USE OF FUNCTIONAL CLAIM ELEMENTS FOR PATENTING COMPUTER PROGRAMS

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Computer programs can be patented by claiming their underlying algorithms.[1] *One possibility to claim algorithms is to use functional claim elements. Different from structural claim elements, functional claim elements do not define inventions in terms of what they are, but rather in terms of what they do. This article will discuss the use of functional claim elements for patenting computer programs embedding it in a discussion of functional claiming in general. After a short introduction covering the historical development towards the present legal situation (Part I.), an element-for-element analysis of the current black letter law is presented (Parts II. – VII.), which will be wrapped up in a final summary (Part VIII.).*

I. History of Functional Claim Elements

Although the Patent Act of 1836 did not yet provide for use of functional claim elements,[2] such elements were already addressed by the Circuit Court for the District of Massachusetts in its 1840 case *Wyeth v. Stone*.[3] In this case, the court invalidated the claim "to cut ice of a uniform size, by means of an apparatus worked by any other power than human."[4] The court reasoned that the claim would cover an art or principle in the abstract instead of relating to a particular method or machinery.[5] Subsequent case law confirmed this finding, refraining from upholding

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[1] *See Copyrighting Software v. Patenting Software,* HARVARD UNIVERSITY: OFFICE OF TECHNOLOGY DEVELOPMENT, *archived at* www.webcitation.org/62g7XzqvK (referencing cases that state an algorithm is patentable in conjunction with a computer program). An algorithm can be defined as "an unambiguous specification of a conditional sequence of steps or operations for solving a class of problems." *See* Allen Newell, *The Future of Software Protection: Response: The Models are Broken, the Models are Broken!,* 47 U. PITT. L. REV. 1023, 1024 (1986) (defining an algorithm).

[2] *See* Patent Act of July 4, 1836, ch. 357, 5 Stat. 117 (establishing a U.S. Patent Office, designating officers, outlining the process for obtaining a patent, and instructions for addressing patent infringement).

[3] *See* 30 F. Cas. 723, 725 (C.C.D. Mass. 1840) (beginning to discuss the elements of the patent claim).

[4] *See id.* at 727.

[5] *See id.* (determining that the claim was unmaintainable because it was too abstract).

patents for processes that involved nothing more than the function of a machine.[6] The Supreme Court found that granting a patent in these cases would amount to pure functional claiming and inhibit the disclosure of the invention.[7] Therefore, the Court held, the performance of a function must be limited to the particular disclosure.[8]

In 1946, the Supreme Court addressed the use of functional claim elements in its landmark decision *Halliburton Oil Well Cementing Co. v. Walker*.[9] The Court found the functional claim element at issue indefinite and invalidated the patent.[10] The claim element recited an improvement over certain prior art means as a "means…for tuning said [prior art] receiving means…."[11] The Court held that it was not permissible to describe the crucial element of a new combination of elements that the patentee sought protection for in terms of what it will do, rather than in terms of its physical characteristics or its arrangement in the new combination apparatus.[12] With this holding, the Supreme Court confirmed earlier decisions finding functional claim elements incompliant with the definiteness requirement of the Patent Act of 1870.[13]

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[6] *See, e.g.,* Westinghouse v. Boyden Power Brake Co., 170 U.S. 537, 557 (1898) (declaring that to be patentable, the performance of a function must be limited to the particular means described in the application); Risdon Iron & Locomotive Works v. Medart, 158 U.S. 68, 77 (1895) (holding that the function of a machine to improve a pulley was not patentable as a process); Corning v. Burden, 56 U.S. 252, 268 (1854) (delineating the term "process" as a discovery versus the process by which a machine operates, and clarifying that in the latter context the patentable subject matter is the machine itself).

[7] *See Westinghouse*, 158 U.S. at 557 (1898); *Corning*, 56 U.S. at 268 (describing the Supreme Court's reasoning behind granting the patents).

[8] *See, e.g., Westinghouse*, 170 U.S. at 557 (1898) (describing when the performance of a function is patentable).

[9] *See* 329 U.S. 1, 9 (1946) (invalidating claim element for describing function only and not physical characteristics).

[10] *See id.* (restating the holding of the case).

[11] *See id.* at 8 (quoting U.S. Patent No. 2,156,519 (filed Feb. 4, 1947)).

[12] *See id.* at 9 (reemphasizing importance of addressing physical structure element in claim).

[13] *See id.* (pointing to the Supreme Court's reasoning and holding); *see also,* Patent Act of July 8, 1870, ch. 230, § 26, 16 Stat. 198, which later became Rev.

In response to the Supreme Court's restrictive view of functional claim elements, Congress decided to codify a statute expressly permitting patentees to use functional claim elements.[14] Shortly after the decision in *Halliburton*, Subcommittee No. 3 of the House Committee on the Judiciary conducted a complete study of the patent laws, in which it also revised the law on functional claiming.[15] After some changes to the draft proposal, a bill embodying the current 35 U.S.C. § 112 ¶ 6 (2009) became law in 1952.[16] While enacting the Patent Act of 1952, it was Congress's intent to permit functional claim elements abrogating the ruling of *Halliburton*.[17] This intent was clearly expressed by Congressman Joseph R. Bryson, who served as the Chairman of Subcommittee No. 3, who stated that "[a]ll the elements of a combination now will be able to be claimed in terms of what they do as well as in terms of what they are."[18] This basic rule of law provides the foundation for using functional claim elements.[19]

Congress's willingness to establish the possibility of expressing claim elements in functional language is unambiguously reflected in the Patent Act of 1952 and its legislative history.[20] However, "the exact limits of the enlargement remain to be de-

Stat. 4888, 35 U.S.C. § 33 (1946) (requiring a patentee to "particularly point out and distinctly claim the part, improvement, or combination which he claims as his invention or discovery."); United Carbon Co. v. Binney & Smith Co., 317 U.S. 228, 234-35 (1942) (citing Holland Furniture Co. v. Perkins Glue Co., 277 U.S. 245, 256-58 (1928) and Gen. Elec. Co. v. Wabash Appliance Corp., 304 U.S. 364, 371-72 (1938)) (supporting the proposition that functional claims are invalid).

[14] *See* Patent Act of 1952, Pub. L. No. 82-593, ch. 950, § 112, 66 Stat. 792 (1952) (current version at 35 U.S.C. § 112 (2011)) (codifying the functional claim elements).

[15] *See* H.R. 3760, 82d Cong., § 112 (1951) (modifying the functional requirements in specifying a patent).

[16] *See* 35 U.S.C. § 112 (outlining the latest revision in patent application law).

[17] *See* Application of Fuetterer, 319 F.2d 259, 264 n.11 (C.C.P.A. 1963) (quoting Representative Joseph R. Bryson).

[18] *See id.*

[19] *See id.* (discussing the legislative background from which the present law is derived).

[20] *See* 35 U.S.C. § 112 (highlighting the Act and its preceding history).

termined."[21] This statement of Pasquale J. Federico, one of the drafters of the Patent Act of 1952, was valid in 1952 and remains true until today.[22] Therefore, the following Parts of this article are intended to clarify the limits of functional claim language as it is permitted under the current statutory language of § 112 ¶ 6. The statute reads:

> An element in a claim for a combination [Part II.] may be expressed as a means or step for performing a specified function [Part III.] without the recital of structure, material, or acts in support thereof [Part IV.], and such claim shall be construed to cover the corresponding structure, material, or acts [Part V.] described in the specification [Part VI.] and equivalents thereof [Part VII.].[23]

II. "An Element in a Claim for a Combination"

First, § 112 ¶ 6 refers to an "element in a claim" and not to a claim as a whole, which clarifies that the statute is only applicable to *single claim elements* expressed in functional language and *not to the claim overall*.[24] If a claim contains multiple functional elements, each single element is subject to § 112 ¶ 6.[25] However, any remaining non-functional claim element is not subject to § 112 ¶ 6.[26] Therefore, when using the common terminology of a "functional claim," it has to be taken care that § 112 ¶ 6 does not refer to the whole claim, but rather only to one or more functional elements of the claim.[27] Although, designation of a claim as a

[21] Pasquale J. Federico, *Commentary on the New Patent Act*, 35 U.S.C.A. 1 (1954), *reprinted in* 75 J. PAT. & TRADEMARK OFF. SOC'Y 161, 186 (1993).
[22] *See* 35 U.S.C. § 112 (drawing a conclusion that the statement is valid by noting a lack of amendment to the Act addressing enlargement limits).
[23] *See id*. (illustrating historical background of functional claim elements).
[24] *See id.*(explaining the language in § 112 ¶ 6).
[25] *See id.* (providing the statutory basis from which such claims are governed).
[26] *See* Michael T. Hopkins, *When a Lack of Equivalence Can Still Be Equivalent - Litigating Infringement of Means-Plus-Function Claims*, 40 IDEA 581, 596 n.76 (2000) (discussing that Congress amended § 112 to allow drafting of claims in the means-plus-function format).
[27] *See* 35 U.S.C. § 112 (illustrating that functional claim refers to elements of the claim rather than the whole claim in its entirety).

"functional claim" in the literal sense would be actually appropriate if a claim is limited to one functional element, i.e., it is a single means claim.[28]

With regard to single means claims, § 112 ¶ 6 allows functional claiming only for an element in a "claim for a combination."[29] Consequently, under an early interpretation provided by Pasquale J. Federico, which was later adopted by the Federal Circuit in *Hyatt*, claims using functional language must encompass more than one claim element.[30] The statutory language does not permit a single means claim, that is, a claim that recites means plus a statement of function without any structural claim element.[31] This result will not be altered by adding purely nominal structural elements to a single means claim.[32] According to this interpretation, a claim for a combination requires at least one structural element that is not nominal.[33]

Hyatt referred to a claim with only one element for a "Fourier transform processor comprising incremental means for incrementally generating the Fourier transformed incremental output signals in response to the incremental input signals."[34] The court categorized this claim as a single means claim finding it invalid for incompliance with the enablement requirement of § 112 ¶ 1.[35] It reasoned that single means claims would cover every conceivable means for achieving the stated result, while the specification discloses at most only those means known to the in-

[28] *See id*. at ¶ 4 (observing that the Act allows for a functional claim as long as it is a single means claim).
[29] *See id.* at ¶ 6 (introducing the concept of a combination claim).
[30] *See In re* Hyatt, 708 F.2d 712, 713-14 (Fed. Cir. 1983) (discussing that the Board quoted a portion of Federico when it found that there was an implied prohibition against single means claims in § 112).
[31] *See* 35 U.S.C. § 112 (interpreting the Act to not permit a single means claim).
[32] *See Hyatt*, 708 F.2d at 714 (describing rejection of single means claim by U.S. Patent & Trademark Office).
[33] *See id.* at 715 (reiterating the requirement a claim drafted in a means-plus-function format be drawn to a combination).
[34] *See id.* at 712-13.
[35] *See id.* at 714. (affirming the U.S. Patent and Trademark Office Board of Appeals's determination that claim 35 is a single means claim and that it was a violation of §112).

ventor.[36] Therefore, concluded the court, while § 112 ¶ 6 saves combination claims using means-plus-function format from undue breadth, no provision saves such claims if they are not drawn to a combination.[37]

The Federal Circuit's opinion in *Hyatt* raises various issues. First, a lack of enablement under § 112 ¶ 1 does not lead to the conclusion of invalidity under § 112¶ 6.[38] Further, using a single means claim does not necessarily imply that the claim is not enabled.[39] If the person having ordinary skill in the art is able to make the invention without undue experimentation, there is no reason why a single means claim may not be enabled.[40] Insofar, a single means claim is not different from any other claim type.[41] Also, contrary to the court's reasoning, a single means claim would not necessarily cover every conceivable means for achieving the stated result.[42] Rather, a patentee would only be entitled to the structure disclosed in the specification and equivalents thereof.[43] Under § 112 ¶ 6, this is true for any claim using functional language—whether it is a single means claim or not.[44] Thus, a single means claim should be subject to the same validity requirements as other claims using functional language.[45]

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[36] *See id.* (noting the historical problems associated with single means claims).
[37] *See id.* at 714-15 (reviewing §112 ¶ 6 and the limitations it places on claims drafted using means-plus-function format).
[38] *See* 35 U.S.C. § 112 (inferring that a patentable claim need not include the recital of structure material or acts in a claim for a combination); *see also infra* Part V.D (discussing the separate roles of §112 ¶ 1 and ¶ 6).
[39] *See Hyatt*, 708 F.2d at 715 (offering the court's opinion on how a single means claim does not imply the claim to be enabled).
[40] *See id.* at 713 (defining a single means claim); *supra* note 31 (interpreting the language of the statute as possibly enabling a single means claim).
[41] *See Hyatt*, 708 F.2d at 713 (elaborating on the validity of a single means claim in relation to ordinary claims).
[42] *See* 35 U.S.C. § 112 ¶ 6 (highlighting that a single element claim maybe supported through specification and functional description).
[43] *See id*. (pointing to the language in paragraph 6 of 35 U.S.C. § 112).
[44] *See id*. (justifying the validity of a single means claim using § 112).
[45] *See* Stephen Winslow, *Means for Improving Modern Functional Patent Claiming*, 98 GEO. L.J. 1891, 1911 (2010) (proposing a modification of § 112 ¶ 6 that allows single means claims).

For the aforementioned reasons, it follows that there is no convincing justification for excluding single means claims per se from being valid means-plus-function claims.[46] However, it remains to be resolved how this result can be obtained under the current statutory language of § 112 ¶ 6, which only allows a functional element in a "claim for a combination."[47] The plain language of the statute appears to unambiguously reflect the traditional understanding, according to which claims that make use of functional claim elements need to recite at least one structural claim element.[48] However, this understanding of the statutory language is not the only possible interpretation.[49] Rather, an element in a claim for a combination can be understood in a way that captures the preferable view allowing single means claims as well.[50]

How can this interpretation be achieved? Instead of reading a "claim for a combination" as a *claim combining multiple claim elements*, as it is traditionally suggested, it can be interpreted as a *claim combining a claim element and a supporting structure*.[51] Such interpretation would recognize the "claim for a combination" as a connection of a claim element and its related structure in the specification, thereby covering claims with a single functional element as well.[52] This interpretation is the preferred understanding of § 112 ¶ 6.[53] It is not only consistent with the statutory plain language, but also serves the purpose of § 112 ¶ 6, that is, to ensure that each functional claim element is sup-

[46] *See id.* (supporting the argument for no longer fearing single means claims).
[47] *See* 35 U.S.C. § 112 ¶ 6 (demonstrating the difficulty of interpreting single means claims).
[48] *See supra* note 21, at 186 (reiterating the need for specificity in the patent claim process).
[49] *See supra* note 45, at 1896-97 (proposing a way to draft around the prohibition against single means claims).
[50] *See supra* note 45, at 1896-97 (providing an example that would allow a single means claim to be enabled under § 112).
[51] *See supra* note 45, at 1896 (pointing to how a "claim for a combination" should be interpreted).
[52] *See supra* note 45, at 1896-97 (hypothesizing how a single means claim could be patentable).
[53] *See supra* note 45, at 1896-97 (proposing a way to draft around the prohibition against single means claims).

ported by sufficient disclosure of structure.[54] If such supporting structure is sufficiently present, there is no reason for holding single means claims invalid for lack of structure.[55]

III. "May be Expressed as a Means or Step for Performing a Specified Function"

§ 112 ¶ 6 further provides that an element in a claim for a combination "may be expressed as a means or step for performing a specified function."[56] The language "may" in § 112 ¶ 6 makes clear that it is the choice of the patentee to express a claim element in functional terms.[57]

A. Presumptions Involving Means-Plus-Function Claim Elements

The initial determination for classifying claim language as expression of a function consists of checking whether it is a gerund, i.e., a verb ending in "ing."[58] Additionally, two presumptions govern application of the statutory procedures of § 112 ¶ 6.[59] First, the use of the phrase "means for" in the language of a claim triggers a presumption that a patentee used this phrase advisedly to invoke the statutory mandate for means-plus-function

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[54] *See supra* note 45, at 1897 (showing how a single means claim could be sufficient eve under the criteria of § 112).
[55] *See supra* note 45, at 1897 (suggesting that single means claims can have sufficient structure).
[56] *See* 35 U.S.C. § 112 ¶ 6 (explaining how a combination claim can be expressed).
[57] *See id*. (indicating that it is the patentee's option to form a functional claim element); *see also* O.I. Corp. v. Tekmar Co., 115 F.3d 1576, 1583 (Fed. Cir. 1997) (explaining meaning of word "may"); Lindsay M. Beyer, *Still Beating the Dead Horse: Eliminating Redundant Analyses and Inconsistent Judgments for Means-Plus-Function Claims*, 2006 U. ILL. L. REV. 499, 502 (2006) (explaining that language may be either structural or functional).
[58] *See supra* note 45, at 1893 (discussing use of gerunds to indicate functional claims).
[59] *See* Biomedino, LLC v. Waters Tech. Corp., 490 F.3d 946, 950 (Fed. Cir. 2007) (asserting that a claim using the word "means" presumes §112 is being invoked); *see also* Generation II Orthotics, Inc. v. Med. Tech., 263 F.3d 1356, 1368-69 (Fed. Cir. 2001) (setting forth that §112 is presumed to not be invoked when the "means" language is absent).

claim elements.[60] Second, if the "means-for" phrase is not used, there arises a presumption that the claim element is not a means-plus-function claim element.[61] These presumptions are well established and regularly applied by courts.[62]

It should be observed that the presence or absence of "means for" language is not the final delimiter of whether a claim element should be construed as a means-plus-function claim element.[63] Both presumptions are rebuttable.[64] On the one side, even if a claim uses the phrase "means for", application of § 112 ¶ 6 is rebutted if the claim element does not recite a function,[65] or recites sufficient structure for performing the specified func-

[60] *See Biomedino*, 490 F.3d at 950 (citing Altiris, Inc. v. Symantec Corp., 318 F.3d 1363, 1375 (Fed. Cir. 2003)) (noting use of the language "means" triggers a presumption that §112 is invoked); *see also Altiris*, 318 F.3d at 1375 (citing Sage Prods., Inc. v. Devon Indus., Inc., 126 F.3d 1420, 1427 (Fed. Cir. 1997)); York Prods., Inc. v. Cent. Family Farm, 99 F.3d 1568, 1574 (Fed. Cir. 1996) (adopting a finding of the *Greenberg* court); Greenberg v. Ethicon Endo-Surgery, Inc., 91 F.3d 1580, (Fed. Cir. 1996) (concerning a patent infringement action between competitor manufacturers of surgical instruments).

[61] *See Generation*, 263 F.3d at 1368-69 (citing Watts v. XL Sys., Inc., 232 F.3d 877, 881 (Fed. Cir. 2000)) (affirming that the absence of "means" language creates a rebuttable presumption that §112 is not used).

[62] *See* ROBERT C. FABER, FABER ON MECHANICS OF PATENT CLAIM DRAFTING § 3:29.6, para. 1 (6th ed. 2008) (highlighting Federal Circuit treatment of "means" presumptions).

[63] *See Greenberg* 91 F.3d at 1583 (noting a court finding in which a variation on the "means for" language qualified as means-plus-function claim element); *see also* Laitram Corp. v. Rexnord, 939 F.2d 1533, 1536 (Fed. Cir. 1991) (explaining use of merely some means language is not sufficient to satisfy claim limitation).

[64] *See Biomedino*, 490 F.3d at 950 (stating the use of "means" for the purpose of invoking § 112 is a rebuttable presumption); s*ee also Watts*, 232 F.3d at 881 (stating the absence of the word "means" translates to the creator not invoking § 112 is a rebuttable presumption).

[65] *See* Wenger Mfg., Inc. v. Coating Mach. Sys., Inc., 239 F.3d 1225, 1232 (Fed. Cir. 2001) (citing Rodime PLC v. Seagate Tech., Inc., 174 F.3d 1294, 1302 (Fed. Cir. 1999)) (supporting the rebuttal of § 112 ¶ 6 if the claim element does not recite a function); *Rodime*, 174 F.3d at 1302 (citing Sage Prods., Inc. v. Devon Indus., Inc., 126 F.3d 1420, 1427-28 (Fed. Cir. 1997)) (offering that without a function, § 112 ¶ 6 is rebutted); FABER, *supra* note 62, at § 3:29.6 (discussing that the burden of proof for the claim element follows the presumption of § 112 ¶ 6).

tion.[66] On the other side, the presumption for a claim that does not use the phrase "means for" is rebutted if the claim element is purely functional,[67] or does not recite sufficient structure.[68]

For both rebuttals, determining whether a claim element recites sufficient structure depends on whether it has an understood meaning in the art.[69] In order to rebut the presumption for application of § 112 ¶ 6 on the basis that a claim element contains sufficient structure, it can be even satisfactory that the claim element encompasses a single structural term.[70] As far as a particular term in a claim element has a reasonably well understood meaning in the art, i.e., discloses sufficient structure to the person having ordinary skill in the art, it will be suitable to rebut the

[66] *See Biomedino*, 490 F.3d at 950 (citing *Altiris*, 318 F.3d at 1375) (illustrating that lack of sufficient structure will not rebut the use of § 112); *Rodime*, 174 F.3d at 1302 (citing *Sage Prods.*, 126 F.3d at 1427-28) (reciting sufficient structure for performing the function); FABER, *supra* note 62, at § 3:29.6 (reiterating sufficient structure for performing the function).

[67] *See* Mas-Hamilton Group v. LaGaurd, Inc., 156 F.3d 1206, 1214 (Fed. Cir. 1998) (discussing rebuttal of presumption that claim is not purely functional where the language used only describes a function).

[68] *See* Mass. Inst. of Tech. v. Abacus Software, 462 F.3d 1344, 1361 (Fed. Cir. 2006) (Michel, C.J., dissenting) (noting that without a sufficiently definite structure, § 112 ¶ 6 is applied); *see also* Toro Co. v. Deere & Co., 355 F.3d 1313, 1325 (Fed. Cir. 2004) (analyzing whether the claim has enough structure to avoid the § 112 limitation); Personalized Media v. Int'l Trade Commission, 161 F.3d 696, 703-04 (Fed. Cir. 1998) (discussing that even if the claim uses the term "means" and recites a function, the claim is not in means-plus-function format if structure is elaborated sufficiently).

[69] *See* Linear Tech. Corp. v. Impala Linear Corp., 379 F.3d 1311, 1320-21 (Fed. Cir. 2004) (interpreting the word "circuit" as one that suggests sufficient structure to a person of ordinary skill in the art); *see also* CCS Fitness, Inc. v. Brunswick Corp., 288 F.3d 1359, 1369 (Fed. Cir. 2002) (concluding that a person of ordinary skill in the art would understand the term "reciprocating member" to connote beam-like structures, not a single component); *Watts*, 232 F.3d at 880-81 (holding that the claim describing the sealing of at least two pipes used terminology that is reasonably well understood as names for structure by those skilled in the art); *Greenberg*, 91 F.3d at 1583 (highlighting that although the claim defines "detent" or "detent mechanism" in terms of what it does, the term also has a reasonably well understood meaning in the art).

[70] *See* Default Proof Credit Card Sys., Inc. v. Home Depot U.S.A., Inc., 412 F.3d 1291, 1302 (2005) (summarizing that only some structure is necessary to rebut § 112 ¶ 6).

presumption of a means-plus-function claim element.[71] For instance, use of the word "circuit" can convey sufficient structure leaving § 112 ¶ 6 inapplicable.[72]

B. Presumptions Involving Step-Plus-Function Claim Elements

§ 112 ¶ 6 goes beyond means-plus-function format allowing step-plus-function format as well.[73] While means-plus-function claim elements relate to machine claims, step-plus-function claim elements relate to process claims.[74] Thus, similar to machine claim elements, an element in a process claim may be expressed as a step for performing a specified function.[75] Consistent with the established correlation in § 112 ¶ 6 between "means" and "structure", "steps" refers to the generic description of elements of a process, and "acts" refers to the implementation of such steps.[76] A patent may contain parallel machine and

[71] *See Greenberg,* 91 F.3d at 1583 (stating that a structural term need only have a reasonably well understood meaning in the art).

[72] *See* Apex, Inc. v. Raritan Computer, Inc., 325 F.3d 1364, 1373 (Fed. Cir. 2003) (opining that the term "circuit" connotes structure and can render avoidance of § 112 ¶ 6); *see also Linear Tech. Corp.*, 379 F.3d at 1320-21 (reaffirming that the term "circuit" connotes structure and can render avoidance of § 112 ¶ 6).

[73] *See* 35 U.S.C. § 112 ¶ 6 (indicating that a combination claim may be expressed in means or steps). For ease of reading, this article usually refers to means-plus-function claim elements. However, unless otherwise noted, all considerations are equally applicable to step-plus-function claim elements.

[74] *See* 35 U.S.C. § 100(b) (1999) (defining a process as an art or method, and includes a new use of a known process, machine, manufacture, composition of matter, or material); *see also* Paul R. Kitch, *Step-Plus-Function: Just What Have We Stepped Into?*, 7 J. MARSHALL REV. INTELL. PROP. L. 117, 118 (2007) (describing the interplay between step-plus-function claims and process claims).

[75] *See* Kitch, *supra* note 74, at 118 (describing how elements and claims can be expressed as either a means or step for performing a function).

[76] *See O.I. Corp*. 115 F.3d at 1582-83 (describing judicial statutory interpretation of 'steps' and 'acts' as they relate to structural elements and implementation); *see also* Tobi C. Clinton, *Infringement and Software Claimed Under 35 U.S.C. § 112, ¶ 6: Software Function Is the Important Part*, 5 VA. J.L. & TECH. 4, 15 (2000) (noting that the interpretation of "steps" and "acts" is consistent with the established correlation between means and structure).

process claims that both make use of functional claim elements.[77] In such case, applicability of § 112 ¶ 6 is evaluated for each claim element separately.[78] It cannot be concluded that one claim element is subject to § 112 ¶ 6 as a matter of the corresponding claim element being subject to § 112 ¶ 6.[79]

It appears that most arguments about qualification of a claim element as a step-plus-function element are not addressed during prosecution, but rather in the course of litigation when the accused infringer attempts to limit the scope of the asserted process patent.[80] Compared to means-plus-function elements, there are fewer cases addressing step-plus-function elements.[81]

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[77] *See, e.g.,* Epcon Gas Sys., Inc. v. Bauer Compressors, Inc., 279 F.3d 1022, 1025-26 (Fed. Cir. 2002) (reciting process and machine claims for providing gas assistance to an injection molding process).

[78] *See id.* at 1028 (holding that the district court erred when it did not independently evaluate the application of 112 to each claim).

[79] *See id* (asserting that an independent evaluation of a claim shows that it is not subject to § 112 ¶ 6); *see also O.I. Corp*., 115 F.3d at 1578-80 (reviewing a patent containing method and machine claims for removing water vapor from a sample to be analyzed in a gas chromatograph).

[80] *See* Kitch, *supra* note 74, at 118 (commenting on recent usage of § 112 by accused infringers to narrow the scope of process claims).

[81] *See, e.g.,* Seal-Flex, Inc. v. Athletic Track & Court Constr., 172 F.3d 836, 848 (Fed. Cir. 1999) (Rader, C.J., concurring) (discussing when step plus function treatment is appropriate); *O.I. Corp*., 115 F.3d at 1583 (Fed. Cir. 1997) (holding preamble statement of purpose not a function for purposes of step plus function analysis); *In re* Roberts, 470 F.2d 1399 (C.C.P.A. 1973) (holding result of unstated step not a separate step); 5A DONALD S. CHISUM, CHISUM ON PATENTS § 18.03[5][e][H][iii] (2007) (noting that there is almost no court decisions directly addressing the "step" clauses before the 1990s). *See also* Cardiac Pacemakers, Inc. v. St. Jude Med., Inc., 381 F.3d 1371, 1381 (Fed. Cir. 2004) (holding that mere inclusion of a step in a claim does not make it a step plus function claim); Utica Enterprises, Inc. v. Fed. Broach & Machine Co., 109 Fed. App'x 403, 409 (Fed. Cir. 2004) (decision was issued as unpublished or non-precedental and may not be cited as precedent) (holding words "step of" did not invoke presumption that claim was a step plus function claim); *Epcon Gas Sys*., 279 F.3d at 1028 (Fed. Cir. 2002) (holding statement of purpose need not be function, and steps without function do not make a step plus function claim); Masco Corp. v. United States, 303 F.3d 1316, 1327 (Fed. Cir. 2002) (holding that where claim element could be interpreted as an act rather than a function, it was not a step plus function claim unless patentee intentionally invoked § 112 ¶ 6); Micro Chemical, Inc. v. Great Plains Chemical Co., 194 F.3d

However, the basic rules for step-plus-function elements are equivalent to the rules for means-plus-function elements.[82] This parallel approach is well founded because application of deviating standards to process and machine claims would lead to arbitrary claim scope.[83] After all, patentees may claim their invention in terms of their own choosing.[84] Thus, virtually any invention can be claimed both as a machine and a process.[85] Against this background, § 112 ¶ 6 ensures that machine claims using means-plus-function elements and process claims using step-plus-function elements can have equal scope.[86]

Process claim elements are subject to § 112 ¶ 6 if they are expressed as steps for performing a specified function without the recital of sufficient acts in support thereof.[87] If the claim element uses the phrase "step for", then § 112 ¶ 6 is presumed to apply.[88] As "step for" introduces language that would probably encompass every possible act for performing the recited function, § 112 ¶ 6 limits such claim element to the specific acts recited in the specification for performing that function and their equivalents.[89] In the absence of the phrase "step for", the language of a claim raises a presumption that § 112 ¶ 6 does not apply.[90]

1250, 1258-59 (Fed. Cir. 1999) (discussing conditions under which step plus function limitations are avoided).

[82] *See* CHISUM, *supra* note 81, at § 18.03[4][d][5] (enumerating the basic rules for step-plus and means-plus function elements).

[83] *See* CHISUM, *supra* note 81, at § 18.03 (outlining how process and machine claims are similar in scope to means-plus and step-plus function elements).

[84] *See In re* Alappat, 33 F.3d 1526, 1583 (Fed. Cir. 1994) (Rader, C.J., concurring) (explaining the categorization used to describe invention not as important as invention itself).

[85] *See* Cathy E. Cretsinger, *I. Intellectual Property, B. Patent: 4. Patentability: a) Computer Software: AT&T Corp. v. Excel Communications, Inc.*, 15 BERKELEY TECH. L.J. 165, 176 (2000) (discussing impact of *Alappat*).

[86] *See id.* at 177 (stipulating that process and machine claims are on an equal basis).

[87] *See* 35 U.S.C. § 112 ¶ 6 (pointing to the language of the statute).

[88] *See Masco Corp.*, 303 F.3d at 1326 (affirming use of the term "step for" signals the patentee's intent to invoke § 112 ¶ 6); *Greenberg*, 91 F.3d 1583 (establishing that the use of "steps for" signals intention to invoke § 112 ¶ 6).

[89] *See Seal-Flex*, 172 F.3d at 850 (outlining limitations of claim coverage to specified acts).

[90] *See id.* at 849 (reasoning the claim element is not in step-plus-function form thereby removing §112 ¶ 6 applicability).

However, claim elements without express step-plus-function language may nevertheless fall within the scope of § 112 ¶ 6 if they are purely functional,[91] or if they do not recite sufficient acts.[92] Conversely, even if a claim element uses step-plus-function format, § 112 ¶ 6 still does not apply if the claim element does not recite a function,[93] or recites sufficient acts for performing the specified function.[94] For both rebuttals, determining whether a claim element recites sufficient acts depends on whether it has an understood meaning in the art.[95]

Identifying a step-plus-function claim element appears more elaborate than identifying a means-plus-function claim element.[96] This results from the fact that any process patent – whether it makes use of functional claim elements or not – necessarily recites steps of a process.[97] For example, a conventionally used transitional phrase in process patent claims refers to "[a] method for [X] . . . comprising the steps of [Y]."[98] However, the simple recitation of steps does not necessarily convert each en-

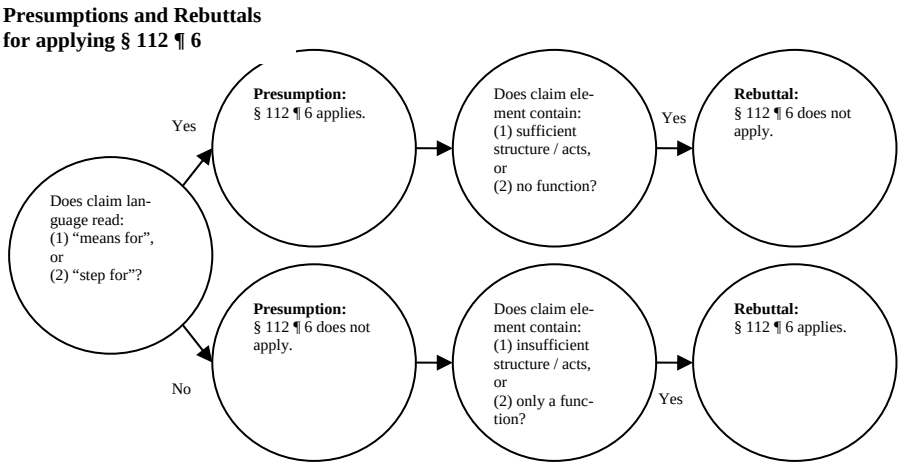
[91] *See id.* at 848 (supporting assertion that merely claiming the underlying function may allow a claim to fall with § 112 ¶ 6).
[92] *See Utica Enterprises*, 109 F. App'x at 409 (proffering that claims not using "step for" language may still fall within §112 ¶ 6 if they list steps but do not specify acts for the function); *see also Masco Corp*., 303 F.3d at 1326 (explaining that § 112 ¶ 6 applies where the drafter does not describe sufficient acts); *O.I. Corp*., 115 F.3d at 1583 (clarifying §112 ¶ 6 is implicated only when steps plus function without acts are present); CHISUM, *supra* note 81, at iii (detailing the case law addressing "step" clauses).
[93] *See* CHISUM, *supra* note 81, at iii (discussing that in step-plus-function format § 112 ¶ 6 may not apply if a function is not present).
[94] *See Seal-Flex*, 172 F.3d at 849-50 (clarifying that §112 ¶ 6 may apply if a claim recites an underlying function without the acts for performing it).
[95] *See* CHISUM, *supra* note 81, at iii (citations omitted) (proffering that acts are functional in the way that all acts are functional).
[96] *Compare Masco Corp.*, 303 F.3d at 1327 (determining that no step-plus-function element existed), *with* Aristocrat Techs. Australia PTY Ltd. v. Int'l Game Tech., 521 F.3d 1328, 1333 (Fed. Cir. 2008) (analyzing a means-plus function claim issue).
[97] *See Masco Corp.*, 303 F.3d at 1327 (discussing a list of actions that comprise a method claim); *see also Cardiac Pacemakers*, 381 F.3d at 1382 (explaining why § 112 ¶ 6 does not apply).
[98] *See Seal-Flex*, 172 F.3d at 839 (showing an example of a process claim).

suing step into a step-plus-function claim element.[99] Such language does not invoke the presumption for step-plus-function claim elements.[100] Rather, in the absence of "steps for" language the opposite presumption applies.[101] Thus, if the phrase "steps of" as well as the term "step" without the preposition "for" is used, for example, it can be presumed that § 112 ¶ 6 does not govern the limitation unless such language is followed by purely functional language or insufficient acts.[102]

Despite their linguistic proximity, step-plus-function claim elements and step elements of ordinary process claims can be well distinguished.[103] Based on the characteristic nature of functional claim elements, the main criterion for identifying a step-plus-function claim element is the recitation of a pure function or the lack in recitation of sufficient acts.[104] Therefore, if a claim element consists of a step that is purely functional or does not recite sufficient acts, it can only be categorized as a step-plus-function claim element and must be supported by sufficient acts in the specification in order to be valid.[105] However, if the step does not encompass a function or recites sufficient acts for carry-

[99] *See id.* at 849 (illustrating that § 112 ¶ 6 does not apply when the limitation recites sufficient acts for performing the function).
[100] *See Utica Enterprises*, 109 F. App'x at 409 (citing *Masco Corp.*, 303 F.3d at 1327) (discussing when a method claim is a step-plus-function claim); *see also Seal-Flex*, 172 F.3d at 850 (discussing how § 112 ¶ 6 may apply if a claim element only recites an underlying function without the acts performing it).
[101] *See Cardiac Pacemakers*, 381 F.3d at 1382 (explaining the presumption against application of § 112 ¶ 6 when the claim says "steps of" instead of "steps for").
[102] *See id.* (discussing the application of § 112 ¶ 6). The result is the same for machine claims when using the phrase "means of" or the term "means" without the preposition "for." *See id.* (referring to similar logic regarding application of § 112 ¶ 6).
[103] *See Seal-Flex*, 172 F.3d at 848-49 (stating when a claim element deserves step-plus function treatment).
[104] *See id.* (illustrating that § 112 ¶ 6 does not apply when the limitation recites sufficient acts for performing the function).
[105] *See* Clinton, *supra* note 76, at 21 (showing that a step clause will trigger § 112 ¶ 6 only when step plus functions do not have acts).

ing out the step, it is appropriately characterized as a step of an ordinary process claim.[106]



C. Disclosure of Specific Utility

As a side effect, the use of functional claim elements can satisfy the statutory requirement for disclosure of specific utility.[107] The utility requirement mandates any new invention to be useful and requires disclosure of its usefulness in the specification.[108] In other words, the invention has to do something, and what it does has to be disclosed.[109] Thus, if a mean-plus-function

[106] *See* Clinton, *supra* note 76, at 16 (noting where there is not a step plus function and § 112 ¶ 6 is not triggered).
[107] *See, e.g.*, Brenner v. Manson, 383 U.S. 519, 535-36 (1966) (setting forth that if a functional claim element encompasses the aspect of the invention's utility that signals uniqueness, the statutory requirement is fulfilled).
[108] *See* 35 U.S.C. § 101 (2006) (mandating that the invention be new and useful); 35 U.S.C. § 112 ¶ 1 (stating disclosure requirements).
[109] *See* 35 U.S.C. § 112 ¶ 1 (giving the requirements of the referenced patent statutes).

claim element discloses a function of the invention, such disclosure can be a sufficient description of specific utility.[110] Arguably, disclosure of specific utility in the claim language violates § 112 ¶ 1 because the statute requires disclosure of utility in the specification, not in the claims.[111] However, as the claims are a part of the specification, disclosure of utility in a claim element is in compliance with the statutory mandate.[112] Thus, different from claims that use only structural elements, claims that employ functional elements can disclose specific utility in the claim language.[113]

IV. "Without the Recital of Structure, Material, or Acts in Support Thereof,"

According to § 112 ¶ 6, it is necessary for a functional claim element to express a function "without the recital of structure."[114] However, disclosure of some structure is not prohibitive for qualifying a claim element as functional.[115] If the person having ordinary skill in the art is unable to fully discern the structure for performing a claimed function, such claim element can still be qualified as a functional claim element.[116] Thus, "without the recital of structure" does not mean "without the recital of *any* structure", but rather "without the recital of *sufficient* structure."[117] The term "structure" means "sufficient structure."[118] Thus, the determinative inquiry is not whether there is a total

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[110] *See In re* Fisher, 421 F.3d 1365, 1371 (Fed. Cir. 2005) (discussing sufficiency of disclosure to establish specific utility).
[111] *See* 35 U.S.C. § 112 ¶ 1 (declaring disclosure requirements).
[112] *See infra* Part VI.A (discussing disclosure of structure in claims).
[113] *See Fisher*, 421 F.3d at 1371 (justifying a functional claim's ability to establish specific utility).
[114] *See* 35 U.S.C. §112 ¶ 6 (2006) (providing the requirements for expression of a claim element).
[115] *See supra* Part III.A-B (discussing presumptions involving means-plus-function claim elements).
[116] *See supra* Part III.A-B (detailing presumptions involving means-plus-function claim elements).
[117] *See Default Proof Credit Card Sys.*, 412 F.3d at 1302 (summarizing that only some structure is necessary to rebut § 112 ¶ 6).
[118] *See id.* (explaining that only some structure is necessary to rebut § 112 ¶ 6).

lack of structure, but rather whether there is a lack of sufficient structure.[119]

V. "And such Claim Shall be Construed to Cover the Corresponding Structure, Material, or Acts"

§ 112 ¶ 6 determines that a functional claim element "shall be construed to cover the corresponding structure" described in the specification and equivalents thereof.[120]

A. Scope of Structural and Functional Claim Elements

§ 112 ¶ 6 is based on the notion that functional claim elements broadly claim a function of the invention, hence, are not inherently limited to a particular structure.[121] However, as there must be some determination of what the invention consists of, § 112 ¶ 6 limits the scope of a claim element to the corresponding structure disclosed in the specification and its equivalents.[122] The statute has a two-step mechanism.[123] In a first step, a functional claim element will be construed to encompass any structure for performing the claimed function.[124] At this point, the claim element is not limited to the embodiments disclosed in the specification and its equivalents.[125] However, in a second step,

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[119] *See id.* (distilling a case holding).
[120] *See* 35 U.S.C. § 112 ¶ 6 (highlighting how a functional claim element is construed).
[121] *See id.* (mandating that a patent claim for a combination does not need a description of structure in support of the claim).
[122] *See id.* (maintaining that in the specification and equivalents, the structure of the claim will be construed).
[123] *See id.* (setting forth the two-step process).
[124] *See id.* (articulating that a particular combination claim, while not explicitly stating structure, is construed to cover the structure).
[125] *See id.* (recognizing that the claim element is not restricted to the specifications and equivalents thereof); *see also In re* Wong, 80 Fed. App'x. 107, 109 (Fed. Cir. 2003) (discussing claims must be construed in light of the methods and structure described in the specification); *In re* Morris, 127 F.3d 1048, 1055 (Fed. Cir. 1997) (describing that the court found no basis in limiting a claim element to its specification and equivalents); *In re* Graves, 69 F.3d 1147, 1152 (Fed. Cir. 1995) (declaring that claims are given the broadest interpretation possible); *In re* Donaldson, 16 F.3d 1189, 1193-94 (Fed. Cir. 1994) (find-

the statute limits the claim element insofar as it cannot reach beyond its embodiments that are disclosed in the specification and equivalents thereof.[126] This is the structural limitation of functional claim elements.[127]

Different from a functional claim element, a structural claim element is not limited to the structure disclosed in the specification and equivalents thereof.[128] Rather it is defined by the structural language of the claim element itself.[129] Based on this observation most commentators hold that a structural claim element is broader in scope than a functional claim element.[130] However, at the first step of § 112 ¶ 6's two-step mechanism the language of a functional claim element is as broad as it possibly can be.[131] The claim element covers any means for performing

ing that § 112 ¶ 6 is applicable during prosecution invalidating the U.S.P.T.O.'s interpretation of functional claim elements as being not limited by the disclosed structure); STEVEN W. LUNDBERG, STEPHEN C. DURANT & ANN M. MCCRACKIN, ELECTRONIC AND SOFTWARE PATENTS § 7.02 (2d ed. 2005) (observing the applicability of ¶ 6 in the patent application).

[126] *See* 35 U.S.C. § 112 ¶ 6 (indicating the second prong of the ¶ 6 criteria); *see also* LUNDBERG ET AL., *supra* note 125, at § 7.02 (illustrating the applicability of ¶ 6 in patent applications).

[127] *See id*. (providing the structural limitation of functional claim elements).

[128] *See id.* (noting that the structural aspect of a combination claim is not limited to the specificity of the function requirement).

[129] *See* Aro Mfg. Co., Inc. v. Convertible Top Replacement Co., Inc., 365 U.S. 336, 339 (1961) (establishing that the claims made in the patent are the sole measure of the patent grant); *see also* SRI Int'l v. Matsushita Elec. Corp. of Am., 775 F.2d 1107, 1121 (Fed. Cir. 1985) (eliminating fabric from patent because term was not included in the claims); Bandag, Inc. v. Al Bolser's Tire Stores, Inc., 750 F.2d 903, 922 (Fed. Cir. 1984) (reaffirming it is the claims of a patent which are the sole measure of the patent grant); Jones v. Hardy, 727 F.2d 1524, 1528 (Fed. Cir. 1984) (upholding that patent analysis properly begins with the claim, as the claim is the measure and definition of the invention).

[130] *See, e.g.*, IRAH H. DONNER, PATENT PROSECUTION: LAW, PRACTICE, AND PROCEDURE, 230-31. (6th ed. 2009) (summarizing difference in interpretation between means-plus-function and standard claims); FABER, *supra* note 62, at § 3:29.1 (concluding functional claim element is narrower because claim elements are only as broad as the invention); Peter H. Kang & Kristin A. Snyder, *A Practitioner's Approach to Strategic Enforcement and Analysis of Business Method Patents in the Post-State Street Era*, 40 IDEA 267, 283-84 (2000) (arguing limited scope is a disadvantage to functional claims).

[131] *See* ROBERT P. MERGES & JOHN F. DUFFY, PATENT LAW AND POLICY: CASES AND MATERIALS 17 (2d ed. 1997) (pointing to the "very broad claiming format").

the claimed function.[132] It is true that there is a limitation in the second step.[133] However, this limitation does not necessarily lead to a narrower claim element compared to a structural claim element.[134] Rather, depending on the disclosed structure, both claim elements can be of equal scope.[135] After all, there is no reason why structure recited in the claims should be inevitably broader than structure recited in the remainder of the specification.[136]

Particularly, if multiple embodiments in the specification correspond to the claimed function, proper application of § 112 ¶ 6 reads the claim element to embrace each of those embodiments.[137] There is no requirement that a functional claim element must have a single claim construction, but rather the element can encompass all embodiments disclosed in the specification.[138] Moreover, to give a functional claim element additional scope, the specification may include broad definitions of the invention.[139] In fact, the same language used in a structural

[132] *See id*. (summarizing the basis of claims in § 112 ¶ 6).
[133] *See* LUNDBERG *supra* note 125 at § 7.02 (articulating the limitations in the second step of § 112 ¶ 6).
[134] *See* LUNDBERG *supra* note 125 at § 7.02 (distinguishing the elements of § 112 ¶ 6).
[135] *See* LUNDBERG *supra* note 125 at § 7.02 (noting that § 112 ¶ 6 provides a range for claim scope).
[136] *See* LUNDBERG *supra* note 125 at § 7.02 (indicating broad range).
[137] *See Micro Chemical*, 194 F.3d at 1258-59 (citing Serrano v. Telular Corp., 111 F.3d 1578, 1583 (Fed. Cir. 1997)) (holding that a less-preferred embodiment mentioned in the specification was covered); DONNER, *supra* note 130, at 516-17 (explaining general application of § 112 ¶ 6 to each embodiment corresponding to the function); Chad S.C. Stover, *Deciphering Means-Plus-Function Claim Limitation Infringement Under § 112, Paragraph 6: Finding Certainty in the Uncertain Case Law*, 3 N.C. J.L. & TECH. 101, 102-3 (2001) (stating claim would cover embodiment mentioned in specification and all equivalents).
[138] *See* Stover, *supra* note 137 (noting the limitations and requirements in the format of a means-plus-function claim).
[139] *See* JEFFREY G. SHELDON, HOW TO WRITE A PATENT APPLICATION § 7:3.5[A][4][a] (2d ed. 2009) (describing how to expand element scope through broad language in the means clause); Michael A. Sartori, *Software, E-Commerce, Internet, and Business Method Patents*, *in* DRAFTING PATENTS FOR LITIGATION AND LICENSING 357, 424 (Bradley C. Wright ed., 2008) (detailing how to add breadth to claims reciting means-plus-function language).

claim element can be included in the specification as corresponding structure of a functional claim element.[140] In such a case, it is obvious that the functional claim element can be of equal scope as the structural claim element because both elements relate to the same structure.[141] The functional claim element can be even broader because it also covers equivalents of the disclosed structure.[142] Further, even if the specification contains more structure than a structural claim element, a functional claim element would not be necessarily narrower because not all structure is "corresponding structure."[143]

It could be argued that structural claim elements are broader than functional claim elements due to application of the doctrine of equivalents.[144] This could be claimed on the basis that § 112 ¶ 6 limits the scope of functional claim elements to exclude all equivalents not known at the time of the invention, while the doctrine of equivalents broadens the scope of structural claim elements by extending them to equivalents known at the time an infringement issue is considered.[145] However, it has to be taken into account that functional claim elements are subject to the doctrine of equivalents as well.[146] After determining literal infringement under §112 ¶ 6, the next step would be the infringement analysis under the doctrine of equivalents extending the functional claim element to its equivalents.[147] Thus, also

[140] *See infra* Part V.D ¶ 2 (dissecting the language needed for claim elements).
[141] *See* LUNDBERG *supra* note 125, at § 7.02 (distinguishing the elements of § 112 ¶ 6).
[142] *See* LUNDBERG *supra* note 125, at § 7.02 (setting forth the elements of § 112 ¶ 6).
[143] *See* LUNDBERG *supra* note 125, at § 7.02 (citing the elements of § 112 ¶ 6).
[144] *See* BLACK'S LAW DICTIONARY 553 (9th ed. 2009) (defining "doctrine of equivalents" as "a judicially created theory for finding patent infringement when the accused process or product falls outside the literal scope of the patent claims").
[145] *See* FABER, *supra* note 62, at § 3:29.1 (summarizing the relationship between the scope of the claim element and the invention).
[146] *See infra* Part VII.B (explaining the scope of infringement under the doctrine of equivalents).
[147] *See, e.g.*, WMS Gaming, Inc. v. Int'l Game Tech., 184 F.3d 1339 (Fed. Cir. 1999) (reviewing the claim first through statutory regulations and then through the doctrine of equivalents).

from the perspective of the doctrine of equivalents, selecting functional or structural claim format does not inherently lead to different claim scopes.

B. Determination of Existence of Structure in Disclosure

§ 112 ¶ 6 implies that the functional claim element must be complemented by some structure in the specification.[148] The term "structure" is used as opposed to the term "function."[149] While a function describes what an invention does, a structure describes what an invention is made of.[150] Initially, in *Trovato*, which involved a shortest path algorithm, the Federal Circuit required the supporting structure for a functional claim element of a computer program to be physical.[151] However, when the Federal Circuit decided *Alappat*, it vacated and withdrew its earlier decision in *Trovato*.[152] Under the holding of *Alappat* it would have been inconsistent to sustain the requirement that supporting structure of a computer program must be physical.[153] *Alappat* identified as crucial structure not a disclosed general purpose computer, but rather found determinative the programming that transformed the general purpose computer into a special purpose computer.[154] In fact, computer programs are machines that have been constructed in the medium of text.[155]

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[148] *See* 35 U.S.C. § 112 ¶ 6 (setting forth the mandates of the statute).
[149] *See id.* (describing structure in contrast to function).
[150] *See supra* Part V.A ¶ 1 (indicating the distinctions between functions and structures).
[151] *See In re* Trovato, 42 F.3d 1376, 1382 (Fed Cir. 1994), *vacated*, 60 F.3d 807 (Fed. Cir. 1995) (en banc) (holding physical structure required).
[152] *See Trovato*, 60 F.3d 807, (en banc, per curiam), *vacating* 42 F.3d 1376 (1994) (citing *Alappat*, 33 F.3d at 1545 and following it explicitly).
[153] *See Alappat*, 33 F.3d. at 1545 (supporting the proposition that "a computer operating pursuant to software *may* represent patentable subject matter").
[154] *See id*. (defining that a programmed computer as a separate machine from a general purpose computer); *see also In re* Noll, 545 F.2d 141, 148 (C.C.P.A. 1976) (holding a programmed computer was structurally different from a non-programmed computer); *In re* Prater, 415 F.2d 1393, 1404 n.29 (C.C.P.A. 1969) (holding that a program makes a computer a different machine, allowing for an apparatus claim).
[155] *See* Pamela Samuelson, Randall Davis, Mitchell D. Kapor, & J.H. Reichman, *A Manifesto Concerning the Legal Protection of Computer Programs*, 94 COLUM. L.

In *WMS Gaming v. International Game Technology*[156] the Federal Circuit confirmed its holding in *Alappat*, reiterating that the structure to be disclosed consists of the programming that creates a special purpose computer.[157] Therefore, a functional element for claiming a computer program is limited to the corresponding structure disclosed in the specification and equivalents thereof, and the corresponding structure is the algorithm.[158] The corresponding structure of a claim element under § 112 ¶ 6 for a program-related function consists of the algorithm disclosed in the specification.[159] The reasoning in *WMS Gaming*

REV. 2308, 2320 (1994) (describing the principle that programs are machines constructed in text); *see also* THOMAS H. CORMEN, CHARLES E. LEISERSON, RONALD L. RIVEST, & CLIFFORD STEIN, INTRODUCTION TO ALGORITHMS 13 (3d ed. 2009) (stating that algorithms should be considered a technology); John A. Gibby, *Software Patent Developments: A Programmer's Perspective*, 23 RUTGERS COMPUTER & TECH. L.J. 293, 345 (1997) (arguing that a computer program should be considered an independent machine for the purposes of patent claims).

[156] 184 F.3d 1339 (Fed. Cir. 1999).

[157] *See id.* at 1349 (holding the disclosed structure is not the general purpose computer, but rather the special purpose computer programmed to perform the disclosed algorithm); *see also Aristocrat Techs.*, 521 F.3d at 1333 (showing that the required structure disclosed in a patent specification must be more than simply a general purpose computer); Brown v. Baylor Healthcare Sys., 381 Fed. Appx. 981, 984 (Fed. Cir. 2010) (highlighting that structure must be more than a general purpose computer or microprocessor); Encyclopedia Britannica, Inc. v. Alpine Elecs., Inc., 355 Fed.Appx. 389, 392-93 (Fed. Cir. 2009) (supporting the assertion that structure must be more than a general purpose computer or microprocessor); Net MoneyIN, Inc. v. VeriSign, Inc., 545 F.3d 1359, 1367 (Fed. Cir. 2008) (holding the claims indefinite under §112 ¶ 6 because the specification fails to disclose an algorithm for performing the claimed function); Blackboard, Inc. v. Desire2Learn, Inc., 574 F.3d 1371, 1384 (Fed. Cir. 2009) (explaining that simply describing the function to be performed is not sufficient to uphold the claim); Finisar Corp. v. DirecTV Group, Inc., 523 F.3d 1323, 1340-41 (Fed. Cir. 2008) (elucidating that a general purpose computer is too broad a means for performing a specific function).

[158] *See WMS Gaming*, 184 F.3d at 1349 (discussing that in a means-plus-function claim the general purpose of the programmed computer is to perform the disclosed algorithm); *see also* Harris Corp. v. Ericsson, Inc., 417 F.3d 1241, 1253 (Fed. Cir. 2005) (declaring that *WMS Gaming* restricts computer-implemented means-plus-function terms to the disclosed algorithm).

[159] *See WMS Gaming*, 184 F.3d at 1349 (discussing that in a means-plus-function claim the general purpose of the programmed computer is to perform the disclosed algorithm); *see also Aristocrat Techs.*, 521 F.3d at 1333 (discussing the structure of a § 112 ¶ 6 claim for a computer-implemented function is

and its progenies, that the algorithm is the structure that supports functional claim elements, is well founded.[160] If the only physical structure used consists of a prior art general purpose computer or other prior art hardware, the invention must be contained in the computer program.[161] In such case, it is both necessary and sufficient to disclose the algorithm underlying the computer program in order to provide structure for a means-plus-function claim element.[162]

In its decision in *Aristocrat Technologies Australia v. International Game Technology*, the Federal Circuit confirmed another rule for the disclosure of algorithmic structure.[163] Under *Aristocrat*, it is insufficient to disclose no algorithm at all.[164] This is even true if the person having ordinary skill in the art would be able to implement the algorithm without its disclosure.[165] Consideration of the understanding of a person skilled in the art does not relieve a patentee from disclosing sufficient structure in the specification.[166] It is not enough for a patentee to simply state or later argue that the person of ordinary skill in the art would know what structure can be used to accomplish the claimed function.[167] Rather, "[T]he inquiry is whether the person of ordinary skill in the art would understand the specification to disclose a structure, not simply whether that person would be capable of

the disclosed algorithm from the specification); *Harris Corp.*, 417 F.3d at 1249 (indicating *WMS Gaming* restricts computer-implemented means-plus-function terms to the disclosed algorithm).

[160] *See Harris Corp.*, 417 F.3d at 1249. (establishing that an algorithm may be considered structure for the purposes of the functional elements of a patent claim).

[161] *See Aristocrat Techs.*, 521 F.3d at 1333 (discussing the interplay between a general purpose computer and disclosing a specification).

[162] *See id.* (indicating that to invoke a means-plus-function claim, disclosure of the algorithm is necessary).

[163] *See id.* (clarifying the rule when it comes to the disclosure of an algorithm).

[164] *See id*. at 1332 (discussing that if the specification lacks disclosure of a specific algorithm, the asserted structure will be insufficient to satisfy § 112 ¶ 6).

[165] *See id.* at 1336 (noting that disclosure that enables one of ordinary skill in the art to make and use the invention is irrelevant if there is insufficient structure).

[166] *See id.* (stating requirements for structure for a § 112 ¶ 6 disclosure).

[167] *See Aristocrat Techs.*, 521 F.3d at 1337 (summarizing the holding in Atmel Corp. v. Information Storage Devices, Inc., 198 F.3d 1374 (Fed. Cir. 1999)).

implementing that structure".[168] Thus, the algorithm for the special programming of a general purpose computer must be explicitly or implicitly disclosed. Only if the function of the means-plus-function claim element can be performed by a general purpose computer without special programming, it is not necessary to disclose an algorithm, as held by *Katz Interactive Call Processing Patent Litig. v. Am. Airlines*.[169]

In order to determine the existence of structure in the disclosure, it is necessary to define the person having ordinary skill in the art of programming.[170] This definition was addressed in *AllVoice Computing v. Nuance Communications.*[171] The court defined the relevant person as someone who has a degree in computer science or something equivalent and two to three years of programming experience.[172] The *AllVoice Computing* court found this definition consistent with the level of skill ascertained in similar cases, where courts required a Bachelor of Science degree in electrical engineering, computer science or three to five years of recent experience in the field,[173] or a Bachelor's degree in a

[168] *Id.* (quoting *Biomedino, LLC* 490 F.3d at 953); *see also* Lucent Tech., Inc. v. Gateway, Inc., 543 F.3d 710, 719 (Fed. Cir. 2008) (discussing that disclosure of sufficient structure is necessary to support means-plus-function claim terms); *Encyclopedia Britannica, Inc.*, 355 Fed.Appx. at 394 (holding that a patentee still has a duty to disclose sufficient structure even where a person of ordinary skill in the art would be able to build the invention); *Biomedino, LLC*., 490 F.3d at 952 (asserting that the requirements of § 112 ¶ 6 necessitate some disclosure of structure).

[169] *See In re* Katz Interactive Call Processing Patent Litig. v. Am. Airlines, Inc., 639 F.3d 1303, 1316 (Fed. Cir. 2011) (discussing a period when it is not necessary to disclose more than the general purpose processor that performs the function).

[170] *See* AllVoice Computing PLC v. Nuance Comm., Inc., 504 F.3d 1236, 1240 (Fed. Cir. 2007) (addressing definition of person skilled in the art of software engineering).

[171] *See id.* (indicating a person who has the skill to computer program).

[172] *See id.* (discussing hypothetical person skilled in the art of software engineering); *see also* Scott Elengold, *An Inquiry into Computer System Patents: Breaking Down the "Software Engineer*," 61 N.Y.U. ANN. SURV. AM. L. 349, 350 (2005) (noting that courts often use the "all-knowing engineer" as the benchmark of a person with ordinary skill).

[173] *See* Data Race, Inc. v. Lucent Tech., Inc., 73 F.Supp.2d 698, 746 n.330 (W.D. Tex. 1999) (offering a definition of who could be considered a person of ordi-

scientific or engineering field, such as physics, electrical engineering, or computer science, and at least two years experience working in the field of computer telephony.[174] Thus, the crucial test for determining the existence of structure is if this hypothetical person would understand the disclosure to contain an algorithm for performing the claimed function.

C. Evaluation of Sufficiency of Disclosed Structure

Levels of Abstraction for Disclosure of Algorithms

Level of Abstraction	**Disclosure of algorithmic Structure**
High	**Requirements document**: A statement of what is required from the program developers (product requirements document) and a statement of what the users expect from the program (user requirements document).
Medium	**Data flow diagram (DFD)**: A graphical representation modeling the flow of information in a computer program or system. **Entity-relationship diagram (ER diagram)**: A graphical representation modeling the relationship between data objects, mainly used in database design. **State diagram**: A graphical representation modeling a finite

nary skill in the field of computer science); *see also AllVoice Computing*, 504 F.3d at 1240 (noting consistency in software patent cases regarding person skilled in the art of software engineering).

[174] *See* Katz v. AT&T Corp., 63 F.Supp.2d 583, 594 n.2 (E.D. Pa. 1999) (asserting an alternative view of a person of ordinary skill); *see also AllVoice Computing*, 504 F.3d at 1240 (discussing qualities required of a person skilled in the art of software engineering and supported by case law).

Level of Abstraction	**Disclosure of algorithmic Structure**
	set of states, including events that trigger transition of states. **Unified Modeling Language diagram (UML diagram)**: A graphical representation modeling the artifacts of a computer program or system.
Low	**Pseudo code**: An informal high-level representation that uses the structural conventions of source code, but is intended for human reading, thus, cannot be processed by computers. **Source code**: A high-level representation that consists of natural language and symbolic notation that can be compiled into machine-readable object code.

An algorithm can be disclosed in multiple ways, dependent on the level of abstraction. Disclosure of an algorithm lies between adding nothing to the functional claim element on one side, and including the full object code—that is machine-readable code consisting entirely of 0's and 1's—on the other side.[175] In between this range are multiple other possibilities of representing algorithmic structure.[176] In this regard, the question becomes which representation can be deemed a sufficient disclosure. This selection of the algorithmic structure is of great importance because it will determine the scope of the patent.[177] Under § 112 ¶ 6 a functional claim element will be construed to

[175] *See* Clinton, *supra* note 76, at 45-47 (discussing that the level of disclosure is based on the level of sophistication); GREGORY A. STOBBS, SOFTWARE PATENTS 277 (2nd ed. 2000) (discussing that on one end of the source no details are specified, whereas on the other every detail may be disclosed).

[176] *See* Clinton, *supra* note 76, at 45-47 (describing variety of detail that can be provided for a software patent).

[177] *See* Clinton, *supra* note 76, at 44 (discussing optimal drafting of software patent claims).

cover its corresponding structure disclosed in the specification.[178] Thus, the higher the level of abstraction is chosen, the greater the scope of the patent will be.

§ 112 ¶ 6 is rooted in the definiteness requirement of § 112 ¶ 2.[179] It is the purpose of § 112 ¶ 6 to provide a rule for interpreting a specific type of claim element—that is, a functional claim element—which otherwise could cause indefiniteness of the claim it belongs to.[180] In the absence of § 112 ¶ 6, a purely functional claim element would render the pertinent claim invalid under § 112 ¶ 2.[181] However, different from the application of § 112 ¶ 2 to structural claim elements, § 112 ¶ 6 extends § 112 ¶ 2 for functional claim elements beyond the claims to the remainder of the specification.[182] The definiteness requirement does not only apply to the claim language itself but also to the corresponding structure of the remainder of the specification.[183] Consequently, a claim can be found indefinite if the corresponding structure of a functional claim element is indefinite.[184] If a patentee fails to set forth a definite disclosure of the structure corresponding to a functional claim element, the patentee has in effect failed to particularly point out and distinctly claim the invention as required by § 112 ¶ 2.[185]

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[178] *See* STOBBS, *supra* note 175, at 262-63 (asserting that the specification must be enabled at the time the application is filed and that a § 112 ¶ 6 functional claim element shall cover what is disclosed in the specification).

[179] *See Mass. Inst. of Tech*, 462 F.3d at 1361 (describing that Congress has provided a specific instruction on interpretation).

[180] *See id.* at 1361 (citing Data Line Corp. v. Micro Techs., Inc., 813 F.2d 1196, 1201 (Fed. Cir. 1987), Jonsson v. Stanley Works, 903 F.2d 812, 819 (Fed. Cir. 1990), and *Laitram*, 939 F.2d at 1536) (noting that Congress provided specific instructions on § 112 interpretation).

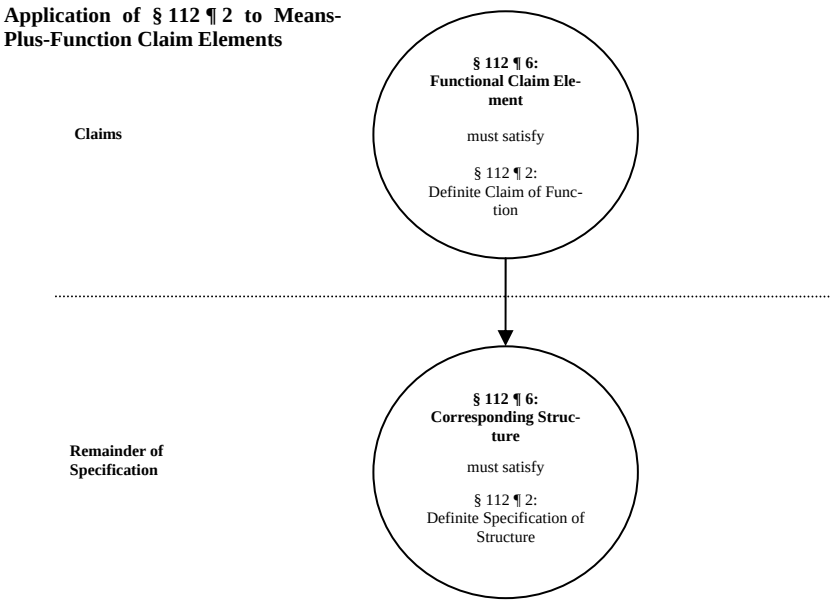
[181] *See Mass. Inst. of Tech*, 462 F.3d at 1361 (noting that § 112 ¶ 2 provides definiteness to a functional claim).

[182] *See id.* (citing congressional intent to broaden the scope of interpretation of functional claims that might otherwise be held indefinite).

[183] *See* 35 U.S.C. § 112 ¶ 2 (requiring the patentee to "particularly point[] out and distinctly claim[] the subject matter" in the specification).

[184] *See Mass. Inst. of Tech.*, 462 F.3d at 1361 (describing the "definite structure" requirement).

[185] *See Blackboard, Inc.*, 574 F.3d at 1382 (citing *In re* Donaldson Co. Inc., 16 F.3d 1189, 1195 (Fed. Cir. 1994) (en banc)) (commenting that the requirement



Having identified § 112 ¶ 2 as the decisive standard for determining the sufficiency of disclosed structure, this statute requires patentees to distinctly claim the subject matter they regard as their invention in a manner that allows a person experienced in the field of the invention to understand the scope of the subject matter that is patented when reading the claim in conjunction with the remainder of the specification.[186] In this re-

of adequate disclosure in the specification for means-plus-function claims is well settled law); *Biomedino, LLC*, 490 F.3d at 948 (citing *In re Donaldson*, 16 F.3d at 1195) (holding that adequate disclosure in either the claims or specification is necessary to support a means-plus-function claim); B. Braun Med., Inc. v. Abbott Laboratories, 124 F.3d 1419, 1425 (Fed. Cir. 1997) (citing *In re Donaldson*, 16 F.3d at 1195 (Fed. Cir. 1994) (en banc) and *In re* Dossel, 115 F.3d 942, 946-47 (Fed. Cir. 1997)) (illustrating clear precedent that failure of adequate disclosure results in failure to satisfy § 112 ¶ 2). *But see In re* Noll, 545 F.2d at 149 (reversing examiner's rejection of claims as indefinite by 112 ¶ 2, even though rejection may have been proper for not meeting requirements of § 112 ¶ 1).

[186] *See Default Proof Credit Card Sys.*, 412 F.3d at 1298 (citing S3, Inc. v. NVIDIA Corp., 259 F.3d 1364, 1367 (Fed. Cir. 2001) (following § 112 ¶ 2 standard for scope and detail of patent subject matter); Med. Instrumentation & Diagnostics Corp. v. Elekta AB, 344 F.3d 1205, 1211 (Fed. Cir. 2003) (citing *S3, Inc.,* 259

gard, functional claim elements are subject to the same standard as structural claim elements.[187] Thus, on which level of abstraction the algorithmic structure is represented is the choosing of the patentee as long as the person of ordinary skill in the art is able to sufficiently recognize the algorithm.[188] Sufficient recognition of an algorithm means that it is possible to discern what computer program is covered by the structure and what computer programs are not covered by the structure, viewed from the perspective of the person of ordinary skill in the art of programming.[189]

D. Identification of Corresponding Structure

Before being able to identify the "corresponding structure," it is necessary to determine whereto this structure actually corresponds.[190] § 112 ¶ 6 reads that "[a]n element in a claim for a combination may be expressed as a . . . function . . . and *such claim* shall be construed to cover the corresponding structure."[191] Therefore, from the statutory language it follows that "such claim," i.e., the earlier mentioned "claim for a combination," shall be construed to cover the corresponding structure.[192] Thus, it is the claim that the structure must correspond to.[193] However, more specifically, it is a single element of a functional claim that must be supported by the corresponding structure.[194] This is because a claim can also contain structural claim elements, which do not have any corresponding structure, but are of structural na-

F.3d 1367) (following § 112 ¶ 2 standard for scope and detail of patent subject matter).

[187] *See In re Donaldson*, 16 F.3d 1195 (citing In re Lundberg, 244 F.2d 543, 547-48 (C.C.P.A. 1957) following precedent that functional claim elements must meet standards established by § 112 ¶ 2).

[188] *See Finisar Corp.,* 523 F.3d 1340 (permitting patentee to disclose algorithm in any understandable terms).

[189] *See supra* Part V.B (describing applicability of § 112 to algorithms).

[190] *See* 35 U.S.C. § 112 ¶ 6 (utilizing "corresponding structure" language for the construction of a claim).

[191] *Id.* (emphasis added).

[192] *See id.* (outlining combination claims may be construed to cover structure).

[193] *See id.* (detailing correspondence of structure to claim).

[194] *See In re Donaldson*, 16 F.3d at 1196 (describing structure as corresponding to a single segment of a claim).

ture themselves.[195] Therefore, it is preferable to relate the corresponding structure to functional claim elements and read § 112 ¶ 6 such that the "claim shall be construed to cover the corresponding structure" *of the element.*[196]

The decisive guide for identifying the corresponding structure of a functional claim element is the purpose of § 112 ¶ 6, which is the safeguarding of the definiteness requirement of § 112 ¶ 2 for functional claim elements.[197] Based on this purpose, the corresponding structure is not necessarily all of the structure contained in the specification, but rather covers only structure that is sufficient under § 112 ¶ 2 to determine the bounds of the claim element with definiteness for the person having ordinary skill in the art.[198] In other words, the corresponding structure is that part of the structure that is disclosed for defining the claimed function.[199] It is the structure that would be required for incorporation into the functional claim element to make it a

[195] *See* David J. Stein, *How to Write a Patent Application (Sheldon)*, at 13, Sept. 28, 2011, *archived at* http://www.webcitation.org/633Q1Fy9r (summarizing JEFFERY G. SHELDON, HOW TO WRITE A PATENT APPLICATION (2011)) (discussing means plus function claims containing structural elements).

[196] *See* 35 U.S.C. § 112 ¶ 6 (giving correspondence structure language for expression of an element in a claim for a combination); *see also Halliburton Oil Well Cementing Co.,* 329 U.S. at 9 (providing reasoning for construction of statutory language).

[197] *See supra* Part V.C. (explaining the definiteness requirement is applicable to the disclosure of the "corresponding structure.").

[198] *See supra* Part V.B. (setting forth the court's standard for "skilled in the art" of computer science).

[199] *See Blackboard, Inc.,* 574 F.3d at 1384 (citing *Net MoneyIN, Inc.* 545 F.3d 1367) (stressing the requirement of § 112 ¶ 6 that the scope of the claim be limited by disclosing the corresponding structure, material, or acts that perform the function); *see also Micro Chemical*, 194 F.3d at 1257-58 (citing *Rodime*, 174 F.3d at 1302) ("[112 ¶ 6 does not] permit incorporation of structure from the written description beyond that necessary to perform the claimed function"); Hopkins, *supra* note 26, at 588 (distinguishing between the treatment of means-plus-function elements of a claim versus the claim's remaining elements); Scott G. Ulbrich, *Festo, Notice, and the Application of Prosecution History Estoppel to Means-Plus-Function Claim Limitations*, 28 WM. MITCHELL L. REV. 1165, 1173 (2002) (setting forth how courts must determine structural limitations on means-plus-function claims).

valid structural claim element of the same scope.[200] By using this approach for identifying corresponding structure, it will also be ensured that functional claim elements can have potentially the same scope as structural claim elements.[201]

As described, only the structure disclosed in order to satisfy the definiteness requirement of § 112 ¶ 2 is the structure that the scope of the functional claim element should be limited to.[202] However, other structure may be disclosed in order to satisfy the requirements of written description, enablement, or best mode under § 112 ¶ 1.[203] Therefore, for determining the adequate scope of the patent, it has to be identified which structure in the specification is actually used to satisfy the definiteness requirement under § 112 ¶ 2, and which structure is used to satisfy the requirements of § 112 ¶ 1.[204] Both structures are not necessarily identical and can be completely separated.[205] However, it is also possible that there is an overlap of both structures up to the point of total identity.[206]

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[200] *See* Hopkins, *supra* note 26, at 588 (stating only means-plus-function elements will be narrowly construed under § 112, ¶ 6). Not taking into account equivalents under § 112 ¶ 6, which would broaden the functional claim element. *See id.*

[201] *See infra* Part V.D. Identification of Corresponding Structure, ¶ 3 (discussing how functional and structural claim elements must be distinctly separated because both may be disclosed in order to satisfy § 112 requirements).

[202] *See* 35 U.S.C. § 112 (detailing scope of functional claim element).

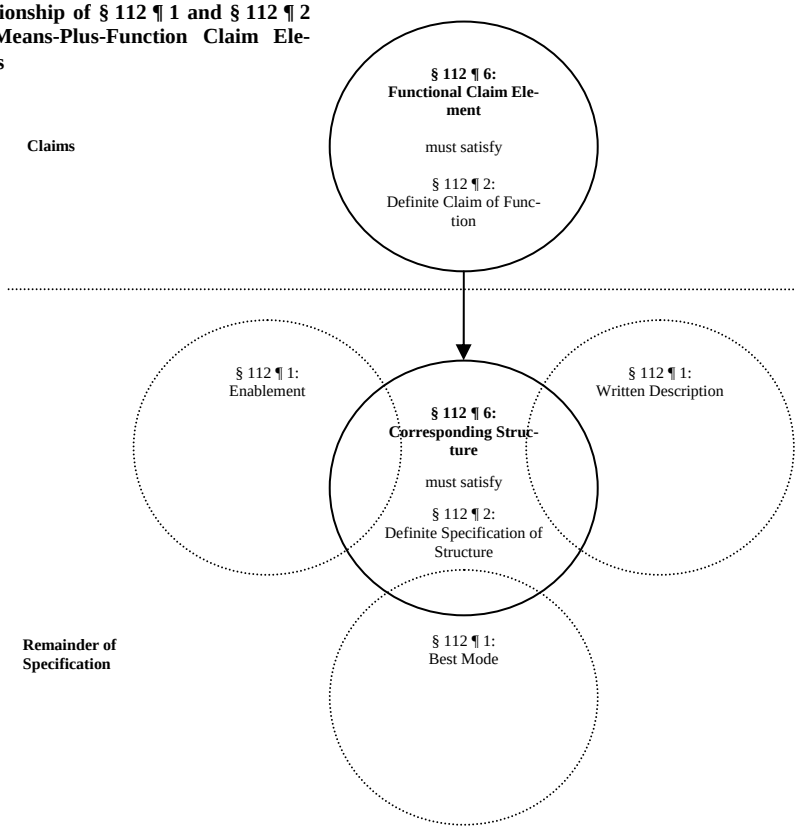
[203] *See Blackboard, Inc*., 574 F.3d at 1384-85 (noting that definiteness and enablement are separate requirements); Pennwalt Corp. v. Durand-Wayland, Inc., 833 F.2d 931, 934 (Fed. Cir. 1987) (placing the burden of proof on the patent owner to show that the structure that performs the function is the same as or an equivalent of the structure disclosed in the specification).

[204] *See* Bradley D. Baugh, *WMS Gaming, Inc. v. International Game Technology*, 15 BERKELEY TECH. L.J. 109, 113 (2000) (discussing the purpose of the definiteness requirement and how to satisfy it).

[205] *See id.* (viewing structure required to satisfy definiteness requirement); *Pennwalt Corp.*, 833 F.2d at 942-43 (noting that limitations must be made separately when each are at issue).

[206] *See* John N. Kandara, *Application of the Doctrine of Equivalents to Means Plus Function Claims: WMS Gaming Inc. v. International Game Technology*, 50 DUKE L.J. 887, 903 (2000) (noting courts' confusion upon the occurrence of structural overlap).

Relationship of § 112 ¶ 1 and § 112 ¶ 2 for Means-Plus-Function Claim Elements



§ 112 ¶ 2 and § 112 ¶ 1 serve different purposes.[207] The definiteness requirement of § 112 ¶ 2 has the purpose of notifying the public about the extent of the patent grant.[208] This notice

[207] *See* discussion *supra* Part D. Identification of Corresponding Structure ¶ 3 (illustrating the differing requirements and functions of both paragraphs).

[208] *See* Permutit Co. v. Graver Corp., 284 U.S. 52, 60 (1931) (laying out the duty to disclose sufficient information for the public to know the limits of the patent); McClain v. Ortmayer, 141 U.S. 419, 424 (1891) (holding that the object of the patent laws definiteness requirement is to "apprise the public" of what is still open to them); London v. Carson Pirie Scott & Co., 946 F.2d 1534, 1538 (Fed. Cir. 1991) (citing State Indus. v. A.O. Smith Corp., 751 F.2d 1226, 1236 (Fed. Cir. 1985)) (noting that claims must be particular and distinct so that the public has fair notice); Laitram Corp. v. Cambridge Wire Cloth Co., 863 F.2d 855, 856-57 (Fed. Cir. 1988) (reiterating competitors need for definiteness to avoid infringement); *Pennwalt Corp.,* 833 F.2d at 931, 954 (Nies, J., concurring) (noting reasonable notice must be given to the public); Baugh, *supra* note 204

function secures that interested members of the public, e.g., competitors of the patent holder, can determine whether their activities infringe the patent.[209] This is the reason why the subject matter has to be claimed distinctly and why § 112 ¶ 6 requires limiting the scope of a functional claim element to the corresponding structure that defines the claimed function.[210] Different from the notice function, the requirements of § 112 ¶ 1 implement the teaching function of the patent.[211] As part of the disclosure bargain between the patentee and the public, the patentee must teach the invention to the public.[212] By disclosing the invention in a manner permitting the person having ordinary skill in the art to implement it, such teaching will ensure that the invention does not remain a trade secret, but ultimately enters the public domain.[213]

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at 113 (describing the duty to disclose sufficient information regarding the patent for the public).

[209] *See Default Proof Credit Card Sys.*, 412 F.3d at 1302-03 (citing All Dental Prodx, LLC v. Advantage Dental Prods., Inc., 309 F.3d 774, 779-80 (Fed. Cir. 2002)) (affirming the purpose of the definiteness requirement as providing notice to the public of the extent of the invention claimed); Fidel D. Nwamu, *Does your Claim Conform to Means-Plus-Function Format Under Section 112, Paragraph Six?: O.I. Corp. v. Tekmar Co.*, 6 J. INTELL. PROP. L. 189, 193 (1999) (citing DONALD S. CHISUM, CHISUM ON PATENTS § 8.01 (Supp. 1997)) (highlighting one purpose of claim language as providing public notice of the boundaries of an invention).

[210] *See, e.g.*, *Blackboard, Inc.*, 574 F.3d at 1384 (citing *Net MoneyIN, Inc.*, 545 F.3d 1367) (affirming that an algorithm is required for means-plus-function claims that disclose a computer as the means).

[211] *See* 35 U.S.C. § 112 ¶ 1 (stating requirements for sufficient disclosure in the specification so that a person skilled in the art may make and use the invention).

[212] *See* Markman v. Westview Instruments, Inc., 517 U.S. 370, 373 (1996) (highlighting function of claims as enabling a person skilled in the art to make and use the invention); Enzo Biochem, Inc. v. Gen-Probe, Inc., 323 F.3d 956, 970 (Fed. Cir. 2002) (noting the public must receive meaningful disclosure); *see also*

In re Alonso, 545 F.3d 1015, 1019 (Fed. Cir. 2008) (discussing that the requirement serves as a teaching function so that the public is given meaningful disclosure); Univ. of Rochester v. G.D. Searle & Co., Inc., 358 F.3d 916, 922 (Fed. Cir. 2004) (describing that the public is given disclosure in exchange for being excluded from practicing the invention).

[213] *See* Pitney-Bowes, Inc. v. Mestre, 701 F.2d 1365, 1372 n.12 (11th Cir. 1983) (discussing interplay of trade secret and patent laws).

Thus, § 112 ¶ 2 and § 112 ¶ 1 can refer to different structures as a matter of their different purpose.[214] Distinctly notifying the public of the scope of the invention may require a different structure than enabling the person of ordinary skill in the art to build the invention.[215] Thus, the sufficiency of each of these disclosure requirements is evaluated according to its own purpose and independent of other disclosure requirements.[216] Such independent evaluation of each structural disclosure will ensure that the patentee is awarded the appropriate patent scope, while at the same time the teaching function of the patent is maintained.[217] Thus, the aforementioned independent evaluation of structure, acknowledging the different purposes of § 112 ¶ 2 and § 112 ¶ 1, guarantees that there is no incentive for a patentee to reduce the disclosure to the detriment of the teaching function.[218]

VI. "Described in the Specification"

§ 112 ¶ 6 further requires that the structure for supporting functional claim elements should be "described in the specification."[219]

A. Disclosure of Structure in Claims

The reason why § 112 ¶ 6 mandates description of structure in the specification is that means-plus-function claim elements, as a matter of their nature, do not convey sufficient struc-

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[214] *See* 35 U.S.C. § 112 ¶¶ 1-2 (differentiating between structures in terms of specific purpose).
[215] *See* Baugh, *supra* note 204, at 113 (describing the interplay between the definiteness requirement and enablement).
[216] *See* 35 U.S.C. § 112 ¶¶ 1-2 (acknowledging the difference in disclosure requirements stated in § 112).
[217] *See Markman*, 517 U.S. at 373 (explaining the difference in purpose between § 112 ¶ 2 and § 112 ¶ 1).
[218] *See id*. at 373 (distinguishing the dual disclosure elements in § 112). *But see* Dan L. Burk & Mark A. Lemley, *Is Patent Law Technology-Specific?*, 17 BERKELEY TECH. L.J. 1155, 1165-66 (2002) (noting the incentive of patentees to disclose structure as general as possible).
[219] *See* 35 U.S.C. § 112 ¶ 6 (providing that the functional claim element needs to be "described in the specification").

tural meaning.[220] The question then becomes what parts of the patent document actually qualify as part of the "specification." Certainly, the specification encompasses the title, abstract, drawings, description of drawings, description of field of invention, description of background of invention, summary of invention, as well as the detailed description of the invention.[221] However, does the specification also include the claims? If that is the case, it would be permissible to read structure contained in structural claim elements into functional claim elements.

In this regard, it is indeed preferable to interpret the specification to include the claims as well.[222] Especially, the wording of § 112 ¶ 2 demonstrates that the claim language is part of the specification.[223] The statute states that the "specification shall conclude with one or more claims," thereby implicitly making the claims a part of the specification.[224] This interpretation is also supported by § 112's title "Specification" in combination with § 112 ¶ 2 addressing the claims.[225] On the basis of such interpretation of what is encompassed by the specification, the structure to support functional claim elements can be also disclosed in structural claim elements.[226] It is obvious that this is only possible if a patent includes at least one structural claim element.[227]

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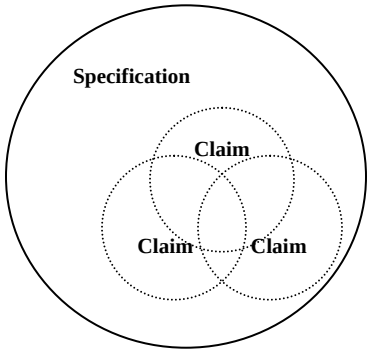
[220] *See Aristocrat Techs.*, 521 F.3d at 1138 (admonishing that a means plus function claim lacks sufficient structural meaning).
[221] *See* 37 C.F.R. § 1.77 (b) (2010) (listing the arrangement of application elements).
[222] *See* 35 U.S.C. § 112 ¶ 2 (articulating that claims are included in the specification).
[223] *See id*. (indicating that claim language is a factor of the specification).
[224] *See id*. (determining that claims are a part of the specification).
[225] *See id*. (pointing to ¶ 2 of the statute and how claims are addressed with the specification).
[226] *See Alappat*, 33 F.3d at 1539 (elucidating that the specification of structure to support functional claim elements may be also disclosed in the description of structural claim elements).
[227] *See supra* Part II (outlining that a patent claim must include at least one structural claim element).

Relationship between Claims and Specification



There are three possibilities for how structural claim elements can provide structure to functional claim elements: First, the functional claim element itself can have a structural meaning.[228] Second, the functional claim element can obtain its structure from structural elements of the same claim.[229] Third, the functional claim element can obtain its structure from structural elements of a different claim.[230] Also, these three possibilities can be combined, which, however, will not be further discussed here. Addressing the first possibility, insofar as an element in a claim—despite its functional meaning—conveys to the person having ordinary skill in the art a sufficient structure, the element will be interpreted as being structural leaving § 112 ¶ 6 inapplicable.[231] This result is a consequence of the rebuttal of the presumption for applying § 112 ¶ 6.[232] However, if the element does

[228] *See Mass. Inst. of Tech.*, 462 F.3d at 1361 (noting that a sufficiently definite structure is required to avoid § 112).
[229] *See Micro Chemical*, 194 F.3d at 1258 (establishing that structure recited in function elements is sufficient under § 112).
[230] *See* Autogiro Co. of Am. v. United States, 384 F.2d 391, 401 (Ct. Cl. 1967) (providing that the doctrine of equivalence describes that a functional claim can obtain its structure from an overlap whereby structures of different claims perform the same function in substantially the same way).
[231] *See Generation*, *supra* note 61, at 1368-69 (discussing the rebuttable presumption of § 112 ¶ 6 where the claim recites sufficient structure).
[232] *See supra* Parts III.A and III.B (discussing means plus function and step-plus function and the presumption involved in the specifications).

not contain sufficient structure, § 112 ¶ 6 will be applicable.[233] In such case, § 112 ¶ 6 will not be satisfied due to lack of structure leading to invalidity of the claim.[234]

Under the second possibility, according to which a functional claim element obtains its structure from structural elements of the same claim, the functional claim element satisfies § 112 ¶ 6 if it actually can obtain sufficient structure from those structural claim elements.[235] In this case, the functional claim element is sufficiently definite.[236] However, it has to be noted, if the functional claim element obtains its structure exclusively from structural claim elements of the same claim, there will be no further limitation to the claim beyond the limitations already expressed by the structural claim elements.[237] Therefore, although it is true that the functional claim element satisfies § 112 ¶ 6, the element would be actually redundant. Therefore, the Federal Circuit found that the presumption in favor of means-plus-function claims was rebutted leaving § 112 ¶ 6 inapplicable.[238]

As a third possibility, a functional claim element can obtain structure from structural claim elements contained in a dif-

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[233] *See Mass. Inst. Tech. supra* note 68, at 1360-61 (discussing failure to rebut § 112 ¶ 6 presumption where insufficient structure is disclosed).

[234] *See supra* Part III. A ¶ 3 (considering rebuttals § 112 ¶ 6 and the structural claim elements).

[235] *See Biomedino*, 490 F.3d at 950 (citing *Altiris, Inc*., 318 F.3d at 1375) (describing how sufficient structure within the claims can rebut the presumption of invocation of § 112 ¶ 6).

[236] *See id.* (identifying when to apply § 112 ¶ 6 when faced with sufficient or insufficient structure).

[237] *Compare* Becton, Dickinson and Co. v. Tyco Healthcare Group, 616 F. 3d 1249, 1262 (Fed. Cir. 2010) (Gajarsa, J., dissenting) (opining that the specification may further limit the claim construction by explaining that additional structural limitations rebut the means-plus-function presumption), *with Sage Prods., Inc*., 126 F.3d at 1427 (holding that 'closure means' was not adequately supported by structure in claims and therefore interpretation regimens of § 112 ¶ 6 applied).

[238] *See Beckton*, 616 F.3d at 1262-63 (Gajarsa, J. dissenting) (claiming that term 'spring means' in intravenous needle was sufficient structure to rebut presumption of § 112 ¶ 6).

ferent claim.[239] In this case, the interpretation of § 112 ¶ 6 must be harmonized with the doctrine of claim differentiation.[240] In its most general application, the doctrine of claim differentiation provides that no two claims in the same patent should be interpreted as having the same scope.[241] Given this rule, reading structural claim elements of one claim into a functional claim element of another claim can result in two claims with the same scope.[242] However, such finding will be limited to rare cases because both claims would be awarded different scope if the conveying claim does not cover the equivalents that the incorporating claim would cover under § 112 ¶ 6.[243] This is even true if the conveying claim would cover the § 112 ¶ 6 equivalents of the incorporating claim under the doctrine of equivalents because this coverage would not be the literal scope of the claim.[244] Thus, structure can be incorporated from claim elements of a different claim, thereby, in most cases, satisfying both § 112 ¶ 6 and the doctrine of claim differentiation.

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[239] *See Autogiro*, 384 F.2d at 401 (indicating that a functional claim can be obtained from different claims so long as they accomplish the same result).

[240] *See id*. at 404 (exemplifying the doctrine of claim differentiation as a guide and not a rigid rule).

[241] *See* Ecolab, Inc. v. Paraclipse, Inc., 285 F.3d 1362, 1375-76 (Fed. Cir. 2002) (holding that limitation of 'ultraviolet light' required by one claim implies lack of requirement in another claim); Mark A. Lemley, *The Limits of Claim Differentiation*, 22 BERKELEY TECH. L.J. 1389, 1391-92 (2007) (commenting on rationale for claim differentiation, including the presumption that applicants do not waste money by stating the same claim twice).

[242] *See Laitram v. Rexnord*, 939 F.2d at 1538 (stating that two claims could be held to have the same scope if a statute so required).

[243] *See* Shenanne Tucker, *IMS Technology, Inc. v. Haas Automation, Inc.: Does the next Mutation of Means-Plus-Function Claim Infringement Analysis Comport with the Purpose Envisioned by the Drafters of Section 112, Paragraph 6?*, 36 NEW ENG. L. REV. 525, 548 n.174 (2002) (discussing the court's holding that two claims had different scope where the means plus function claim literally covered equivalents of the disclosed structure).

[244] *See id.* (discussing the likelihood that a non-means-plus-function claim would cover equivalents through the doctrine of equivalents yet still be considered different from a similar means-plus-function claim by a court); *see also Laitram v. Rexnord*, 939 F.2d at 1538 (distinguishing two claims where the only difference was that the non-means-plus-function claim did not literally cover equivalents).

In a narrower application, the doctrine of claim differentiation prohibits reading a limitation of a dependent claim into an independent claim.[245] This application of the doctrine of claim differentiation can become relevant if an independent claim contains a functional claim element and is referenced by a dependent claim, which contains an additional structural claim element beyond the claim elements of the independent claim.[246] As § 112 ¶ 4 determines that the dependent claim shall be construed to incorporate all the limitations of the independent claim to which it refers, reading the additional structural element of the dependent claim into the functional element of the independent claim would equalize the scope of both claims.[247] Because of the dependent claim incorporating all elements from the independent claim, and because both claims cover the structure of the additional structural element and its equivalents, the claims would be of the same scope.[248] Despite of the reluctance of the Federal Circuit to hold so,[249] in such case it can be concluded that both claims have

[245] *See Laitram v. Rexnord*, 939 F.2d at 1538 (holding chosen interpretation of claim did not read limitations of dependent claim into independent claim and thus did not violate doctrine of claim differentiation); Lemley, *supra* note 241, at 1389 (analyzing the use of the doctrine of claim differentiation by plaintiffs to prevent the limitation of broader claims).

[246] *See Laitram v. Rexnord,* 939 F.2d at 1538 (discussing application of doctrine to dependent structural claim based on independent means plus function claim).

[247] *See* 35 U.S.C. § 112 ¶ 4 (indicating when a dependent claim is subject to the limitations of an independent claim); *Laitram v. Rexnord*, 939 F.2d at 1538 (holding independent functional claim could have the same scope as dependent structural claim).

[248] *See Laitram v. Rexnord*, 939 F.2d at 1538 (noting that when claims are made up of the same components, they can cover the same scope). In fact, the dependent claim would contain the additional structural element twice: First, it would be expressly recited in the dependent claim itself. *See* Lemley, *supra* note 241, at 1396 (setting forth that the limitations of the independent claim are encompassed by the dependent claim). Second, it would be implicitly incorporated from the independent claim. *See id.* However, only the incorporation from the independent claim would make the dependent claim cover equivalents of the additional structural element. *See id*.

[249] *See, e.g., Laitram v. Rexnord*, 939 F.2d at 1538 (citing *Pennwalt Corp*., 833 F.2d at 934) (supporting the premise that two claims were not "*literally*" the same).

the same scope, thereby violating the doctrine of claim differentiation.[250]

In case of a conflict between the doctrine of claim differentiation and § 112 ¶ 6, the latter will prevail.[251] Thus, means-plus-function claim elements will be construed to be limited by their corresponding structure even if such construction would create overlap or identity of the two claims.[252] The doctrine of claim differentiation cannot override § 112 ¶ 6.[253] The Federal Circuit justifies this inapplicability of the doctrine of claim differentiation by reasoning that otherwise a means-plus-function element could be made open-ended.[254] Patentees would be able to escape § 112 ¶ 6 by reciting the corresponding structure of a means-plus-function element in another claim.[255] However, if the doctrine of claim differentiation would be actually applied, such application would not necessarily result in an open-ended functional claim element.[256] Rather, as a matter of refusal to incorporate structure into the functional claim element, the claim containing such element would be lacking sufficient structure leading to a finding of invalidity for indefiniteness under § 112 ¶ 2.[257] Thus,

[250] *See* Lemley, *supra* note 241, at 1396 (summarizing the doctrine of claim differentiation and how it should be applied by the court).
[251] *See Laitram v. Rexnord*, 939 F.2d at 1538 (indicating that the statute overrides claim differentiation).
[252] *See Rodime*, 174 F.3d at 1304 (distinguishing from *Laitram*, 939 F.2d at 1538 and discussing construction of means plus function claims).
[253] *See Laitram v. Rexnord*, 939 F.2d at 1538 (indicating that the statute overrides claim differentiation).
[254] *See* Animatics Corp. v. Quicksilver Controls, Inc., 102 F. App'x. 659, 669-70 (Fed. Cir. 2004) (citing *Laitram v. Rexnord*, 939 F.2d at 1538) (observing a shortfall of the doctrine of claim differentiation).
[255] *See id.* (rejecting an attempt to use claim differentiation to make a means-plus-function claim broader); *Wenger*, 239 F.3d at 1234 (citing *Laitram*, 939 F.2d at 1538) (holding the addition of a structural claim using structure from means-plus-function claims could not circumvent § 112 ¶ 6).
[256] *See* C.R. Bard, Inc., v. M3 Sys., Inc., 157 F.3d 1340, 1364 (Fed. Cir. 1998) (quoting *Laitram*, 939 F.2d at 1538) (explaining how the presence of another claim does not make the means-plus-function limitation open-ended when that claim specifically addresses the "disclosed structure which underlies the means clause or an equivalent of that structure").
[257] *See supra* Part V.C. ¶ 2 (distinguishing a claim's failure under the statute for a lack of definiteness).

overriding the doctrine of claim differentiation is a result of interpreting the claims such that claim validity is maintained.[258]

B. Amendment of Structure During Prosecution

According to § 112 ¶ 6, the validity of a means-plus-function claim element depends on the sufficiency of the disclosed structure.[259] However, it is not possible to save a functional claim element that is lacking sufficient structure by amending that structure.[260] First, the statutory prohibition against adding new matter in § 132(a) does not allow to amend the disclosure.[261] In this regard, the statute provides that no amendment shall introduce new matter into the disclosure of the invention, while the disclosure is understood to encompass the specification and to exclude the claims.[262] "The statutory prohibition against adding 'new matter' to the disclosure prevents applicants from filing before they have completed their inventions and then updating their applications as they finish their research."[263] Therefore, as a matter of this statutory prohibition, the patentee is prevented from adding new structure to the specification to save functional claim elements.

Second, as the new matter prohibition in § 132(a) does not relate to the claims, one may consider amending the claim language with sufficient structure, which could be incorporated

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[258] *See* Smith v. Snow, 294 U.S. 1, 14 (1935) (citing Keystone Mfg. Co. v. Adams, 151 U.S. 139, 144-45 (1894)) (explaining that when a claim is susceptible to two constructions the court should adopt the construction that will allow the patentee to preserve the invention); Phillips v. AWH Corp., 415 F.3d 1303, 1322 (Fed. Cir. 2005) (citing *Smith*, 294 U.S. at 14) (illustrating the use of a dictionary to support an alternate construction may bring the claim outside of the patentee's actual invention).

[259] *See* 35 U.S.C. § 112 (reiterating the terms of the statute).

[260] *See* 35 U.S.C. § 132(a) (dictating that no additional structure may be added as an amendment).

[261] *See id.* (stating the limitations of amending a claim).

[262] *See* Pennwalt Corp. v. Akzona Inc., 740 F.2d 1573, 1578 n.11 (Fed. Cir. 1984) (citing *In re* Rasmussen, 650 F.2d 1212, 1214 (C.C.P.A. 1981)) (detailing that claim amendments with limitations not supported by the original disclosure are rejected under § 112).

[263] *See* MERGES & DUFFY, *supra* note 131, at 26.

into the insufficient functional claim element.[264] Although it is true that § 132(a) does not apply to the claims, however adding structure to the claims would be impermissible for another reason—amended claim language which is unsupported in the original disclosure is rejected under § 112 ¶ 1.[265] As the lack of structural support is exactly the reason for the invalidity of the means-plus-function claim element that is intended to be cured, it is not possible to amend the claim.[266] Amendment of the claim would mean to introduce a new structure leading to a rejection under § 112 ¶ 1.[267] Therefore, if there is a lack of structure to sufficiently support means-plus-function claim elements, it is neither possible to amend the claims nor the remainder of the specification. The insufficient functional claim element will render the claim it belongs to invalid.

C. Language with both Structural and Functional Meaning

As it was discussed earlier, functional claim elements can have structural meaning.[268] Similarly, the remainder of the specification may also contain functional language with structural meaning.[269] Arguably, such language could be an insufficient disclosure of structure as required by § 112 ¶ 6.[270] However, the use of functional language may be permissible if the person having ordinary skill in the art would understand the function to contain sufficient structure.[271] Thus, the use of functional language to describe the structure of an algorithm is satisfactory if

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[264] *See supra* Part VI.A. (discussing the specification/claim relationship in the context of the provision of structure to functional claim elements).
[265] *See Pennwalt*, 740 F.2d at 1578 n.11 (drawing the distinction between rejections based on "new matter" versus those based on having previously unsupported amended claim language).
[266] *See id.* (reviewing the claim rejection in *In re Rasmussen*).
[267] *See id.* (rejecting claims for lacking support in the specification).
[268] *See Mass. Inst. of Tech.*, 462 F.3d at 1361 (noting that § 112 is avoided with a sufficiently definite structure).
[269] *See id.* (describing the interplay between definite structure and § 112).
[270] *See* cases cited *supra* note 68 (discussing failure to rebut §112¶6 presumption where insufficient structure is disclosed).
[271] *See* cases cited *supra* note 66 (discussing rebuttal of §112¶6 where the claim recites sufficient structure).

the person having ordinary skill in the art of programming would understand the functional description as disclosure of sufficient algorithmic structure.[272] Thus, although language is functional on its face, it can also convey sufficient structure.

VII. "And Equivalents Thereof."

§ 112 ¶ 6 determines that mean-plus-function claim elements are not limited to their structure described in the specification, but cover "equivalents thereof" as well. Thus, different from structural claim elements, literal infringement extends beyond the structure contained in the patent, but also includes equivalents.[273] Such literal infringement analysis is the first part in the infringement analysis for means-plus-function claim elements.[274] The second part tests for infringement under the doctrine of equivalents.[275] Both will be addressed in turn, before discussing prosecution history estoppel.

A. Literal Infringement

According to § 112, ¶ 6, a claim element "for performing a specified function…shall be construed to cover the corresponding structure…described in the specification and equivalents thereof."[276] Thus, a means-plus-function element reads literally on an accused device if the device performs the specified function—meaning, it performs the *identical function*—and employs structure described in the specification or equivalents thereof—

[272] *See* STOBBS, *supra* note 175, at 355 (describing functional language as being permissible so long as it is not overly broad and does not claim only the "end result").
[273] *See* Al-Site Corp. v. VSI Int'l, Inc., 174 F.3d 1308, 1320 (Fed. Cir. 1999) (holding equivalent may literally infringe); Beyer, *supra* note 57, at 504 (stating that literal infringement requires functional identity, but also includes equivalents).
[274] *See* D.M.I., Inc. v. Deere & Co., 755 F.2d 1570, 1574-75 (Fed. Cir. 1985) (explaining that the court will look at literal infringement through structural equivalents, then look at doctrine of equivalents).
[275] *See* Beyer, *supra* note 57, at 507 (literal infringement is likely considered first, followed by the doctrine of equivalents).
[276] 35 U.S.C. § 112 ¶ 6.

meaning, it employs *identical or equivalent structure*.[277] With regard to the latter, deviating from structural claim elements, the literal scope of means-plus-function claim elements is not limited to the structure actually disclosed in the specification, but covers equivalents of the disclosed structure as well.[278] Only if the accused device neither infringes the disclosed nor an equivalent structure, the infringement analysis proceeds to the doctrine of equivalents analysis.[279]

Guidance for finding identity or equivalence of structure can be found in the Federal Circuit's decision in *WMS Gaming*.[280] This case involved a patent for a microprocessor-controlled slot machine for generating higher payoffs than prior art slot ma-

[277] *See WMS Gaming*, 184 F.3d at 1347 (citing Valmont Indus., Inc. v. Reinke Mfg. Co., Inc., 983 F.2d 1039, 1042 (Fed. Cir. 1993) and *Pennwalt Corp.,* 833 F.2d at 934) (stressing that to infringe, the accused device must perform the identical function as specified in the claims and employ means identical to or the equivalent of the structures, material, or acts described in the specification); Chiuminatta Concrete Concepts, Inc. v. Cardinal Indus., Inc., 145 F.3d 1303, 1307-08 (Fed. Cir. 1998) (citing *Pennwalt Corp*., 833 F.2d at 934) (explaining "to determine whether a [means-plus-function] claim limitation is met literally …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"); *D.M.I., Inc.*, 755 F.2d at 1575 (exemplifying the standard for determining whether a claim limitation is met literally); Radio Steel & Mfg. Co. v. MTD Prods., Inc., 731 F.2d 840, 848 (Fed. Cir. 1984) (offering guidance regarding the standard for literal claim infringement); Beyer, *supra* note 57, at 504 (setting forth the test for literal infringement with the qualification that literal infringement of a means-plus-function claim requires functional identity whereas the doctrine of equivalents only requires the functions performed be equivalent); Jonathan N. Geld, *General Does Not Mean Generic – Shedding Light on In re Alappat*, 4 TEX. INTELL. PROP. L.J. 71, 78 (1995) (explaining the "device will be found equivalent if the change is insubstantial and adds nothing of significance to the structure, material, or acts of the original device").

[278] *See Al-Site Corp.,* 174 F.3d at 1320 (explaining that §112 ¶ 6 allows for equivalent structures); Beyer, *supra* note 57, at 504 (stating that equivalent structure is covered by a means plus function claim).

[279] *See D.M.I., Inc.*, 755 F.2d at 1575 (detailing the sole question for determining doctrine of equivalent application).

[280] *See WMS Gaming*, 184 F.3d at 1347 (laying out the meaning of equivalence as used to construe means plus function claims).

chines without decreasing the slot machine's profitability.[281] In order to avoid the conventional approach of increasing the number of reels or stop positions per reel, which indicate to the player a smaller chance to win, the patent disclosed a slot machine that extends the reel virtually to include a range of numbers greater than the actual number of reel stop positions.[282] This virtual increase of stop positions reduces the probability for winning, thereby allowing higher payoffs, while at the same time maintaining the outward appearance of a conventional slot machine.[283] As a matter of the virtual extension of the reel, determination of a winning combination of reel positions depends in fact on a random number generator, which in turn selects the stop position for each reel.[284]

For example, in a traditional slot machine a reel could have twenty-two stop positions.[285] If two of the twenty-two positions would display a cherry symbol, the probability of the reel stopping at a cherry would be 0.0909.[286] The invention disclosed a reel with twenty-two stop positions that could be virtually extended to forty-four stop positions assigning three of the forty-four positions to display a cherry, thereby decreasing the odds of displaying a cherry to 0.0681.[287] Consequently, when the player starts the slot machine, the random number generator would generate a random number, which, if associated with the cherry symbol, would make the reel stop at a position displaying a cher-

[281] *See* Baugh, *supra* note 204, at 116-17 (reviewing the factual circumstances of the case).
[282] *See WMS Gaming*, 184 F.3d at 1343 (examining the workings of slot machines and highlighting the general method and purpose of the patent).
[283] *See id*. (describing the effect of the changes the patented material ahs on the slot machine); *see also* Baugh, *supra* note 204, at 117 (dissecting the inner-workings of the slot machine); Juicy Whip, Inc. v. Orange Bang, Inc, 185 F.3d 1364, 1366-68 (Fed. Cir. 1999) (analyzing beneficial utility under § 101 for an invention that is designed to appear to viewers to be something it is not).
[284] *See WMS Gamin.*, 184 F.3d at 1343 (explaining how the patented slot machine works).
[285] *See id.* (discussing traditional slot machine).
[286] *See* Baugh, *supra* note 204, at 117 (discussing probability of getting certain results with traditional slot machine).
[287] *See* Baugh, *supra* note 204, at 117-18 (articulating the odds of getting certain results with patented slot machine).

ry symbol.[288] Thus, different from the perception of the player, the reel has no part in determining which symbol is displayed, but rather it is the random number generator, whose numbers are mapped to the symbols of the reel and make the reel stop accordingly.[289]

The accused infringing device was a microprocessor-controlled slot machine that also generated higher payoffs without decreasing profitability.[290] However, the accused slot-machine did not directly map randomly generated numbers to reel stop positions, but instead used the following algorithm: a random number generator selects a first number (R1) from a first range of numbers, and the selected number is mapped to a first payoff multiplier (X).[291] Then the random number generator selects another number (R2) from a second range of numbers, and the selected number is mapped to a second payoff multiplier (Y).[292] Then the actual payoff amount is determined by multiplying X times Y.[293] Finally, the calculated payoff amount is matched to a combination of reel stop positions indicating the payoff amount.[294] If there is more than one combination that can indicate the payout amount, a third random number determines which of the combinations will be displayed.[295]

[288] *See WMS Gaming*, 184 F.3d at 1343 (explaining use of random number generator).
[289] *See id.* (reiterating that the "reels only serve the function of displaying the randomly chosen result").
[290] *See id.* at 1344-46 (describing in detail the mechanics of the alleged infringing device).
[291] *See id.* at 1344 (discussing algorithm used in slot machine).
[292] *See id.* (detailing next step of the process).
[293] *See id.* (detailing third step of the process).
[294] *See WMS Gaming*, 184 F.3d at 1344. (outlining how stop position is determined).
[295] *See id*. at 1344-45 (describing final step of the algorithm).

Numbers for determining the payoff amount as disclosed in U.S. Patent No. 5,456,465

Random Numbers (R1)	Quantity	Multiplier (X)
1	1	10
2 – 31	30	2
32 – 181	150	1
182 – 632	451	0

Random Numbers (R2)	Quantity	Multiplier (Y)
1	1	100
2 – 23	22	10
24 – 259	236	5
260 – 396	137	1
397 – 632	236	0

The Federal Circuit found that the two algorithms were not identical because the algorithm in the asserted patent consisted of assigning single random numbers to single reel stop positions, while the algorithm of the accused device generated random numbers to calculate the payoff amount, which would then be mapped to a matching combination of reel positions.[296] However, the court found the algorithms equivalent because of the similarity in determining the reel stop positions.[297] Under the patent, randomly generated single numbers were mapped to single reel stop positions, and the accused device mapped a single number—the payoff amount—to a combination of reel stop positions.[298] The court viewed these algorithms as equivalent.[299]

[296] *See id*. at 1350-51 (outlining the reasoning behind the holding).
[297] *See id*. at 1351 (accepting the district court's conclusion that the two algorithms were equivalent).
[298] *See id*. (analyzing the methods by which the two slot machines determined stop positions).
[299] *See* Baugh, *supra* note 204, at 121-22 (reiterating that the question was a "close call" and that the federal court did not overturn the district court's ruling of equivalence).

However, referring to its finding as a "close question" the court implied that the opposite finding would have some merits as well.[300]

The analysis for determining equivalence of structure under § 112 ¶ 6 can borrow from the insubstantial difference test of the doctrine of equivalents.[301] Under the insubstantial difference test, equivalence will be found if, from the perspective of the person having ordinary skill in the art, the accused device adds nothing of significance to the structure disclosed in the specification of the asserted patent.[302] Determining if differences are insubstantial depends on the level of abstraction of the disclosed algorithm.[303] The structure of the disclosed algorithm has to be compared to the structure of the accused device at the same level of abstraction.[304] Generally, more abstract structure tolerates less difference than specific structure.[305] Thus, for example, on the

[300] *See WMS Gaming*, 184 F.3d at 1352 (holding that district court's contrary decision was not clearly erroneous).
[301] *See* Warner-Jenkinson Co., Inc. v. Hilton Davis Chemical Co., 520 U.S. 17, 39-41 (1997) (giving an overview of insubstantial difference test and doctrine of equivalents to resolve questions of patent infringement).
[302] *See* Festo Corp. v. Shoketsu Kinzoku Kogyo Kabushiki Co., Ltd., 535 U.S. 722, 732-33 (2002) (citing Graver Tank & Mfg. Co., Inc. v. Linde Air Products Co., 339 U.S. 605, 607 (1950)) (referencing previous case where the Court held that patent claims should not protect copyists that add insubstantial changes and substitutions that provide no added value to the original patent); *Warner-Jenkinson*, 520 U.S. at 39-40 (discussing the use of the insubstantial difference test and the "triple identity" test to ultimately determine whether the accused product or process shares identical or equivalent elements with the patented invention); *Graver Tank*, 339 U.S. at 610 (considering whether identical methods utilizing different materials to produce the same yield were so insubstantially different as to justify the application of the doctrine of equivalents); *Chiuminatta*, 145 F.3d at 1309 (citing Valmont Indus., Inc. v. Reinke Mfg. Co., 983 F.2d 1039, 1043 (Fed. Cir. 1993) and Alpex Computer Corp. v. Nintendo Co., 102 F.3d 1214, 1222 (Fed. Cir. 1996)) (outlining the insubstantial difference test and describing what is considered an insubstantial change); *Valmont*, 983 F.2d at 1043 (describing the process for determining equivalence in the context of § 112).
[303] *See WMS Gaming*, 184 F.3d at 1351 (comparing two patented algorithms at the same level of abstraction).
[304] *See id.* (balancing the algorithms of two patents).
[305] *See* Clinton, *supra* note 76, at 45-48 (discussing difference required to defeat patents at varying levels of abstraction).

level of data flow diagrams a minor difference can prevent a finding of equivalence, while a minor difference would not prevent a finding of equivalence on the source code level.[306] As opposed to the insubstantial difference test, the triple identity test of the doctrine of equivalents analysis appears less helpful because the only question of equivalence under § 112 ¶ 6 involves comparison of structure.[307]

Addressing determination of identical function, the *WMS Gaming* court found that the functional claim elements did not read on the accused slot machine. The asserted patent contained functional language claiming "means for assigning a plurality of numbers representing…positions of [a]…reel…," "means for randomly selecting one of said plurality of assigned numbers; and means for stopping said reel at the…position represented by said selected number."[308] As mentioned above, different from these claimed means that map single numbers to single reel stop positions, the accused device mapped a single number to a combination of reel stop positions.[309] Thus, the court held that the accused device did not perform a function identical to that of the means-plus-function claim elements of the asserted patent.[310] "Accordingly, although it ha[d] equivalent structure, the [accused] slot machine d[id] not literally infringe the claim."[311]

So, what is the standard for identity of function? Identity of function means that a functional claim element discloses a

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[306] *See* Clinton, *supra* note 76, at 45-48 (discussing the different results of patenting one invention in different ways).

[307] *See infra* Part VII.B (discussing the test for infringement under the doctrine of equivalents); *Valmont*, 983 F.2d at 1043 (citing *D.M.I., Inc.*, 755 F.2d at 1575 and Durango Assocs. Inc. v. Reflange, Inc., 843 F.2d 1349, 1357 (Fed. Cir. 1988)) (contrasting equivalence analysis under § 112 with the doctrine of equivalents).

[308] *See WMS Gaming*, 184 F.3d at 1346-47 (reviewing independent claim 1 of patent for a game apparatus).

[309] *See id.* at 1351 (describing difference in assignment of stop positions in accused device and claim).

[310] *See id.* at 1352 (holding that because assignment of combination of numbers does not perform the same function as assignment of single numbers, the accused device did not infringe the patent).

[311] *Id.*

function that is identically performed by the accused device.[312] A function of an algorithm as expressed in a claim can be viewed as the algorithm's most abstract representation.[313] Accordingly, a slight deviation of the claimed function from the function of the accused device will lead to a finding that the two functions are not identical.[314] If the accused device is also patented—as it was the case in *WMS Gaming*—it is possible to compare the actual language used in the patents.[315] If the language is identical, the function is identical as well.[316] The same is true if the terms are different, but are synonyms for each other.[317] In such cases of linguistic identity or synonymy, a finding of functional identity is justified.[318] Comparing the language of two patents can also prove useful if functional identity of a patent application and a prior art patent is analyzed in the course of an anticipation analysis during prosecution.[319]

On a side note, if a specification discloses an algorithm in functional terms, arguably the accused device would only infringe if it employs an identical algorithm because literal infringement under § 112 ¶ 6 requires identity of function.[320] However, this argument does not hold. There are two possibilities: First, if the

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[312] *See id.* at 1347 (discussing that the accused device must perform the identical function as specified in the claims and employ means identical to or the equivalent of the structures, material, or acts described in the specification).
[313] *See* 35 U.S.C. § 112 ¶ 6 (inferring from the statute that a function can be an abstract representation of an algorithm).
[314] *See WMS Gaming*, 184 F.3d at 1352 (holding that an algorithm that assigns a single number differs from one that assigns a combination of numbers).
[315] *See id.* at 1350 (directly comparing language of Telnaes and Durham patents to find different functions).
[316] *See id.* at 1347 (discussing where the means and function are identical).
[317] *See Graver Tank*, 339 U.S. at 607 (explaining that "[i]f accused matter falls clearly within the claim, infringement is made out and that is the end of it.").
[318] *See id.* (discussing the rationale of linguistic and functional identity justification).
[319] *See* In re Gleave, 560 F.3d 1331, 1338 (Fed. Cir. 2009) (discussing the distinction between two patents, one of which having the nature of a prior art).
[320] *See* Todd M. Oberdick, *Section 112, Paragraph 6 - Means Claim and Limitation to Specific Algorithm -- Is This a Stricter Standard Than Gentry Gallery and Related Mechanical Cases?*, 22 PACE L. REV. 385, 392 (2002) (discussing that a difference between equivalent analysis is that § 112 ¶ 6 "requires identical, not equivalent, function[s]").

specification of an algorithm, although, functional on its face, actually conveys sufficient structure to the person having ordinary skill in the art, a finding of literal infringement is justified if the accused device employs identical or equivalent structures.[321] This is not different from the case where the algorithm is specified in structural terms. Second, if the description remains purely functional or discloses insufficient structure, the disclosure of algorithmic structure is defective and the claim is invalid for indefiniteness under § 112 ¶ 2.[322]

B. Infringement Under the Doctrine of Equivalents

The doctrine of equivalents determines that an accused device can infringe a patent if there is equivalence between the elements of the patent and the elements implemented in the accused device.[323] Under the insubstantial difference test, equivalence is present if, from the perspective of the person of ordinary skill in the art, the accused device adds nothing of significance to the structure disclosed in the specification of the asserted patent.[324] Alternatively, the triple identity test, also known as tri-

[321] *See id.* at 393 (clarifying that literal infringement will not be found when the accused algorithm is not identical to the claimed function).

[322] *See Mass. Inst. of Tech.*, 462 F.3d at 1361 (citing congressional intent to broaden the scope of interpretation of functional claims which might otherwise held indefinite); 35 U.S.C. § 112 ¶ 2 (requiring the patentee to "particularly point out and distinctly claim[] the subject matter" in the specification).

[323] *Warner-Jenkinson*, 520 U.S. at 21 (citing *Graver Tank*, 339 U.S. at 609) (assessing that a process or product that does not literally infringe can still infringe if there is equivalence between the elements).

[324] *See Festo Corp.*, 535 U.S. at 732-33 (focusing on the rationale for the doctrine as in part to protect inventors from copyists who make insubstantial changes that nonetheless take the copied matter outside the claims); *Warner-Jenkinson*, 520 U.S. at 39-40 (highlighting flaws in the insubstantial differences test); *Graver Tank*, 339 U.S. at 610 (comparing composition of two fluxes to determine if a change was so insubstantial that the fluxes were essentially equivalent); *Chiuminatta*, 145 F.3d at 1309 (citing *Valmont*, 983 F.2d at 1043 and *Alpex*, 102 F.3d at 1222) ("The proper test is whether the differences between the structure in the accused device and any disclosed in the specification are insubstantial"); *Valmont*, 983 F.2d at 1043 (defining equivalent under doctrine of equivalents as incorporating an insubstantial change that adds nothing of significance to a claimed invention).

partite function-way-result test, can be applied.[325] Using this test, equivalence is found if a device performs substantially the same function, in substantially the same way, to achieve substantially the same result as the claimed invention.[326] Under either test, the patent holder cannot claim the doctrine of equivalents if § 112 ¶ 6 was not met due to a lack of identical or equivalent structure.[327] This is because an element cannot be simultaneously equivalent under the doctrine of equivalents and not equivalent under § 112 ¶ 6.[328]

Despite the overlap of the analysis of literal infringement under § 112 ¶ 6 and the analysis of infringement under the doctrine of equivalents, there are cases in which only the latter is applicable.[329] For example, literal infringement under § 112 ¶ 6 is

[325] *See Graver Tank*, 339 U.S. at 608-09 (setting forth the elements of the triple identity test); *see also* Beyer, *supra* note 57, at 502 (introducing the tripartite function-way-result test as the traditional test applied under the doctrine of equivalents).

[326] *See Pennwalt Corp.,* Inc., 833 F.2d at 934-935 (citing *Graver Tank*, 339 U.S. at 608 and Perkin-Elmer Corp. v. Computervision Corp., 732 F.2d 888, 901-02 (Fed. Cir. 1984)) (noting that the triple identity test, while not dispositive, may be used to find infringement under the doctrine of equivalents); *Autogiro*, 384 F.2d at 399-400 (providing that determining the meaning of the claims is only half of the process to determine infringement and the court must also apply the doctrine of equivalents); Geld, *supra* note 277, at 77 (describing two paths courts may take in evaluating equivalence: equivalents language in 35 U.S.C. § 112 ¶ 6, and triple identity test).

[327] *See* Ballard Med. Prods. v. Allegiance Healthcare Corp., 268 F.3d 1352, 1363 (Fed. Cir. 2001) (citing *Chiuminatta*, 145 F.3d at 1311) (maintaining that when a claim of infringement fails under § 112 ¶ 6 for lack of identical structure, the doctrine of equivalents is unavailable).

[328] *See Chiuminatta*, 145 F.3d at 1311 (citing Dawn Equip. Co. v. Kentucky Farms, Inc., 140 F.3d 1009, 1017-22 (Fed. Cir. 1998)) (highlighting that an element of a device cannot simultaneously be "not equivalent" under § 112 ¶ 6 yet still be equivalent under the doctrine of equivalents). *But see WMS Gaming*, 184 F.3d at 1353-54 (showing that an accused device may still infringe under the doctrine of equivalents even if literal infringement is not met, because only equivalent, not exact function is required).

[329] *See, e.g., WMS Gaming*, 184 F.3d at 1353-54 (holding that a functional claim element was not identical in an accused device, but it was still equivalent under the doctrine of equivalents).

subject to a temporal limitation.[330] Only technologies that existed at the time the patent was issued may be literally covered by a functional claim element.[331] An equivalent under § 112 ¶ 6 cannot embrace technology developed after the issuance of the patent because the literal meaning of a claim is fixed upon its issuance.[332] Thus, technology originating after the patent was issued cannot literally read on a functional claim element—neither on an identical claim element, nor on an equivalent thereof.[333] Therefore, the claim may only be infringed under the doctrine of equivalents.[334] Insofar as there is room for applying the doctrine of equivalents because later-developed technology is not covered by § 112 ¶ 6.[335]

Another case where the analysis of infringement under the doctrine of equivalents becomes crucial occurs if the structure of the accused device was found to be identical or equivalent under § 112 ¶ 6, however, the function was determined to be different.[336] In this constellation, a device which is not equivalent

[330] *See Chiuminatta*, 145 F.3d at 1310 (discussing how variations of structure invented after issuance of a patent could not have been disclosed in the patent).
[331] *See id.* (clarifying that technologies existing at the time of the initial patent filing will be covered as a functional claim element as an equivalent).
[332] *See Al-Site*, 174 F.3d at 1320 (reasoning that a claim cannot include technology developed after a patent issues, because the literal claim is fixed at that time).
[333] *See id.* (outlining that literal infringement under § 112 ¶ 6 requires an equivalent structure or act to have been available at the time of patent issuance).
[334] *See id.* (citing *Warner-Jenkinson*, 520 U.S. at 34-35 and Hughes Aircraft Co. v. U.S., 140 F.3d 1470, 1475 (Fed. Cir. 1998)) (explaining after arising equivalent" infringements can only occur under the doctrine of equivalents); Beyer, *supra* note 57, at 505 (explaining that an after-arising technology cannot literally infringe a means-plus-function claim because it was not conceived of at the time of the first filing); Stover, *supra* note 137, at 106-07 (detailing common law doctrine of equivalents is the only means of finding infringement if accused technology was developed after patent issuance).
[335] *See Al-Site*, 174 F.3d at 1320 (indicating that later developed technologies may not be covered by § 112 ¶ 6).
[336] *See id*. at 1320-21 (citing *Hughes Aircraft Co.*, 140 F.3d at 1475 and Cybor Corp. v. FAS Techs., Inc., 138 F.3d 1448, 1456 (Fed. Cir. 1998)) (distinguishing that § 112 ¶ 6 requires device to perform an identical function of that de-

under the literal infringement analysis may be found to use equivalent elements under the doctrine of equivalents as well.[337] These aforementioned applications show how the doctrine of equivalents expands claim elements beyond the equivalents of § 112 ¶ 6, which rather limits functional claim elements to equivalents of their structure.[338] Apart from application of the doctrine of equivalents in the cases of later developed technology and diverging functions, further constellations are imaginable.[339] This is especially true if the doctrine of equivalents is applied to functional claims as a whole and not on an element-by-element basis as usual.[340]

Ultimately, the *WMS Gaming* court found the accused device infringing under the doctrine of equivalents.[341] The court

scribed in the claim element while the doctrine of equivalents may be satisfied where the device performs a function that is only substantially the same); Beyer, *supra* note 57, at 506 (discussing Chiuminatta's holding that if the accused device did not literally infringe because of a lack of functionality, the doctrine of equivalents still applies).

[337] *See* Geld, *supra* note 277, at 79-80 (asserting that the doctrine of equivalents expands patent rights while equivalence under § 112¶ 6 is narrow).

[338] *See Warner-Jenkinson*, 520 U.S. at 28 (explaining narrowing role of § 112 ¶ 6 equivalence and refusing to extend it to the doctrine of equivalents); *Valmont*, 983 F.2d at 1043-44 (comparing the term "equivalents" under the doctrine of equivalents to that under §112 ¶ 6 and explaining how in the former, the term "expands exclusive patent rights," whereas in the latter, it limits the language of mean-plus-function claims); *Chiuminatta*, 145 F.3d at 1310 (explaining equivalents under § 112 applies the doctrine of equivalents in a restrictive role); Burk & Lemley, *supra* note 218, at 1173 (predicting the vast expansion in scope of claims when doctrine of equivalents is used instead of means-plus-function structural equivalence); Kevin R. Casey, *Means Plus Function Claims After Markman: Is Claim Construction Under § 35 U.S.C. 112 ¶ 6 a Question of Fact or an Issue of Law?*, 79 J. PAT. & TRADEMARK OFF. SOC'Y 841, 845 (1997) (proposing that § 112 ¶ 6 and the doctrine of equivalents have opposite effects).

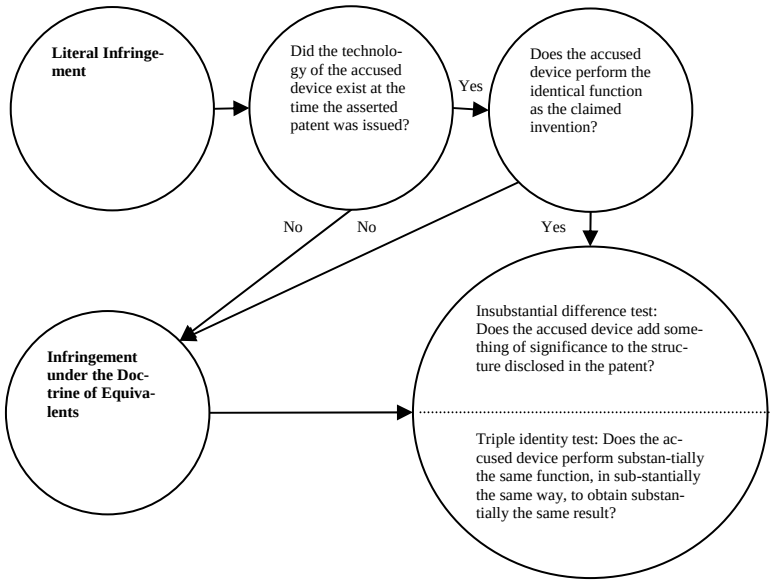
[339] *See* Deron Burton, *Bringing Theory into Practice: Predictable Scope for Functional Patent Claims*, 42 UCLA L. REV. 221, 258-59 (1994) (describing use of "as a whole" analysis to distinguish literal infringement of means-plus-function claims through structural equivalence from doctrine of equivalents infringement).

[340] *See id.* (describing application of doctrine of equivalents to the invention as a whole rather than to single elements).

[341] *See WMS Gaming*, 184 F.3d at 1362 (holding that the doctrine of equivalence was caused for patent infringement).

did not follow the defendant's theory that the accused device works substantially different from the disclosed algorithm, because it does not assign numbers to reel stop positions to determine a result, but rather, determines a result before reel stop positions are selected.[342] Instead, the court reasoned that choosing two random numbers, performing mathematical operations to determine the payoff amount, and then choosing a third random number to determine a matching reel combination does not change the fact that reel stop positions are identified by certain numbers.[343] The crucial element employed by the accused device as well as by the disclosed algorithm consists of the assignment of numbers to reel stop positions.[344] Such assignment makes both structures equivalent and supports a finding of infringement under the doctrine of equivalents.[345]

Applying the Doctrine of Equivalents to Means-Plus-Function Claim Elements



[342] *See id.* at 1354 (rejecting infringer's claim that reversing the order of stop steps was substantially different).
[343] *See id.* (holding the process in question still constituted identifying the stop position by a combination of numbers).
[344] *See id.* (characterizing assignment of numbers to stop positions as key question).
[345] *See id.* (affirming holding of infringement under doctrine of equivalents).

C. Prosecution History Estoppel

The doctrine of equivalents is subject to prosecution history estoppel, which limits the permissible range of equivalents that may be asserted in an infringement action.[346] A patent holder cannot use the doctrine of equivalents to expand the interpretation of a claim recapturing the inventive territory that was surrendered by either a claim amendment or by a statement made during prosecution.[347] These two cases that give rise to prosecution history estoppel—claim amendments and statements made during prosecution—are referred to as amendment estoppel and argument estoppel, respectively.[348] For both of these cases, it is well established that the prosecution history limits equivalents in the infringement analysis under the doctrine of equivalents.[349] However, the relationship between prosecution history estoppel and literal infringement of equivalents under § 112 ¶ 6 is less clear.

Addressing this relationship, the Federal Circuit held that prosecution history estoppel is irrelevant for determining the scope of a claim in a literal infringement analysis.[350] Technically, prosecution history estoppel is only applicable to the doctrine of

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[346] *See Festo Corp.*, 535 U.S. at 727 (reaffirming that doctrine of equivalents is limited by prosecution history estoppel); Lockheed Martin Corp. v. Space Sys./Loral, Inc., 249 F.3d 1314, 1323 (Fed. Cir. 2001), *vacated*, 535 U.S. 1109 (2002) (mentioning prosecution history estoppel as one basis for limiting determination of infringement under doctrine of equivalents); Kenneth D. Bassinger, *Allocating Linguistic Uncertainty in Patent Claims: The Proper Role of Prosecution History Estoppel*, 49 LOY. L. REV. 339, 370 (2003) (discussing role of prosecution history estoppel in informing others what the patent's boundaries are and limiting doctrine of equivalents).

[347] *See* Bassinger, *supra* note 346 (discussing prosecution history estoppel).

[348] *See* Bassinger, *supra* note 346 (elucidating prosecution history estoppel); Ulbrich, *supra* note 199, at 1177-79 (detailing the contexts of prosecution history estoppel—argument and amendment estoppel).

[349] *See* Bassinger, *supra* note 346 (explaining that doctrine of equivalents prevents reclamation of ground given up during prosecution).

[350] *See Wenger*, 239 F.3d at 1238 (holding prosecution history estoppel "irrelevant"); Biodex Corp. v. Loredan Biomed., Inc., 946 F.2d 850, 862-63 (Fed. Cir. 1991) (citing Fromson v. Advance Offset Plate, Inc., 720 F.2d 1565, 1571 (Fed. Cir. 1983)) (confirming the general doctrine of prosecution history estoppel being irrelevant in literal claim scope determination).

equivalents, thus, cannot limit § 112 ¶ 6.[351] However, just as prosecution history estoppel can be used to estop a finding of equivalence under the doctrine of equivalents, amendments and arguments made before the U.S.P.T.O. can be used to bar an inconsistent interpretation of equivalents under § 112 ¶ 6.[352] In this regard, equivalents of functional claim elements cannot encompass subject matter disclaimed or disavowed during prosecution in order to obtain claim allowance.[353] Thus, despite its inapplicability to § 112 ¶ 6, equivalents under § 112 ¶ 6 are identified in the spirit of prosecution history estoppel.[354] The relevant inquiry is whether a competitor would reasonably believe that the patentee had surrendered the pertinent subject matter.[355]

Aforementioned interpretation of equivalents under § 112 ¶ 6 is supported by the legislative history indicating that equivalents in § 112 ¶ 6 were intended to be of similar scope as equivalents under the doctrine of equivalents. In fact, there is evidence that § 112 ¶ 6 is a codification of the doctrine of equivalents for mean-plus-function claim elements.[356] Joseph R. Bryson

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[351] *See Biodex.* 946 F.2d at 862-63 (explaining doctrine of prosecution history estoppel utilizes an analysis under doctrine of equivalents).

[352] *See Wenger,* 239 F.3d at 1239 (citing Cybor Corp. v. FAS Tech., Inc., 138 F.3d 1448 (Fed. Cir. 1998)) (illustrating application of standard for determining infringement by inquiring "whether a competitor would reasonably believe that the applicant had surrendered the relevant subject matter").

[353] *See Biodex*, 946 F.2d at 862-63 (citing ZMI Corp. v. Cardiac Resuscitator Corp., 844 F.2d 1576, 1580 (Fed. Cir. 1988)) (holding disclaimer of particular claim interpretation during prosecution denies patentee that interpretation in infringement analysis); *ZMI Corp*., 844 F.2d at 1580 (citing Standard Oil Co. v. Am. Cyanamid Co., 774 F.2d 448, 452 (Fed. Cir. 1985); McGill, Inc. v. John Zink Co., 736 F.2d 666, 673 (Fed. Cir. 1984)) (articulating reliance on prosecution history to determine present scope of claim is appropriate).

[354] *See* Ulbrich, *supra* note 199, at 1184-85 (reasoning that amendment estoppel has not been applied or forbidden to literal equivalents and thus analogies must be made to doctrine of equivalents).

[355] *See Wenger*, 239 F.3d at 1239 (citing *Cybor*, 138 F.3d at 1457) (applying established precedent for competitor's reasonable belief as to surrendered subject matter).

[356] *See* Julia Hodge, *§ 112, P 6 Claim Interpretation and the Doctrine of Equivalents: An Invitation to Confused Thinking*, 17 SANTA CLARA COMPUTER & HIGH TECH. L.J. 203, 220 (2000) (elucidating drafter intent to incorporate application of doctrine of equivalents into statute); Stover, *supra* note 137, at 104 (arguing

stated that the codification of § 112 ¶ 6 "gives recognition to the existence of the doctrine of equivalents."[357] Further, a parallel interpretation of equivalents ensures identical scope of claims independent from the use of functional claim elements.[358] For example, in all cases of § 112 ¶ 6 where the accused device uses technology existing at the time of patent issuance and performs the identical function as the claimed invention, the doctrine of equivalents would not be applicable,[359] and neither would be prosecution history estoppel.[360] Consequently, inconsistent amendments or statements during prosecution would not limit the scope of such claims. Thus, claims using functional elements would be of broader scope than claims only employing structural elements, whose equivalents would be limited by prosecution history estoppel.

Arguably it could be maintained that limiting equivalents of § 112 ¶ 6 to the same equivalents that would be permitted under prosecution history estoppel is not necessary because § 112 ¶ 6 satisfies the notice function of the claims by notifying the public that functional claim elements cover literal equivalents.[361] However, the general reference in § 112 ¶ 6 stating that equivalents are covered by functional claim elements does not provide clear notice as to which actual embodiments of equivalents are covered by the claim elements.[362] In this regard, the prosecution

Congress intended to apply same standard to § 112 ¶ 6 equivalence as to equivalence under doctrine of equivalents).

[357] *See* Hodge, *supra* note 356, at 220 (quoting Joseph R. Bryson).

[358] *See* Hodge, *supra* note 356, at 220 (interpreting equivalence identically under doctrine of equivalents and under § 112 ¶ 6 promotes equal scope of claim interpretation).

[359] *See Ballard,* 268 F.3d at 1363 (citing *Chiuminatta*, 145 F.3d at 1311) (maintaining that when a claim of infringement fails under § 112 ¶ 6 for lack of identical structure, the doctrine of equivalents is unavailable).

[360] *See Wenger*, 239 F.3d at 1238 (citing *Biodex*, 946 F.2d at 862) (holding prosecution history estoppel "irrelevant" as applied to claims under § 112 ¶ 6); *Biodex*, 946 F.2d at 862-63 (citing Fromson v. Advance Offset Plate, Inc., 720 F.2d 1565, 1571 (Fed. Cir. 1983)) (supporting assertion that prosecution history estoppel irrelevant for literal claim scope determination).

[361] *See* Ulbrich, *supra* note 199, at 1185 (concluding that statute notifies public that literal equivalents infringe).

[362] *See* 35 U.S.C § 112 ¶ 6 (2006) (failing to address which actual embodiments of equivalents are covered, rather it broadly states "equivalents").

history provides better clarification refining the scope of equivalents by specifically excluding certain subject matter.[363] Therefore, the public should be able to rely on what is stated in the publicly available prosecution history independent of the type of claim.[364]

VIII. Summary of Results

Functional claim elements are characterized by not disclosing sufficient structure themselves instead using the remainder of the specification for this purpose. This characteristic allocation of structure is the key element for identifying functional claim elements and determining their validity. For example, if a claim element consists of a step that does not recite sufficient acts or is even purely functional, it can only be categorized as a step-plus-function claim element and must be supported by sufficient acts in the remainder of the specification. However, if the element contains sufficient structure, it should be qualified as a step of an ordinary process claim. A special case for determining the validity of functional elements is the evaluation of single means claims. If single means claims are supported by sufficient structure, they can be just as valid as any other claim that employs functional elements.

Contrary to the prevalent opinion, functional claim elements are not necessarily narrower than parallel structural claim elements. This becomes obvious when considering that the structure contained in a structural claim element can be also disclosed in the remainder of the specification as the corresponding structure of a functional claim element. In such case, the functional claim element would be of equal scope as the structural claim element. In fact, the functional claim element could be even broader because § 112 ¶ 6 would extend its scope to cover equi-

[363] *See ZMI Corp.*, 844 F.2d 1576, 1580 (Fed. Cir. 1988) (citing Moeller v. Ionetics, Inc., 794 F.2d 653, 656 (Fed. Cir. 1986) and SSIH Equipment S.A., v. USITC, 718 F.2d 365, 376 (Fed. Cir. 1983)) (indicating that resorting to extrinsic evidence may be necessary to settle disputed claims).

[364] *See* 37 C.F.R. § 1.11 (Westlaw current through 2011) (specifying which files are open to the public, when, and how to access them).

valents of the corresponding structure as well. Construing functional claim elements narrower than parallel structural claim elements is based on an inadequate identification of the structure that corresponds to the functional claim element. As § 112 ¶ 6 serves the purpose of securing definiteness of functional claim language, not all disclosed structure is corresponding structure, but only structure that is required in order to satisfy § 112 ¶ 2.

The structure to be disclosed in functional elements claiming computer programs is the algorithm. No physical structure has to be disclosed because it is the programming that makes a general purpose computer a new machine. An algorithm is sufficiently disclosed if a person having ordinary skill in the art of programming can distinctly determine which computer program is claimed and which computer programs are not claimed. Insofar, it is the decision of the patentee to choose the level of abstraction for disclosing the algorithm as long as the disclosure satisfies the definiteness standard of § 112 ¶ 2. The higher the level of abstraction is chosen, the greater the scope of the patent will be. Beyond disclosure of structure for purposes of § 112 ¶ 2, the patentee will also be required to disclose enough structure to satisfy the requirements of § 112 ¶ 1. However, this latter structure is not "corresponding" in the sense of § 112 ¶ 6, thus, not taken into account for determining the scope of the patent.

Algorithms and other structure for supporting functional claim elements can be disclosed in the claims because the claims are a part of the specification under § 112 ¶ 6. However, if structure is disclosed in the claims, identification of corresponding structure requires some additional considerations. In this regard, if a functional claim element has structural meaning itself, it is adequately qualified as a structural claim element leaving § 112 ¶ 6 inapplicable. Further, if a functional element only incorporates structure from structural claim elements of the claim it belongs to, § 112 ¶ 6 will be satisfied, however, will make the functional claim element redundant. Moreover, if the structure is incorporated from a claim the functional element does not belong to, § 112 ¶ 6 can be in conflict with the doctrine of claim differentiation. In such case, § 112 ¶ 6 will be applied, even if this applica-

tion leads to overlapping or identical claims. This application will save the validity of the claim.

Finally, analyzing infringement of functional claim language requires distinguishing literal infringement equivalents and equivalents under the doctrine of equivalents. Both types of equivalents have substantial overlap and can be of identical scope. However, the unique scope of the doctrine of equivalents analysis comes into play if the accused device uses technology not in existence at the time of the issuance of the asserted patent or the accused device does not perform the identical function described in the functional claim element. In such cases, the doctrine of equivalents extends beyond the scope of the coverage of § 112 ¶ 6. However, the scope of equivalents is limited by prosecution history estoppel or, in case of the literal infringement analysis under § 112 ¶ 6, by interpretation of the term "equivalents" in the spirit of prosecution history estoppel.