

WMS GAMING INC. V. INTERNATIONAL GAME TECHNOLOGY

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In 1952, Congress amended 35 U.S.C. § 112 to allow patent applicants to claim an element in a combination claim using means-plus-function language.¹ The amendment was in response to *Halliburton Oil Well Cementing Co. v. Walker*² in which the Supreme Court held that means-plus-function language was ambiguous and overbroad.³ To prevent the overbreadth and ambiguity problems noted by the Supreme Court, Congress added a provision that the means-plus-function language would be restricted to the structure disclosed in the specification or its equivalent.⁴ Since its enactment, many disputes have centered around the application of this structural limitation provision.⁵

In *WMS Gaming Inc. v. International Game Technology*,⁶ the Federal Circuit confronted an intriguing question related to claim construction of a software-related patent drafted in means-plus-function format. The crucial question faced by the court was whether a disclosed algorithm was properly part of the means for performing the identified function. The court answered in the affirmative.⁷

The potential effects of the court's decision are both severe and pervasive. Restricting a software-related means-plus-function claim by a disclosed algorithm may severely reduce the scope of the claim.⁸ And, because means-plus-function claims are prevalent in software-related patents, a large number of patents may be affected.⁹ One likely result of the

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1. *See Valmont Indus., Inc. v. Reinke Mfg. Co.*, 983 F.2d 1039, 1042 (Fed. Cir. 1993).

2. 329 U.S. 1 (1946).

3. *See id.* at 12.

4. *See Valmont*, 983 F.2d at 1042.

5. *See* Paul M. Janicke, *Means-Plus-Function Claims in Modern Patent Law*, C785 ALI-ABA 297, at 300 (1992).

6. 184 F.3d 1339 (Fed. Cir. 1999). Judge Rich heard oral arguments in this case but died on June 9, 1999. The case was decided by the remaining judges, Judge Rader and Judge Schall. Judge Schall wrote the opinion.

7. *See id.* at 1349.

8. *See* 35 U.S.C. § 112 ¶ 6 (1994).

9. *See infra* Part I.C.

court's holding is that patent attorneys and companies will re-evaluate the scope and validity of their own and others' software-related patents.¹⁰

I. BACKGROUND

A. Claims and Means-Plus-Function Claims

The second paragraph of section 112 of the Patent Act requires that the "specification . . . conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention."¹¹ This requirement fulfills two purposes. First, it provides "a clear measure of what applicants regard as the invention so that it can be determined whether the claimed invention meets all the criteria for patentability."¹² Second, it clearly establishes the scope of the claims so the public knows what constitutes infringement of the patent.¹³

Means-plus-function claims allow a patent applicant to express an element in a patent claim "as a means or step for performing a specific function without the recital of structure, material, or acts in support thereof."¹⁴ Although some patent drafters prefer this claim format, their choice comes at a cost.¹⁵ Such a claim does not cover every means for performing a specified function, but is limited to the "corresponding structure, material, or acts described in the specification and equivalents thereof."¹⁶

10. See *infra* Part III.B.; see also Chris Ford, *Playing the Odds*, CAL. L. BUS., Sept. 20, 1999, at 10 ("The ruling likely will change considerably the approach counsel must take when drafting patents or developing intellectual property strategy.")

11. 35 U.S.C. § 112 ¶ 2.

12. U.S. DEP'T OF COMMERCE, MANUAL OF PATENT EXAMINING PROCEDURE § 2173 (7th ed. 1998).

13. See *Bandag, Inc. v. Al Bolser's Tire Stores, Inc.*, 750 F.2d 903 (Fed. Cir. 1984) (holding that claims are the measure of the protected right); *Environmental Instruments, Inc. v. Sutron Corp.*, 877 F.2d 1561 (Fed. Cir. 1989) (holding that the language of the claims defines the bounds of the patentee's exclusive rights); see also *Wiener v. NEC Elec., Inc.*, 102 F.3d 534 (Fed. Cir. 1996).

14. 35 U.S.C. § 112 ¶ 6. The full text of the paragraph reads: "An element in a claim for a combination may be expressed as a means or step for performing a specific function without recital of structure, material, or acts in support thereof, and such claim shall be construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof."

15. See *Valmont Indus., Inc. v. Reinke Mfg. Co.*, 983 F.2d 1039, 1042 (Fed. Cir. 1993) (holding that § 112 ¶ 6 permits the use of means-plus-function language in claims, but with the proviso that the claims are limited to the structure, material, or acts disclosed in the specification and their equivalents).

16. 35 U.S.C. § 112 ¶ 6.

B. Claim Construction and Infringement

During the prosecution of a patent application, the Patent and Trademark Office examiner must interpret the claims in the application to determine whether they meet the requirements for patentability.¹⁷ After the patent has issued, an infringement action requires the court to interpret the claims again.¹⁸ In either event, the task of interpreting the claims is taxing. Unique words and phrases, complex subject matter, and ambiguities in language and drafting make even well-written patent claims unclear.¹⁹ Claims drafted in means-plus-function language add to the already difficult task of construing claims.

Construing a means-plus-function claim involves determining, as a matter of law, the claimed function and the structure corresponding to that function.²⁰ The claim language itself defines the functional aspect of a means-plus-function claim limitation.²¹ After the function is identified, the means are identified by looking to the specification for the structure corresponding to the claimed function.²² In theory, construing means-plus-function claims seems almost mechanical in application. In practice, however, such analysis can be problematic and complex.²³ Evidence of this complexity appears in *WMS Gaming* in which a key dispute was how to construe a means-plus-function claim.²⁴

17. The PTO examiner must determine, among other things, if what is claimed is useful (35 U.S.C. § 101), novel (35 U.S.C. § 102), and nonobvious (35 U.S.C. § 103).

18. Interpreting patent claims is a matter of law reserved entirely for the court. *See Markman v. Westview Instruments, Inc.*, 517 U.S. 370 (1996). Thus, a judge has the burden of determining the scope of the patent since the claims define the metes and bounds of the patent grant. *See id.* at 373.

19. *See id.* at 388-89 (holding that the judge, rather than the jury, should perform the complex task of claim construction because judges have special training, discipline, and experience); *see also* *Slimfold Mfg. Co., Inc. v. Kinkead Indus., Inc.*, 810 F.2d 1113, 1117 (Fed. Cir. 1987) (“The specification and claims of a patent . . . constitute one of the most difficult legal instruments to draw with accuracy.” (quoting *Topliff v. Topliff*, 145 U.S. 156, 171 (1892))).

20. *See Chiuminatta Concrete Concepts, Inc. v. Cardinal Indus., Inc.*, 145 F.3d 1303, 1308 (Fed. Cir. 1998).

21. *See id.* (“A determination of the claimed function [is] a matter of construction of specific terms in the claim.”).

22. *See id.*

23. *See* Thomas L. Creel and Thomas McGahren, *Use of Special Masters in Patent Litigation: A Special Master’s Perspective*, 26 AIPLA Q.J. 109 (1998) (arguing for greater use of special masters in patent infringement cases because of the complexities related to claim construction).

24. *See infra* Part II.C.1.

Properly identifying and construing the claims directly affects an infringement analysis because it determines the scope of the claim.²⁵ Following claim construction, the court must determine whether the claims, as construed, read on the accused device.²⁶ For a means-plus-function limitation to read literally on an accused device, the accused device must employ means identical or equivalent to the structures, material, or acts described in the patent specification, and the accused device must also perform the identical function as specified in the claim.²⁷ The test for determining whether the structure in an accused device is equivalent to the structure in the means-plus-function claim is whether the differences between the two structures are insubstantial.²⁸

C. Enablement and Definiteness

1. Enablement

A patent disclosure must enable one skilled in the relevant art to make and use the invention.²⁹ Although the law requires the specification to be "full, clear, concise, and exact,"³⁰ it allows disclosure that requires one skilled in the art to engage in some experimentation before being able to make or use the invention.³¹ The law, however, does not allow disclosure

25. See *Corning Glass Works v. Sumitomo Elec. U.S.A., Inc.*, 868 F.2d 1251, 1257-58 (Fed. Cir. 1989) ("A claim in a patent provides the metes and bounds of the right which the patent confers on the patentee to exclude others from making, using, or selling the protected invention.").

26. See *Cybor Corp. v. FAS Techs., Inc.*, 138 F.3d 1448, 1456 (Fed. Cir. 1998) (en banc).

27. See *Valmont Indus., Inc. v. Reinke Mfg. Co.*, 983 F.2d 1039, 1042 (Fed. Cir. 1993); see also *Pennwalt Corp. v. Durand-Wayland, Inc.*, 833 F.2d 931, 934 (Fed. Cir. 1987) (en banc) ("To determine whether a claim limitation is met literally, where expressed as a means for performing a stated function, the court must compare the accused structure with the disclosed structure, and must find equivalent structure as well as identity of claimed function for that structure.") (emphasis in original).

28. See *Chiuminatta Concrete Concepts, Inc. v. Cardinal Indus., Inc.*, 145 F.3d 1303, 1309 (Fed. Cir. 1998).

29. The statutory basis for this requirement is section 112, first paragraph, which states that the "specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art . . . to make and use the same." 35 U.S.C. § 112 ¶ 1 (1994).

30. 35 U.S.C. § 112 ¶ 1.

31. See *Amgen, Inc. v. Chugai Pharm. Co.*, 927 F.2d 1200, 1212 (Fed. Cir. 1991) ("That some experimentation is necessary does not constitute a lack of enablement; the amount of experimentation, however, must not be unduly extensive."), *cert. denied*, 502 U.S. 856 (1991).

that requires undue experimentation.³² Because the patent claims define what “invention” must be enabled,³³ the “scope of the claims must bear a reasonable correlation to the scope of enablement provided by the specification.”³⁴ If the patent claims more than what is enabled in the specification, the claim is invalid.³⁵

2. *Definiteness*

In addition to promoting “the Progress of Science and useful Arts”³⁶ by enabling others to make and use the invention, patents serve an important notice function. A patent provides the public with notice by delineating the limits of the patent grant.³⁷ To ensure this notice function, patent law demands certainty whenever possible.³⁸ For example, section 112 paragraph 2 requires that the subject matter be claimed “distinctly.”³⁹ This requirement allows the public to determine which areas are left open to them and which areas they enter at the risk of infringement.⁴⁰ Without clearly demarcated boundaries, a penumbra around the patent scope may discourage others from entering the fringe.⁴¹ If claims fail to define the legal scope of the patent, then the claims are invalid due to indefiniteness.⁴² Whether a claim is invalid for indefiniteness depends on whether

32. *See id.*

33. *See Phillips Petroleum Co. v. United States Steel Corp.*, 673 F. Supp. 1278, 1292 (D. Del. 1987), *aff'd*, 865 F.2d 1247 (Fed. Cir. 1989).

34. *In re Fisher*, 427 F.2d 833, 839 (C.C.P.A. 1970).

35. *See In re Hyatt*, 708 F.2d 712, 714-15 (Fed. Cir. 1983).

36. U.S. CONST. art. I, § 8, cl. 8.

37. *See Permutit Co. v. Graver Corp.*, 284 U.S. 52, 60 (1931) (“The statute requires the patentee not only to explain the principle of his apparatus and to describe it in such terms that any person skilled in the art to which it appertains may construct and use it after the expiration of the patent, but also to inform the public during the life of the patent of the limits of the monopoly asserted, so that it may be known which features may be safely used or manufactured without a license and which may not.”); *McClain v. Ort-mayer*, 141 U.S. 419, 424 (1891) (“The object . . . is not only to secure to [the patentee] all to which he is entitled, but to apprise the public of what is still open to them.”).

38. *See United Carbon Co. v. Binney & Smith Co.*, 317 U.S. 228, 236 (1942) (“A zone of uncertainty which enterprise and experimentation may enter only at the risk of infringement [sic] claims would discourage invention only a little less than unequivocal foreclosure of the field.”).

39. 35 U.S.C. § 112 ¶ 2 (1994) (“The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.”).

40. *See Athletic Alternatives, Inc. v. Prince Mfg., Inc.*, 73 F.3d 1573, 1581 (Fed. Cir. 1996).

41. *See id.*

42. *See Miles Laboratories, Inc. v. Shandon Inc.*, 997 F.2d 870, 874-75 (Fed. Cir. 1993); *see generally* 3 DONALD S. CHISUM, CHISUM ON PATENTS § 8.03 (1999).

those skilled in the art would understand its scope when read in light of the specification.⁴³

D. Software Patents

Historically, algorithms embodied in software were not considered patentable subject matter.⁴⁴ Software's journey to recognition as patentable subject matter was at best convoluted. Its circuitous path generated a vast and complex network of legal doctrines, and a discussion of this area of law exceeds the scope of this paper.⁴⁵ One significant result of this complex body of case law was that a large number of software patents were claimed in means-plus-function language.⁴⁶ Means-plus-function claims are common in software-related patents because this format presents an inventive algorithm as part of a physical apparatus rather than as just an abstract idea. This practice has its origins in the seminal case *In re Alappat*.⁴⁷

In *Alappat*, the patent applicants appealed from a reconsideration decision of the Board of Patent Appeals and Interferences which sustained the examiner's rejection of claims 15-19 as being unpatentable subject matter.⁴⁸ The rejected claims, written in means-plus-function format, were directed to a "rasterizer"—a mathematical algorithm-based invention for

43. See *Miles Laboratories*, 997 F.2d at 875 (Fed. Cir. 1993) ("The test for definiteness is whether one skilled in the art would understand the bounds of the claim when read in light of the specification.").

44. See *Gottschalk v. Benson*, 409 U.S. 63, 71-73 (1972) (holding that a computer program that embodied an algorithm for converting binary coded decimal into pure binary numbers was not patentable subject matter). The key statute defining statutory subject matter is 35 U.S.C. § 101 (1994) which states: "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."

45. For articles that discuss patentability of software-related inventions, see, for example, Lawrence Kass, *Computer Software Patentability and the Role of Means-Plus-Function Format in Computer Software Claims*, 15 PACE L.J. 787 (1995); Alan D. Minsk, *The Patentability of Algorithms: A Review and Critical Analysis of the Current Doctrine*, 8 SANTA CLARA COMPUTER & HIGH TECH. L.J. 251 (1992); Pamela Samuelson, *Benson Revisited: The Case Against Patent Protection for Algorithms and Other Computer Program-Related Inventions*, 39 EMORY L.J. 1025 (1990).

46. See Mark D. Janis, *Who's Afraid of Functional Claims? Reforming the Patent Law's § 112, ¶ 6 Jurisprudence*, 15 COMPUTER & HIGH TECH. L.J. 231, 235 (1999) ("Claims drafted in means-plus-function [language] are especially prevalent in patents on software-related inventions, where the format has been thought useful for complying with the subject matter eligibility requirement.").

47. 33 F.3d 1526 (Fed. Cir. 1994) (en banc).

48. See *id.* at 1531.

displaying smooth waveform data on an oscilloscope.⁴⁹ On appeal, the Federal Circuit, sitting en banc,⁵⁰ addressed whether Alappat's invention was statutory subject matter under 35 U.S.C. § 101.⁵¹

On the merits of the case, a majority of the Federal Circuit judges declared that the Board erroneously failed to apply 35 U.S.C. § 112 ¶ 6 when construing Alappat's means-plus-function claims.⁵² Judge Rich, writing for the majority, construed the claims to include the proper corresponding structural limitations as disclosed in the specification.⁵³ Once properly construed, the patent application claimed an electronic machine that was patentable subject matter under 35 U.S.C. § 101.⁵⁴

The Board of Patent Appeals and Interferences had also rejected Alappat's claim 15 as being unpatentable subject matter because the means-plus-function claim read on a general purpose computer programmed to perform the algorithm.⁵⁵ Judge Rich dismissed the Board's rejection by reminding it that the Federal Circuit had previously held that a general purpose computer running a program "creates a new machine, because a general purpose computer in effect becomes a special purpose computer once it is programmed to perform particular functions."⁵⁶

It is important to note that the court only addressed the patentability of the invention. The Federal Circuit did not focus on the exact scope of the claims—such a rigorous analysis is typically only performed as part of an infringement suit. This issue remained to be decided in *WMS Gaming*.

49. *See id.* at 1537-39. An oscilloscope is an instrument used to measure or display electronic waveforms. The device displays on a screen, like a TV screen, the amplitude versus time graph of an electronic signal inputted into the oscilloscope.

50. In *South Corp. v. United States*, 690 F.2d 1368, 1370-71 (Fed. Cir. 1982) (en banc), the Federal Circuit announced in its first case that the precedent of the Court of Customs and Patent Appeals (the predecessor court to the Federal Circuit) would be binding on the Federal Circuit and that any conflict with such precedent only could be resolved by the Federal Circuit court sitting en banc. Thus, any case decided en banc clearly overrules any conflicting precedent of the Court of Customs and Patent Appeals.

51. *See Alappat*, 33 F.3d at 1541-44.

52. *See id.* at 1540-41. The court reaffirmed its unanimous en banc decision in *In re Donaldson*, 16 F.3d 1189 (Fed. Cir. 1994), holding that the PTO must limit claims written in means-plus-function language to the corresponding structure disclosed in the specification, i.e., the PTO is bound by 35 U.S.C. § 112 ¶ 6.

53. *See Alappat*, 33 F.3d at 1541.

54. *See id.*

55. *See id.* at 1544-45.

56. *Id.* at 1545.

II. WMS GAMING INC. V. INTERNATIONAL GAME TECHNOLOGY

A. Procedural Background

In May 1994, International Game Technology (“IGT”) sent a cease and desist letter to WMS Gaming Inc. (“WMS”) indicating that the WMS 400 slot machine infringed United States Patent No. 4,448,419, issued to Inge S. Telnaes (the “Telnaes patent”).⁵⁷ WMS responded by filing an action seeking a declaratory judgment that their slot machine did not infringe the Telnaes patent and that the Telnaes patent was invalid.⁵⁸ IGT counter-claimed against WMS for willful infringement.⁵⁹ After a bench trial, the district court held that the Telnaes patent was not invalid and that WMS had willfully infringed the patent.⁶⁰ WMS appealed the decision.⁶¹

B. Technical Background

The dispute centered on a slot machine design that electronically manipulates the odds of winning.⁶² To maintain and increase appeal to play-

57. *See* WMS Gaming Inc. v. International Game Technology, 184 F.3d 1339, 1345 (Fed. Cir. 1999); U.S. Patent No. 4,448,419 (issued May 15, 1984) [hereinafter Telnaes patent].

58. *See id.*

59. *See id.*

60. *See id.*

61. *See id.* at 1346. WMS also appealed a district court order denying its motion for a new trial based on newly discovered information. *See id.* After the trial, WMS obtained an unpatented slot machine that allegedly functioned in a manner similar to the Telnaes patent but had been sold several years before the application for the Telnaes patent was filed. *See id.* After a two-day hearing on the matter, the district court denied WMS’ motion for a new trial on the grounds that WMS had not been diligent in discovering the unpatented slot machine. *See id.* In reaching this conclusion, the district court extended the due diligence requirement to both WMS and its attorneys. *See id.* at 1361-62. Because one of WMS’ employees, who later found the prior art slot machine, did not attempt to locate prior art before or during the trial, the district court held that WMS failed to show diligence of its own employees. *See id.* at 1362. Applying the law of the regional circuit where the appeal would normally lie, the Federal Circuit did not find abuse of discretion by the district court. *See id.* at 1361-62. Although this matter raises interesting questions related to due diligence, space constraints prohibit any further discussion of this matter other than highlighting the issue in this footnote.

62. *See* WMS Gaming Inc. v. International Gaming Tech., No. 94-C3062, 1996 WL 539112, at *1 (N.D. Ill. Sept. 20, 1996). A slot machine contains a series of wheels, or reels, which spin about a common axis. *See id.* Displayed on the periphery of each reel are indicia or symbols, such as cherries, bells, bars, plums and blanks, which coincide with the stopping positions of the reel. *See id.* A typical slot machine has three reels, each with the same number of stop positions per reel, usually between 18 and 22. *See id.* The

ers, the market demanded slot machines with higher payoffs.⁶³ To generate higher payoffs, without decreasing the slot machine's profitability, the probabilities of winning had to be decreased.⁶⁴ To decrease the payout odds for a mechanical slot machine, either more reels or larger reels with more stop positions must be added.⁶⁵ This approach would not increase the machine's appeal since players perceive physically larger machines or machines with more reels "as being less 'good' in terms of winning and payout chances."⁶⁶ As a result, designers sought to increase the payouts without increasing the physical size of the machine.⁶⁷

1. *The Telnaes patent*

The Telnaes patent discloses an electronically-controlled slot machine that decreases the probability of winning while maintaining the external appearance of a standard slot machine.⁶⁸ To decrease the probability of winning, the control circuitry extends the reel "virtually" to include a range of numbers greater than the number of actual stop positions, and then maps these numbers non-uniformly to the actual stop positions.⁶⁹ When in play, the control circuitry randomly determines the stop position of each reel and then stops the reels at the randomly determined positions.⁷⁰ The reels' only function is to display the randomly chosen result.⁷¹

For example, if a reel with twenty-two stop positions contains a cherry symbol in two positions, the probability of stopping at a cherry is two out of twenty-two or 0.0909.⁷² If the reel were "virtually" extended to include forty-four virtual stop positions, with the cherry symbol mapped to numbers seven, twenty-two, and thirty-seven, then the probability of stopping

slot machine dispenses coins or credits by correlating the symbols that align with the "pay line" after the reels stop spinning with the machine's "pay table." *See id.*

63. *See* Telnaes patent, *supra* note 57, at col. 2, ll. 10-26.

64. *See id.*

65. *See id.* at col. 2, ll. 3-9.

66. *Id.* at col. 2, ll. 24-26.

67. *See id.* at col. 2, ll. 19-24.

68. *See* WMS Gaming Inc. v. International Gaming Tech., 184 F.3d 1339, 1343 (Fed. Cir. 1999); Telnaes patent, *supra* note 57, at col. 2, ll. 10-26.

69. *See* Telnaes patent, *supra* note 57, at col. 4, l. 51 - col. 5, l. 4. The non-uniform mapping of numbers is such that some stop positions are allocated more numbers than other stop positions but each stop position is assigned at least one number. *See id.* at col. 6, ll. 32-33, 45-46.

70. *See* WMS Gaming, 184 F.3d at 1343; Telnaes patent, *supra* note 57, at col. 3, ll. 1-4.

71. *See* WMS Gaming, 184 F.3d at 1343; Telnaes patent, *supra* note 57, at col. 3, ll. 10-12.

72. *See* Telnaes patent, *supra* note 57, at col. 4, ll. 53-67.

at the cherry is three out of forty-four or 0.0681.⁷³ Thus, the probability of stopping on the cherry symbol is reduced without altering the physical appearance of the slot machine.

2. *The Durham patent*

WMS based its WMS 400 slot machine after the design disclosed in the patent issued to Timothy Durham, entitled "Method for Determining Payoffs in Reel-Type Slot Machines" (the "Durham patent").⁷⁴ Because the parties stipulated that the Durham patent describes the accused device, the court's discussion of the accused device referred to the Durham patent.⁷⁵

Unlike the Telnaes patent apparatus, which determines the stop positions first and then determines the payoff based on those stop positions, the Durham patent apparatus calculates the payoff first and then chooses stop positions that represent that payoff.⁷⁶ The Durham patent method begins by randomly selecting a number from a range of 1 to 632.⁷⁷ Once selected, that number is mapped to a first multiplier listed in a ROM table.⁷⁸ Next, a second number is randomly selected from a second range of 1 to 632,⁷⁹ and, once selected, it is mapped to a second multiplier listed in a different ROM table.⁸⁰ The two multipliers are then multiplied together to determine the payout value.⁸¹ If there is only one way to display the payout, then the reels are stopped on those symbols.⁸² If, however, there is more than one arrangement of symbols that can indicate the payout, then a

73. *See id.*

74. *See WMS Gaming*, 184 F.3d at 1344; U.S. Patent No. 5,456,465 (issued Oct. 10, 1995) [hereinafter Durham patent].

75. *See id.*

76. *See WMS Gaming*, 184 F.3d at 1344; Durham patent, *supra* note 74, at col. 1, ll. 40-54.

77. *See WMS Gaming*, 184 F.3d at 1344; Durham patent, *supra* note 74, at col. 3, ll. 13-16.

78. *See WMS Gaming*, 184 F.3d at 1344; Durham patent, *supra* note 74, at col. 3, ll. 16-17 and at Figure 5. A ROM table is a table of data stored in a Read Only Memory (ROM) computer chip.

79. *See WMS Gaming*, 184 F.3d at 1344; Durham patent, *supra* note 74, at col. 3, ll. 18-19.

80. *See WMS Gaming*, 184 F.3d at 1344; Durham patent, *supra* note 74, at Figure 6.

81. *See WMS Gaming*, 184 F.3d at 1344; Durham patent, *supra* note 74, at col. 3, ll. 28-37.

82. *See Durham patent*, *supra* note 74, at col. 3, ll. 56-58 and at Figure 4.

third random number is necessary.⁸³ This third random number determines which one of the possible reel arrangements will be displayed.⁸⁴

C. The Federal Circuit's Discussion

1. Claim construction

WMS contended that the district court erred in its claim construction and that the WMS 400 slot machine would not infringe properly construed claims of the Telnaes patent.⁸⁵ Because the parties agreed that claim 1 of the Telnaes patent controlled the infringement issue for all remaining claims, the Federal Circuit infringement analysis focused exclusively on that claim.⁸⁶ Claim 1 of the Telnaes patent reads as follows:

A game apparatus, comprising:

[1] a reel mounted for rotation about an axis through a predetermined number of radial positions;

[2] means to start rotation of said reel about said axis;

[3] indicia fixed to said reel to indicate the angular rotational position of said reel;

[4] means for assigning a plurality of numbers representing said angular positions of said reel, said plurality of numbers exceeding said predetermined number of radial positions such that some rotational positions are represented by a plurality of numbers;

[5] means for randomly selecting one of said plurality of assigned numbers; and

[6] means for stopping said reel at the angular position represented by said selected number.⁸⁷

The parties agreed that the accused device contained the first three claim limitations.⁸⁸ The parties' dispute centered on the last three elements of claim 1.⁸⁹

83. See *WMS Gaming*, 184 F.3d at 1344-45; Durham patent, *supra* note 74, at col. 4, ll. 1-7. More than one way of displaying the result is possible if, for example, the same symbol appears more than once on a single reel. In such a case, displaying either symbol indicates the desired payout. Therefore, the slot machine control circuitry must select one of them. See *id.* at col. 3, l. 60 to col. 4, l. 7.

84. See *WMS Gaming*, 184 F.3d at 1344-45; Durham patent, *supra* note 74, at col. 4, ll. 1-7.

85. See *WMS Gaming*, 184 F.3d at 1346.

86. See *id.*

87. See Telnaes patent, *supra* note 57, at col. 5, ll. 36-53.

88. See *WMS Gaming*, 184 F.3d at 1347.

89. See *id.*

Regarding the fourth claim limitation, the “means for assigning” limitation, WMS argued that the district court incorrectly identified the means corresponding to the identified function.⁹⁰ The district court, relying on the parties’ stipulation that the Telnaes patent disclosed “a microprocessor, or computer, to control the operation of the slot machine,”⁹¹ held that the means for the claim limitation was “an algorithm executed by a computer.”⁹² Under the district court’s construction, the “means for assigning” limitation covered “any table, formula, or algorithm”⁹³ that performed the claimed function.

The Federal Circuit refrained from questioning the parties’ stipulation⁹⁴ and held that the district court erred in not limiting the claim to the disclosed algorithm.⁹⁵ The proper claim construction restricted the invention to a computer performing the algorithm illustrated in Figure 6 of the Telnaes patent.⁹⁶ The Federal Circuit held that “[i]n a means-plus-function claim in which the disclosed structure is a computer, or microprocessor, programmed to carry out an algorithm, the disclosed structure is not the general purpose computer, but rather the special purpose computer programmed to perform the disclosed algorithm.”⁹⁷ A general purpose com-

90. *See id.* at 1348.

91. *Id.* at 1347.

92. *WMS Gaming Inc. v. International Gaming Tech.*, No. 94-C3062, 1996 WL 539112, at *10 (N.D. Ill. Sept. 20, 1996) (emphasis added).

93. *Id.* at *11 (emphasis added).

94. *See WMS Gaming Inc. v. International Gaming Tech.*, 184 F.3d 1339, 1348 (Fed. Cir. 1999). The Federal Circuit noted that the written description of the Telnaes patent was “almost completely devoid of any structure to support [the “means for assigning”] limitation.” *Id.* Although the Federal Circuit court did not find anything in the Telnaes patent that limited the “means for assigning” to a computer, the Federal Circuit refused to raise the issue sua sponte. *See id.* at n.2. The Federal Circuit’s refusal to question this stipulation is problematic because the proper time to remedy problems in patent disclosures is during the prosecution of the patent application or during a reissue examination under 35 U.S.C. § 251, not during infringement litigation. Since parties in litigation have strong self-interested motives and since no one is present to represent society’s interests, the court should have challenged the stipulation to ensure that the patent deserved the exclusive grant given it by the law. *See Seal-Flex, Inc. v. Athletic Track & Court Constr.*, 172 F.3d 836 (Fed. Cir. 1999) (J. Rader, concurring) (stating that the court should review whether a stipulation is proper).

95. *See id.*

96. *See id.* at 1348-49 (“Figure 6 illustrates an algorithm in which a plurality of single numbers are assigned to stop positions such that: 1) the range of single numbers exceeds the number of stop positions; 2) each single number is assigned to only one stop position; 3) each stop position is assigned at least one single number; and 4) at least one stop position is assigned more than one single number.”).

97. *Id.* at 1349.

puter, or processor, programmed with an algorithm creates “a new machine, because a general purpose computer in effect becomes a special purpose computer once it is programmed to perform particular functions pursuant to instructions from program software.”⁹⁸ The software program’s instructions that perform the algorithm change the general purpose computer electrically by creating electrical paths within the device.⁹⁹ “These electrical paths create a special purpose machine for carrying out the particular algorithm.”¹⁰⁰

The dispute regarding the second and third disputed claim limitation centered on the interpretation of the function of each claim limitation. WMS argued that “selecting *one* of said . . . numbers”¹⁰¹ must be limited to selecting single numbers rather than combinations of numbers.¹⁰² The district court had interpreted the functions of both claim limitations to include combinations of numbers.¹⁰³ The Federal Circuit agreed with WMS and restricted both claim limitations to performing functions with single numbers.¹⁰⁴

2. *Infringement analysis—comparing the construed claim to the accused device*

After construing claim 1 of the Telnaes patent, the Federal Circuit determined whether the claim read on the accused device literally or under the doctrine of equivalents.¹⁰⁵ In its literal infringement analysis, the Federal Circuit noted that the two structures were not identical because “the microprocessor disclosed in the Telnaes patent [was] programmed differently from the microprocessor disclosed in the Durham patent.”¹⁰⁶ Because the two structures were not identical, the issue of literal infringement, regarding the structural limitations, turned on whether the accused device had structural equivalents to the two penultimate claim limitations.¹⁰⁷ The Federal Circuit stated that whether the Telnaes and Durham

98. *Id.* at 1348 (quoting *In re Alappat*, 33 F.3d 1526, 1545 (Fed. Cir. 1994)).

99. *See id.* at 1348.

100. *Id.*

101. *See* Telnaes patent, *supra* note 57, at col. 5, ll. 49-51 (emphasis added).

102. *See WMS Gaming*, 184 F.3d at 1349-50.

103. *See id.* at 1350.

104. *See id.* “[T]he functions [of the last two claim limitations] are: . . . 2) randomly selecting *one* of the numbers assigned to stop positions; and 3) stopping the reel at the stop positions that corresponds to the [*one*] selected number.” *Id.* at 1349 (emphasis added).

105. *See id.* at 1350-54.

106. *Id.* at 1350.

107. *See id.* at 1350-51.

algorithms were structurally equivalent was a “close question”¹⁰⁸ but it did not overturn the district court’s ruling that that they were equivalent.¹⁰⁹

Although the accused device was ruled to have equivalent structure, the Federal Circuit reversed the district court’s finding of literal infringement.¹¹⁰ The court reversed the finding of literal infringement because the WMS 400 did not perform the identical function—the WMS 400 selected combinations of numbers, not single numbers as required by the function in claim 1 of the Telnaes patent.¹¹¹ However, because the doctrine of equivalents does not require identical function, the Federal Circuit affirmed the district court’s finding of insubstantial differences between the claimed invention and the accused device.¹¹² Reversing the finding of literal infringement, the Federal Circuit remanded to the district court to reconsider the issue of willfulness.¹¹³

III. DISCUSSION

A. The Federal Circuit’s Holding is Consistent with Legal and Scientific Principles

In *WMS Gaming*, the Federal Circuit held that in a means-plus-function claim in which the disclosed structure is a computer programmed to perform an algorithm, the disclosed structure is the computer as programmed to perform the disclosed algorithm.¹¹⁴ The Federal Circuit’s holding represents a logical extension from its legal precedent and a logical application of scientific principles.

1. Consistent legal precedent

The Federal Circuit has consistently cut back the scope potentially granted by section 112 paragraph 6. This trend first expressly appeared in 1987¹¹⁵ and has continued since then.¹¹⁶ The Federal Circuit recently ex-

108. *Id.* at 1352.

109. *See id.*

110. *See id.*

111. *See id.*

112. *See id.* at 1352-54.

113. *See id.* at 1355.

114. *See id.* at 1349.

115. See Paul M. Janicke, *The Crisis in Patent Coverage: Defining Scope of an Invention by Function*, 8 HARV. J.L. & TECH. 155 (1994) (stating that this “cutting back” effect was first expressly observed by the Federal Circuit in 1987 in *Data Line Corp. v. Micro Tech., Inc.*, 813 F.2d 1196, 1201 (Fed. Cir. 1987) and in *Pennwalt Corp. v. Durland-Wayland, Inc.*, 833 F.2d 931, 934 (Fed. Cir. 1987)).

tended this trend in *Chiuminatta Concrete Concepts, Inc. v. Cardinal Industries, Inc.*,¹¹⁷ in which the court limited the scope of means-plus-function claims further by restricting the application of the doctrine of equivalents to such claims.¹¹⁸ The court's tendency continued in *WMS Gaming* when it restricted the structure of a software-related means-plus-function claim limitation by including the disclosed algorithm.¹¹⁹ This tendency of the court reflects an alignment of the patent scope with what the patentee actually invented and disclosed.¹²⁰ The alternative for the Federal Circuit would have been to invalidate the claim.

If the Federal Circuit had not included the algorithm as part of the structure or means, claim 1 of the Telnaes patent would have been unduly over broad and would be invalid for lack of enablement. A claim construed as IGT wanted would be structurally "limited" to a general purpose computer and its equivalent.¹²¹ Such a claim would cover any method that performed the same function by use of a computer or its equivalents¹²²—even if a method achieved the result in a significantly different manner. To warrant such broad scope, the patent disclosure must enable those skilled in the art to make and use, without undue experimentation, all the inventions that fall within that scope.¹²³ If the scope of the enabling disclosure is not commensurate with the scope of the protection sought by the claim, then the claim is invalid for lack of enablement.¹²⁴

116. See, e.g., *Johnston v. IVAC Corp.*, 885 F.2d 1574, 1580 (Fed. Cir. 1989) (holding that section 112 paragraph 6 "operates to cut back on the types of means which could literally satisfy the claim language"); *Jonsson v. Stanley Works*, 903 F.2d 812, 819 (Fed. Cir. 1990) (same); *In re Donaldson, Co.*, 16 F.3d 1189, 1194-95 (Fed. Cir. 1994) (en banc) (holding that the PTO must limit claims written in means-plus-function language to the corresponding structure disclosed in the specification).

117. 145 F.3d 1303 (Fed. Cir. 1998).

118. *Id.* at 1310 (holding that "a finding of a lack of literal infringement for lack of equivalent structure under a means-plus-function limitation may preclude a finding of equivalence under the doctrine of equivalents.").

119. See *WMS Gaming*, 184 F.3d at 1348-49.

120. See 35 U.S.C. § 112 (1994).

121. See *WMS Gaming*, 184 F.3d at 1348.

122. See *id.* ("The district court construed the 'means for assigning' limitation of claim 1 to cover 'any table, formula, or algorithm' [for performing the specified function].").

123. See *In re Wright*, 999 F.2d 1557, 1561 (Fed. Cir. 1993) ("[T]he specification . . . must teach those skilled in the art how to make and use the *full scope* of the claimed invention without 'undue experimentation.'") (emphasis added); see also, U.S. DEP'T OF COMMERCE, MANUAL OF PATENT EXAMINING PROCEDURE § 2164.08 (7th ed. 1998).

124. See *In re Hyatt*, 708 F.2d 712, 714 (Fed. Cir. 1983).

A good example of undue breadth in claiming is *O'Reilly v. Morse*.¹²⁵ The case involved the validity of Samuel Morse's patent on the telegraph. The Supreme Court had "difficulty" with the last claim of the patent,¹²⁶ wherein Morse asserted rights to all methods of communicating at a distance by use of electromagnetism.¹²⁷ The Court recognized that if the claim was maintained, every system or method of communicating at a distance by means of electrical current would infringe the patent, even a much better system that employed none of the processes disclosed by Morse.¹²⁸ The Court invalidated the claim as "too broad"¹²⁹ and held that a patentee cannot claim "an exclusive right to use a manner and process which he has not described and indeed had not invented."¹³⁰

In *WMS Gaming*, the Federal Circuit could either extend its trend on restricting the broad scope of the section 112 paragraph 6 claims or invalidate the entire claim. The court's choice represents a balance between protecting the patentee's grant and protecting the public's interest.

2. *Consistent and Proper Application of Technical Principles*

Besides being consistent with precedent, the Federal Circuit's decision is also consistent with technical realities. A software program is properly part of the computer means because a general purpose computer needs a program to operate. Also, a software program is properly part of the computer means because the program alters the computer.

A software program that embodies an algorithm is an essential element of a general purpose computer programmed to perform a specific function.¹³¹ A general purpose computer is what its name implies,¹³² a computer designed such that it can be adapted to accomplish many functions without having to be physically rewired.¹³³ However, a computer cannot

125. 56 U.S. (15 How.) 62 (1853).

126. *Id.* at 112.

127. *Id.* at 86.

128. *See id.* at 113.

129. *Id.*

130. *Id.*

131. *See In re Alappat*, 33 F.3d 1526, 1545 (Fed. Cir. 1994) (stating that a general purpose computer becomes a special purpose computer once programmed to perform a specific function).

132. *See* Larry D. Tindell, *Microcomputer*, in *COMPUTER SCIENCE SOURCE BOOK* 38, 40 (Sybil P. Parker ed., 1988) ("Taken as is, the microcomputer [does] not appear to have much to offer.").

133. *See* JOHN CASE, *DIGITAL FUTURE: THE PERSONAL COMPUTER EXPLOSION—WHY IT'S HAPPENING AND WHAT IT MEANS* 79-84 (1985) (reciting that historically one of the reasons why computers developed as they did was because changing the operation of

perform these functions or any “useful work without first being given a program” to direct the actions of the machine.¹³⁴ Thus, an algorithm makes the otherwise ineffectual computer effective by providing the additional means necessary to perform the function.¹³⁵

An algorithm is a fundamental part of the computer means because the algorithm programmed into a microprocessor electrically alters the microprocessor.¹³⁶ Modern microprocessors contain a countless number of interconnected transistors that act as electronic switches.¹³⁷ These transistors form complex arrays of circuits that perform the decisions within the microprocessor.¹³⁸ The transistors either open or close according to the instructions given by the program.¹³⁹ The opening and closing of the transistors creates electrical pathways in the processor causing it to perform the specified function of the instructions that embody the algorithm.¹⁴⁰ This electrical alteration makes the general purpose computer equivalent to an electronic apparatus specifically designed to achieve the desired function. “[F]rom a computer science perspective, any distinctions between hardware-implemented and software-implemented solutions to technological problems are arbitrary and artificial. . . . [A] software-based solution can be ‘translated’ into an equivalent hardware solution, and vice versa.”¹⁴¹ Thus, a program becomes part of the computer means for achieving a desired result by electrically adapting the microprocessor into a special purpose machine.

B. Repercussions of *WMS Gaming v. International Game Technology*

One result of the Federal Circuit’s holding in *WMS Gaming* is that software-related means-plus-function claim limitations similar to the one in *WMS Gaming* are limited by any disclosed algorithms.¹⁴² Patent drafters

early computers involved physically changing the machine which was costly, time consuming, and error prone).

134. See Tindell, *supra* note 132, at 40.

135. See *id.*

136. See *WMS Gaming*, 184 F.3d at 1348 n.3.

137. See Neil Randall, *Dissecting the Heart of Your Computer*, PC MAGAZINE, June 9, 1998, at 254-55.

138. See *id.*

139. See *id.*

140. See *id.*; see also *WMS Gaming*, 184 F.3d at 1348.

141. Ronald S. Laurie & Joseph K. Siino, *A Bridge Over Troubled Waters? Software Patentability and the PTO’s Proposed Guidelines (Part II)*, COMPUTER LAW., Oct. 1995, at 18; see also *In re Alappat*, 33 F.3d 1526, 1544-45 (Fed. Cir. 1994) (stating that Alappat’s hard-wired apparatus was equivalent to a general purpose computer programmed to achieve the same result as the hard-wired apparatus).

142. See *WMS Gaming*, 184 F.3d at 1347-49.

must be aware of this result when drafting patent applications, and companies must consider this result when reviewing theirs or others' patent portfolios.

For those whose technology or products have been restricted by another's software-related patent, *WMS Gaming* provides a possible escape. An apparatus that uses a substantially different algorithm can avoid infringing the means-plus-function claim both literally and under the doctrine of equivalents.¹⁴³ This escape route, however, is not without dangers. Whether two algorithms are equivalent involves factual issues, such as whether one skilled in the art would consider the differences to be insubstantial.¹⁴⁴ Factual issues create uncertainty. For example, in *WMS Gaming*, the Federal Circuit indicated that the two algorithms may be substantially different; however, it refused to reverse the district court's ruling that the two algorithms were equivalent.¹⁴⁵ Added to the factual uncertainty is procedural uncertainty because the Federal Circuit has not resolved the question of "whether a determination of equivalents under § 112, para. 6 is a question of law or fact."¹⁴⁶ Therefore, one may avoid the trap of infringement by employing a different algorithm only to be ensnared by factual or legal uncertainties.

One way to ameliorate the claim limiting effect of *WMS Gaming* is to include alternate algorithms, either expressly or implicitly,¹⁴⁷ in patent specifications. However, at least one practitioner has argued that less, rather than more, disclosure would grant the patentee broader coverage.¹⁴⁸

143. See *WMS Gaming*, 184 F.3d at 1350-54 (analyzing the literal infringement of the means-plus-function claim where the means used are not identical); Jason Schultz, Note, *Chiuminata Concrete Concepts, Inc. v. Cardinal Industries, Inc. & Dawn Equipment Co. v. Kentucky Farms, Inc.*, 14 BERKELEY TECH. L.J. 173 (1999) (explaining the application, and restrictions on its application, of the doctrine of equivalents to means-plus-function claims).

144. See *id.* at 1351 (referring to the district court's reliance on an expert who stated the difference between the two algorithms was minor).

145. See *id.* at 1352.

146. *Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 977 n.8 (Fed. Cir. 1995) (en banc); see also *Chiuminata Concrete Concepts, Inc. v. Cardinal Indus., Inc.*, 145 F.3d 1303, 1309 (Fed. Cir. 1998).

147. The amount of disclosure necessary is measured by one skilled in the art. See *Miles Laboratories, Inc. v. Shandon Inc.*, 997 F.2d 870, 875 (Fed. Cir. 1993). In the some cases it may be possible to incorporate several algorithms without disclosing any specific one. See *In re Dossel*, 115 F.3d 942, 946-47 (Fed. Cir. 1997) (holding that reference to algorithms which were known in the art was sufficiently definite).

148. See Chris Ford, *Playing the Odds*, CAL. L. BUS., Sept. 20, 1999, at 11 (relating that Mr. Robert Krupka, attorney for International Gaming Technologies, indicated that

Providing less disclosure may narrowly avoid the hurdle of *WMS Gaming*, but such action collides with other patent law requirements that are premised on benefiting society by providing disclosure.¹⁴⁹ First, by limiting the disclosure, a patent may run afoul of the enablement requirement by failing to provide enough information to enable the invention.¹⁵⁰ Second, even if the disclosure enables an embodiment of the invention, if the scope of enablement is not commensurate with scope of the claim, the claim is invalid.¹⁵¹ Third, a means-plus-function claim that has very little corresponding structure is more susceptible to novelty and obviousness challenges since the lack of structure in the specification makes any apparatus that performs that specified function prior art.¹⁵² Finally, under *WMS Gaming*, if a patent that uses means-plus-function language to describe a software-related invention does not sufficiently disclose an algorithm, then the patent may be invalidated as indefinite because the scope of the claims would be unclear.¹⁵³ Although providing less disclosure may avoid the effects of *WMS Gaming*, such action runs headlong into other patent law barriers.

“his client [IGT] would have better protected its invention by being vague in its description of how the slot machine’s computer generates numbers”).

149. See *Bonito Boats Inc. v. Thunder Craft Boats, Inc.*, 489 U.S. 141, 150-152 (1989) (“The federal patent system thus embodies a carefully crafted bargain for encouraging the creation and disclosure of new, useful, and nonobvious advances in technology and design in return for the exclusive right to practice the invention for a period of years. . . . We have long held that after the expiration of a federal patent, the subject matter of the patent passes to the free use of the public as a matter of federal law.”).

150. If the disclosure is so sparse that the claimed invention cannot be made or use by some skilled in the art without undue experimentation, then the patent is invalid. See 35 U.S.C. § 112 ¶ 1 (1994).

151. See *supra*, Part III.A.1.; see also, *In re Hyatt*, 708 F.2d 712, 714-15 (Fed. Cir. 1983).

152. See U.S. DEP’T OF COMMERCE, MANUAL OF PATENT EXAMINING PROCEDURE § 2185 (7th ed. 1998) (stating that where a means-plus-function limitation is not supported by corresponding structure, material, or acts in the specification, rejections should be considered under 35 U.S.C. § 102 or § 103 where the prior art anticipates or renders obvious the claimed subject matter, the theory being that since there is no corresponding structure in the specification to limit the means-plus-function limitation, an equivalent is any element that performs the specified function).

153. When an element is claimed in means-plus-function language, the specification becomes integrated into the claim since the means-plus-function element is limited by the disclosure in the specification. See 35 U.S.C. § 112 ¶ 6 (1994). If a patent specification fails to define the *means*, the scope of the claim is unclear and may lose its legal protection due to indefiniteness. See *In re Dossel*, 115 F.3d 942, 946 (Fed. Cir. 1997) (stating that a claim containing a means-plus-function element will generally be held indefinite if the specification does not contain an adequate disclosure of structure corresponding to the function of the claims).

IV. CONCLUSION

In *WMS Gaming*, the Federal Circuit answered an interesting question related to claim construction when it held that a means-plus-function claim limitation that employs a computer programmed to carry out an algorithm must include the algorithm as part of the structure or means.¹⁵⁴ The court's decision reflects a proper extension of its trend to restrict the scope of means-plus-function claims and a proper application of technical understanding. Given this added restriction placed on software-related means-plus-function claims, patent prosecutors and companies with software-related patents should seriously review their current patents and patent applications. They may also need to adjust their approach in the future if they wish to capitalize upon or to minimize the impact of this ruling.

154. See *WMS Gaming Inc. v. International Gaming Tech.*, 184 F.3d 1339, 1349 (Fed. Cir. 1999).