned that, "[i]f the statute intended to limit the reach of 'components of patented inventions,' it would have expressly included some narrowing restriction."[263] The court further clarified its holding in *Pellegrini*, stating that *Pellegrini* "did not address the meaning of the 'components' language in section 271(f)."[264] Rather, the court stated that "*Pelligrini* [sic] requires only that components are physically *supplied* from the United States. *Pelligrini* [sic] does not impose on section 271(f) a tangibility requirement that does not appear anywhere in the language of that section."[265]

III. SELECTION OF A PROPER INTERPRETATION

This part first discusses the possible effects that the recent Federal Circuit decision in *Eolas Technologies Inc. v. Microsoft Corp.*[266] may have on § 271(f) interpretation. It then recommends and provides support for a broad interpretation of § 271(f) in light of software and virtual component technology.

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258. *Id.*
259. *Id.* at *14.
260. Pellegrini v. Analog Devices, Inc., 375 F.3d 1113, 1118 (Fed. Cir.), *cert. denied*, 125 S. Ct. 642 (2004) (second and third alterations in original).
261. *Eolas*, 2005 WL 475391, at *14.
262. *Id.*
263. *Id.*
264. *Id.*
265. *Id.*
266. *Id.* at *1.

A. *Possible Implications of* Eolas

The Federal Circuit opinion in *Eolas* may have far-reaching effects on the interpretation of § 271(f). In addition to holding that software on a golden master is a component,[267] the opinion may provide a stronger foothold for arguments in support of applying § 271(f) to virtual components,[268] and in favor of providing protection for process patents.[269]

1. Protection for Process Patents

The inclusion of process patents certainly seems to indicate a change in § 271(f) jurisprudence.[270] It appears that the Federal Circuit opinion in *Eolas* may have overruled the federal district court decisions in *Enpat* and *Synaptic Pharmaceutical*, where § 271(f) was interpreted to exclude process patents.[271] While the Federal Circuit opinion in *Standard Havens* did not explicitly state why § 271(f) did not apply, subsequent courts seemed to have interpreted that decision to mean that § 271(f) does not apply to process patents as a class.[272]

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267. *See supra* note 245 and accompanying text.

268. *See infra* Part III.A.5.

269. *See infra* Part III.A.1.

270. *See supra* Part I.A.3 (discussing prior cases where courts have refused to apply § 271(f) to process patents).

271. *See supra* Part I.A.3.

272. *See* Enpat, Inc. v. Microsoft Corp., 6 F. Supp. 2d 537, 539 (E.D. Va. 1998) ("Like the asphalt process in *Standard Havens* . . . , plaintiffs' patent describes the steps required to accomplish a particular task rather than the composition of a patented physical product. . . . We conclude that plaintiffs' patent has no 'components' for purposes of § 271(f)."); *see also* AT & T Corp. v. Microsoft Corp., No. 01 Civ.4872, 2004 WL 406640, at *5 (S.D.N.Y. Mar. 5, 2004) (noting that method patents have been determined not have components and therefore do not implicate § 271(f)); Synaptic Pharm. Corp. v. MDS Panlabs, Inc., 265 F. Supp. 2d 452, 464 (D.N.J. 2002) ("Given these court's [sic] determinations that § 271(f) does not apply to method patents, this Court will refrain from extending § 271(f) liability to MDS's activities with regard to Synaptic's assay [process] patents. As a result, the Court determines that MDS cannot have violated § 271(f) . . . ." (citing Standard Havens Prods., Inc. v. Gencor Indus., Inc., 953 F.2d 1360, 1374 (Fed. Cir. 1991); Enpat, 6 F. Supp. 2d at 539; Aerogroup Int'l, Inc. v. Marlboro Footworks, Ltd., 955 F. Supp. 220 (S.D.N.Y. 1997))); Fisch & Allen, *supra* note 34, at 571-72 & n.69 ("[C]ourts have held that method patents do not implicate § 271(f) because they lack any 'components.'" (citing *Standard Havens*, 953 F.2d at 1374; *Synaptic Pharm.*, 265 F. Supp. 2d at 464; *Enpat*, 6 F. Supp. 2d at 539)). *But see* Eolas Techs. Inc. v. Microsoft Corp., No. 04-1234, 2005 WL 475391, at *13 (Fed. Cir. Mar. 2, 2005) (indicating that a process patent could be covered by § 271(f)). Notably, a reading of *Standard Havens*, in light of *Eolas*, indicates that some courts may have misinterpreted *Standard Havens'* holding. In *Standard Havens*, the court noted that the patent in issue "claims a method for producing asphalt, not the apparatus for implementing that process. Thus, the sale in the United States of an unclaimed apparatus alone does not make Gencor a contributory infringer of the patented method." *Standard Havens*, 953 F.2d at 1374. After indicating that there was no infringement under 35 U.S.C. § 271(b), (c), or (g), the court finally concluded that it did not find § 271(f) implicated. *Standard Havens*, 953 F.2d at 1374. Therefore, it appears the court merely ruled that the

The court in *Enpat* held that § 271(f) did not apply to process patents, concluding that process patents lacked components, and therefore, § 271(f) could not apply.[273]

However, in *Eolas*, the court explicitly stated that § 271(f) applies equally to process patents.[274] The court also specifically noted that software claimed as a process is patentable, and indicated that it would be covered by § 271(f).[275] This would seem to overrule *Enpat*, which held that exporting software covered by a process patent did not implicate § 271(f), but the court failed to cite *Enpat* or any of the other opinions that dealt with § 271(f) and process patents.[276]

While it appears that § 271(f) liability will now attach to process patents, some issues still remain. The *Eolas* court went on to discuss what would qualify as a component of a process patent, stating that "[a] 'component' of a process invention would encompass method steps or acts."[277] Accordingly, exporting the "method steps or acts" of a process patent would give rise to § 271(f) liability.[278] This seems simple enough, except for one obvious problem: How does one export "method steps or acts"? This problem is further complicated by the court's reading of *Pellegrini*, which indicates that, while components themselves do not have to be physical, they do have to be "physically supplied" from the United States.[279]

So what could this all mean? It seems that part of the reasoning in *Enpat*, which concluded that exporting physical components used in carrying out a process patent are not components for § 271(f) purposes, is still good law.[280] It would appear that exporting a machine that is used to facilitate a patented process would not infringe

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apparatuses for implementing a process are not components, not that all process patents lack components. *See id.*

273. *See Enpat*, 6 F. Supp. 2d at 539; *see also supra* note 55 and accompanying text (discussing *Synaptic Pharm.* and its citation of *Enpat*).

274. *See supra* notes 253-56 and accompanying text.

275. *See supra* notes 254-56 and accompanying text.

276. *Compare Eolas*, 2005 WL 475391, at *12-13 (determining that exportation of software could give rise to infringement of U.S. Patent 5,838,906 (issued Nov. 17, 1998) under § 271(f), and finding no reason for treating process and product inventions differently), *and* U.S. Patent 5,838,906 (issued Nov. 17, 1998) ("[Claim] 1. A method for running an application program in a computer network environment, comprising . . . ."), *with Enpat*, 6 F. Supp. 2d at 539 (finding that exportation of software could not give rise to infringement of U.S. Patent 5,548,506 (issued Aug. 20, 1996) under § 271(f)), *and* U.S. Patent 5,548,506 (issued Aug. 20, 1996) ("[Claim] 1. A method executed by a computer system as part of a computer program . . . .").

277. *Eolas*, 2005 WL 475391, at *12.

278. *See id.*

279. *See id.* at *14.

280. *See Enpat*, 6 F. Supp. 2d at 539 ("While it is true that any process involves the use of physical objects, this alone is not enough to bring a method patent within the purview of § 271(f) . . . ."); *see also supra* notes 57-59, 255 and accompanying text. This conclusion also seems to be consistent with the holding in *Standard Havens*. *See Standard Havens Prods., Inc. v. Gencor Indus., Inc.*, 953 F.2d 1360, 1374 (Fed. Cir. 1991); *see also supra* note 272.

because the machine is not a "method step[] or act[]."[281] However, it is likely that the holding in *Enpat*, indicating that exporting software that is covered by a process patent does not implicate § 271(f), is now overruled.[282] One reason that could be derived from the *Eolas* opinion is that, with software process patents, the "method steps or acts" of the process are embodied in the software code—which is stored on the golden master—and the golden master is supplied from the United States. Therefore, under *Eolas*, it appears that § 271(f) infringement liability can attach for exporting software covered by a process patent.[283]

2. Protection for Design Patents

The *Eolas* court used some very broad language, stating that "every form of invention eligible for patenting falls within the protection of section 271(f)."[284] This language could be interpreted as broad enough to protect design patents under § 271(f).

In arriving at its broad interpretation of § 271(f), the court relied on Title 35 definitions for guidance.[285] Title 35 also includes a provision for design patents, § 171, which states the following: "Whoever invents any new, original and ornamental design for an article of manufacture may obtain a patent therefor, subject to the conditions and requirements of this title."[286] Section 171 goes on to state that "[t]he provisions of this title relating to patents for inventions shall apply to patents for designs, except as otherwise provided."[287] From this language, it would seem that the subject of a design patent is an invention, and thus, because "every form of invention eligible for patenting falls within the protection of section 271(f)," [288] § 271(f) should apply.

Unlike with process patents, the court did not explicitly state what the components of a design would encompass.[289] Therefore, the question of whether design patents are capable of having components needs to be resolved before § 271(f) would apply. Take, for example, Design Patent No. D501290, a design patent for a hat with a built-in black light system.[290] It would seem that this design has components.

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281. The Federal Circuit's conclusive statement that "[a] 'component' of a process invention would encompass method steps or acts" seems to foreclose an interpretation that would include components that are merely utilized by the process. *See Eolas*, 2005 WL 475391, at *12; *see also supra* note 280.

282. *See supra* note 276 and accompanying text.

283. *See supra* Part II.F.

284. *Eolas*, 2005 WL 475391, at *12; *see supra* note 249 and accompanying text.

285. *Eolas*, 2005 WL 475391, at *12.

286. 35 U.S.C. § 171 (2000).

287. *Id.*

288. *Eolas*, 2005 WL 475391, at *12.

289. *See id.*

290. *See* U.S. Patent No. D501,290 (issued Feb. 1, 2005).

If the hat and black light system were exported separately with the intent that they be assembled abroad, § 271(f) liability might attach. It would appear that all the requirements would be met: (1) this would be a form of invention eligible for patenting;[291] (2) these would be components of an eligible form of invention;[292] and (3) these components would be physically supplied from the United States.[293]

Admittedly, however, this argument would most likely fail. This is because a design patent only protects the appearance of an article, rather than its physical embodiment.[294] Therefore, it could be argued that a design patent lacks components.[295] Thus, it appears that *Eolas* will not affect the holding in *Aerogroup International, Inc. v. Marlboro Footworks, Ltd.*, and design patents will not come under the purview of § 271(f).[296]

3. *Pellegrini's* Limited Meaning

The *Eolas* court also took the time to clarify its holding in *Pellegrini*.[297] The court stated that the holding of *Pellegrini* only dealt with the interpretation of the "supplies or causes to be supplied in or from the United States"[298] language of § 271(f).[299] It made clear that *Pellegrini* and its use of the word "physical" did not affect what could be considered a component for § 271(f) purposes.[300] Not only did the court say that components do not have to be "physical," it further indicated that components do not even have to be tangible.[301]

However, the court did uphold *Pellegrini* for the proposition that components must be "physically *supplied* from the United States."[302] This raises an interesting question: How does one physically supply an intangible component? At first glance, this may seem impossible, but from the court's opinion, it appears that supplying software on a golden master would be one such instance.[303] Perhaps another possible way of answering this question, besides supplying some type

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291. *See supra* notes 249, 286-88 and accompanying text.

292. *See supra* note 249 and accompanying text.

293. *See supra* note 265 and accompanying text.

294. *See* Gorham Co. v. White, 81 U.S. 511, 525 (1871) ("It is the appearance itself, therefore, no matter by what agency caused, that constitutes . . . the contribution to the public which the law deems worthy of recompense.").

295. *See id.* at 525-26.

296. *See* Aerogroup Int'l. Inc. v. Marlboro Footworks. Ltd.. 955 F. Supp. 220, 232 (S.D.N.Y. 1997) (declining to apply § 271(f) to a design patent); *see also supra* notes 49, 53 and accompanying text.

297. *See supra* notes 264-65 and accompanying text.

298. 35 U.S.C. § 271(f) (2000).

299. *See supra* notes 264-65 and accompanying text.

300. *See supra* notes 264-65 and accompanying text.

301. Eolas Techs. Inc. v. Microsoft Corp., No. 04-1234, 2005 WL 475391, at *14 (Fed. Cir. Mar. 2, 2005); *see also supra* notes 261-63 and accompanying text.

302. *Eolas*, 2005 WL 475391, at *14.

303. *See supra* note 245 and accompanying text.

of golden master, could be the supply of blueprints.[304] If the courts adopted an interpretation of § 271(f) that included blueprints as components, exporting blueprints, as was done in *Standard Register*, could be interpreted as physically supplying an intangible component.[305]

4. Electronic Transmission Loophole

According to the court in *Eolas*, *Pellegrini* still requires that "components [be] physically supplied from the United States,"[306] and this may have left another loophole intact. The *Eolas* opinion only stated that "section 271(f)(1)'s 'components' include software code on golden master disks."[307] The court did not address the issue of whether exporting software by using electronic transmissions, perhaps over the internet, would give rise to § 271(f) liability.[308] However, a plain reading of the court's opinion tends to indicate that electronic transmission would not be covered because sending something over the internet arguably does not satisfy the physically supplied requirement.

If this is the correct interpretation of *Pellegrini*, then a loophole in § 271(f) still exists. Software manufacturers in the United States could avoid liability by simply exporting the software by electronic transmission rather than by using a golden master.[309] This certainly seems to be an erroneous result. It is unclear exactly what effect *Pellegrini* will have in this context, but at least one district court has held that software exported by electronic transmission could impose § 271(f) liability.[310]

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304. *See supra* notes 207-12 and accompanying text.

305. *See* Moore U.S.A. Inc. v. Standard Register Co., 144 F. Supp. 2d 188, 195 (W.D.N.Y. 2001); *see also supra* notes 207-12 and accompanying text.

306. *Eolas*, 2005 WL 475391, at *14 (emphasis omitted).

307. *Id.*

308. *See id.* at *12. However, at least one commentator, as early as 1998, indicated that transactions over the internet may give rise to § 271(f) infringement liability. *See* Keith E. Witek, *Software Patent Infringement on the Internet and on Modern Computer Systems—Who Is Liable for Damages?*, 14 Santa Clara Computer & High Tech. L.J. 303, 380-81 (1998); *see also* Dan L. Burk, *Patents in Cyberspace: Territoriality and Infringement on Global Computer Networks*, 68 Tul. L. Rev. 1, 32-47 (1993) (discussing patent infringement on computer networks more generally). Additionally, claims to computer programs embodied in carrier waves would, if accepted by the courts, make transmitting software electronically an infringing activity. *See* Kuester et al., *supra* note 204.

309. However, claims to computer programs embodied in carrier waves would provide patent protection to electronic transmissions of software directly. *See* Kuester et al., *supra* note 204; *see also supra* note 308 and accompanying text.

310. *See* AT & T Corp. v. Microsoft Corp., No. 01 Civ.4872, 2004 WL 406640, at *8 (S.D.N.Y. Mar. 5, 2004).

5. Future of Software and Virtual Components

Under *Eolas*, it is clear that software exported on a golden master is a component and invokes § 271(f) liability.[311] The type of patent that covers the software is not necessarily determinative, because § 271(f) was interpreted to apply to "every form of invention," including both process and product claims.[312] This opinion is favorable to U.S. patent holders who want to prevent other domestic manufacturers from exporting infringing software.

In addition, there is also some language in the opinion that is favorable to the application of § 271(f) to virtual components. First, the court stated without limitation that "every component of every form of invention deserves the protection of section 271(f)."[313] The court went on to note that "the language of section 271(f) does not impose a requirement of 'tangibility' on any component of a patented invention."[314] The court also indicated that it was not good policy to "vary[] the definition of 'component of a patented invention' according to the particular form of the part under consideration."[315] This language would seem to bring virtual components within the scope of § 271(f). However, the protection of virtual components may not be so straightforward because the court also took the time to differentiate software from a "prototype, mold, or detailed set of instructions."[316] Therefore, before virtual components would be protected, they would also have to be differentiated from a "prototype, mold, or detailed set of instructions." However, as discussed in Part II.E.2, there are arguments that indicate virtual components are more than mere prototypes or molds.[317]

Virtual components are components of a patented invention in digital form.[318] Because § 271(f) applies to any component in any form, regardless of tangibility, they may now be covered. *Eolas*, which applies § 271(f) to "any component" without the need for tangibility, provides a stronger case for the application of § 271(f) to virtual components.

B. *Recommendations*

Section 271(f) should be interpreted to provide protection against the exportation of software and virtual components. The Federal

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311. *See supra* note 245 and accompanying text.
312. *Eolas*, 2005 WL 475391, at *12.
313. *Id.*
314. *Id.* at *14.
315. *Id.* at *13
316. *Id.* at *12.
317. *See supra* Parts II.E.2.a-c; *infra* Part III.B (setting forth arguments that differentiate virtual components from mere prototypes, molds, or detailed sets of instructions).
318. *See supra* Parts I.B.2, II.E.2.

Circuit's decision in *Eolas*, which applied § 271(f) to software on golden masters, is a step in the right direction and should be followed by future courts.[319] However, the *Eolas* decision should be expanded to cover virtual components and the exportation of components by electronic transmissions as well. The policy of protecting American inventors supports the adoption of this approach.[320]

To determine whether the courts should apply § 271(f) to the activities of an American company, the courts should focus on what is being done domestically.[321] In the case of software, if the software is being created domestically and only the final steps of replication are being conducted abroad, the courts should realize that the software is in fact being manufactured in the United States.[322] The same is true with virtual components. If components are being fully created on a computer domestically, with only the final step of "printing out" the parts being conducted abroad, courts should realize that, in some respects, the components have been manufactured in the United States.[323] After recognizing that manufacturing processes are occurring in the United States, courts should conclude that § 271(f) applies. Otherwise, domestic copiers "would then be allowed to reap the fruits of the American economy—technology, labor, materials, etc.—but would not be subject to the responsibilities of the American patent laws."[324]

The courts should also not categorize software and virtual components as mere molds or chemical formulas.[325] Software is patentable subject matter and virtual components represent patentable subject matter, except that they exist in a computer in digital form.[326] Software is patentable when stored on a tangible medium[327] and the same could be said for virtual components. There is little difference between storing software in a tangible medium by burning it onto a CD[328] and storing a virtual component in a tangible

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319. *See supra* Part II.F.

320. *See supra* Part II.E.2.d.

321. *See* NTP, Inc. v. Research in Motion, Ltd., 392 F.3d 1336, 1366 (Fed. Cir. 2004) (emphasizing that acts wholly done outside the United States do not give rise to infringement liability). This may indicate that, as long as some portion of the manufacturing process occurs in the United States, liability can attach. *See supra* notes 222-23 and accompanying text.

322. *See supra* note 136 and accompanying text.

323. *See supra* Part I.B.2 and text accompanying notes 231-35.

324. Deepsouth Packing Co. v. Laitram Corp., 406 U.S. 518, 534 (1972) (Blackmun, J., dissenting) (quoting Laitram Corp. v. Deepsouth Packing Co., 443 F.2d 936, 939 (5th Cir. 1971)).

325. *See supra* Parts II.E.2.b-c.

326. *See supra* text accompanying note 71. For a discussion of how both software and virtual components can be "manufactured" on computers and how they can be sent vast distances via electronic transmission for replication, see *supra* notes 72, 75, 79-80, 122, 136, 234 and accompanying text.

327. *See supra* notes 200-01 and accompanying text.

328. *See supra* Part I.B.1.

medium by sending it to a three-dimensional printer.[329]   In this respect, software and virtual components are not like a mold—a separate object used to create other parts—or a chemical formula— instructions used to create the compounds—because software and virtual components are the actual components of the patented invention that simply have not yet been stored in a tangible medium. The courts that have addressed this issue have concluded that software is deserving of § 271(f) protection[330] and future courts should find similarly for virtual components.

The Federal Circuit in *Eolas* was on the right track when it refused to read a "tangibility" requirement into the statute.[331]   It was also deliberate in not interpreting *Pellegrini* to require that components be "physical" for § 271(f) purposes.[332]   However, while the court was strongly opposed to inserting the terms "tangible" and "physical" before the word "component" in § 271(f), the court was content to interpret the *Pellegrini* holding to insert the word "physical" in front of the word "supply" in the statute.[333]   The judicial insertion of the word physical in § 271(f)—that is, the physical supply requirement of *Pellegrini*—should not be left intact.   While this Note does not necessarily advocate a rule that would allow mere corporate oversight to be considered a component, the *Pellegrini* court should have limited its holding to excluding corporate oversight as a component, instead of adopting a bright line rule that components must be physically supplied.[334] The reason is that this requirement may cause electronic transmissions to fall outside the scope of § 271(f), giving rise to another loophole whereby copiers can export their software and virtual components without fear of infringement liability.[335] Therefore, the *Pellegrini* "physical supply" requirement should not be left intact. Future courts should follow *Eolas*'s strong position against reading limitations into the statute, and not apply a physical supply test.[336]

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329. *See supra* Part I.B.2.
330. *See supra* Parts II.A-C, II.F.
331. *See supra* notes 262-65 and accompanying text.
332. *See supra* notes 146, 261-65 and accompanying text.
333. *See supra* notes 146, 264-65 and accompanying text.
334. *See supra* notes 146, 264-65 and accompanying text.
335. *See supra* Part III.A.4.
336. There also appears to be some tension between the positions adopted by both the Supreme Court in *Diehr* and the Federal Circuit in *Eolas*, where the courts were opposed to reading limitations into the patent laws, and the Federal Circuit in *Pellegrini* and *Bayer*, where the court inserted a "physical" limitation into § 271(f) and § 271(g), respectively. *Compare* Diamond v. Diehr, 450 U.S. 175, 182 (1981), *and* Eolas Techs. Inc. v. Microsoft Corp., No. 04-1234, 2005 WL 475391, at *14 (Fed. Cir. Mar. 2, 2005), *with* Pellegrini v. Analog Devices, Inc., 375 F.3d 1113, 1118 (Fed. Cir.), *cert. denied*, 125 S. Ct. 642 (2004), Bayer AG v. Housey Pharms., Inc., 340 F.3d 1367, 1371-73 (Fed. Cir. 2003). *See also supra* notes 102-03, 146, 197. It is unclear if, or how, the *Eolas* decision will affect future courts' interpretations of *Pellegrini* and *Bayer*.

Some commentators, however, have warned against a rule that does not strictly adhere to some tangibility requirement in order for § 271(f) to apply.[337] There is some concern that if § 271(f) liability could attach without a tangibility requirement, a designer or software engineer could infringe a patent by simply traveling to another country with the mere knowledge or memorization of how to design a part or write software that would infringe a United States patent.[338] This result could be avoided if courts simply focused, as this Note suggests, on the actions occurring domestically. While the designer has knowledge of how to infringe the patent—under the theory that software and virtual components are "manufactured" on computers— once the designer arrived at her foreign destination she would still have to go through the process of "manufacturing" the software or virtual component before it could be further replicated. In this scenario, § 271(f) should not apply because the software or virtual component would have to be "remanufactured" abroad by transforming the designer's knowledge into source code or a CAD model. However, when the software or virtual components are created in the United States and then exported for the final step of replication, the courts should find that the patented invention has been infringed under § 271(f).

Some may also be concerned that direct infringement liability could attach simply by developing some software or by designing a part using CAD software which happened to be the subject of another's patent. However, this too would not be a problem because this Note advocates that courts treat the software and virtual components at issue here as components only. Using the example of virtual components, a designer would not be liable for infringement until the product is "made"; that is, until the CAD file is printed out and converted into a physical part.[339] A virtual component is merely a component and, therefore, a designer would not infringe the patent because domestic liability does not attach until the invention is assembled.[340] There is a difference in result, however, if the components were sent abroad in an attempt to avoid the patent laws, because this is the type of activity § 271(f) is designed to prevent.

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337. *See* Pensabene & Berschadsky, *supra* note 184, at 27.

338. *See id.*

339. The district court in *Eolas* cited the *Deepsouth* opinion as good law on the point of whether § 271(a) liability had attached, stating that "[u]nder Section 271(a), there is a requirement that there be an 'operable assembly' of the infringing products [domestically] before there can be liability" meaning that the *Deepsouth* court interpreted "the word 'makes' as used in Section 271(a)" so that "unassembled component parts do not infringe a ... patent claiming the assembled whole." *Eolas*, 274 F. Supp. 2d. at 973 (citing Deepsouth Packing Co. v. Laitram Corp., 406 U.S. 518, 527-29 (1972)). Therefore, a domestic company would not infringe a United States patent by simply creating a CAD drawing.

340. *See supra* note 339.

Keeping software and virtual components out of the scope of § 271(f) creates a loophole, much like the one that § 271(f) was originally intended to close.[341] It would allow domestic companies to copy the inventions of United States patent holders, compete with them in foreign markets, and take advantage of the American economy, all the while not being subject to infringement liability.[342] This would diminish some of the patent holders' exclusionary rights, as well as the incentive to innovate.[343]

Lastly, adoption of these recommendations would not have a catastrophic impact on domestic industry.[344] While applying § 271(f) to software and virtual components may have a negative impact on domestic infringers, this is not unlike any other case of infringement.[345] Preventing infringement would either cause the infringers to develop new noninfringing products, cause them to seek licenses from the patent holders, or simply prevent them from capturing part of the market share and thereby prevent injury to the patent holder's business.

CONCLUSION

As technology changes, patent law must be able to adapt. Under the current state of technology, the vast majority of the work necessary to manufacture components can be completed on computers, without actually creating a physical part. Unlike the days when parts were made by skilled artisans using hand tools, most, if not all, of the skill required to manufacture components today—either software or parts that are modeled using CAD—is employed during the computer phase. Parts can be fabricated with little effort and at remote locations. One researcher has stated that "[t]he impact of [this technology] on everyday life will be so profound, changing the way products are designed, manufactured and distributed, that it can be described as the next industrial revolution."[346]

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341. *See supra* notes 19-26 and accompanying text.

342. *See supra* Part II.E.2.d. This is a particularly insidious form of infringement because a competing domestic manufacturer could infringe every claim in a patent and then, in a single occurrence, export the software or virtual component so that thousands upon thousands of copies of the invention could be created abroad, thereby creating competition in foreign markets. Even if the patent holder managed to successfully sue this domestic infringer, without § 271(f) liability the patent holder would only be entitled to recover for a single occurrence of infringement—the one copy that was exported. *See* AT & T Corp. v. Microsoft Corp., No. 01 Civ.4872, 2004 WL 406640, at *7 & n. 7 (S.D.N.Y. Mar. 5, 2004) (indicating that an infringer would be liable for every unit of software that was exported, but without § 271(f) liability, the infringer would not be liable for the foreign-replicated units).

343. *See supra* notes 19-26 and accompanying text.

344. *See supra* Part II.E.2.d.

345. *See supra* Part II.E.2.d.

346. Phil Dickens, *Industrial Revolution Rapidly Approaching*, Metalworking Production (May 4, 2004) (discussing rapid prototyping/manufacturing technology), *at*

If the courts or Congress disregard the work that is employed during the computer phases, inventors' patent rights will be diminished. Another loophole may develop, allowing domestic copiers, using the resources of the American economy, to take away foreign sales from a patent holder simply because the copier performs the now trivial task of mass-producing its copies abroad.

While it appears that the Federal Circuit's *Eolas* opinion has resolved the issue of whether § 271(f) applies to software on a golden master, the opinion still leaves the issue unresolved with respect to virtual components and exportation using electronic transmissions.[347] However, *Eolas* is a step in the right direction and perhaps future courts will resolve any remaining issues and provide a workable framework that will both be able to adequately adapt to new technologies and protect patent holders.

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http://www.mwponline.com/story.aspx?uid=bd6d32a9-ea7e-4308-9d18-98a2af7aa414.
    347. *See supra* Parts III.A.4-5.