RECONSTRUCTING CLAIM CONSTRUCTION: HOW THE COURT OF APPEALS FOR THE FEDERAL CIRCUIT DISMANTLED FUNCTIONAL CLAIMING, AND HOW TO BRING IT BACK

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A patent's claims are not interpreted in a vacuum. Rather, they are read in light of the specification. Claims are typically defined in terms of "structure," i.e., what the invention is; however, a narrow exception—set forth in 35 U.S.C. § 112(f)—allows inventors to define elements of a claim in terms of "function," i.e., what the invention does. While it is axiomatic that courts should not construe a claim to protect only the embodiments disclosed in the specification, Congress enacted this functional claiming statute as a narrow exception, limiting claims to protect only the structures disclosed in the specification that perform the function recited in the claim. This Note argues that the Court of Appeals for the Federal Circuit effectively rejected Congress's mandate by blurring its definition of "structure" such that § 112(f) now seldom, if ever, applies. As a result, inventors may use technical definitions devoid of structure or offer a specific solution to a general problem to obtain overly broad patent protection. This Note discusses the evolution of the court's method of claim construction before discussing the lasting, detrimental effects of two decisions. It then proposes a new analytical framework for the Federal Circuit that both respects the will of Congress and returns claim interpretation to its original legal principles.

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INTRODUCTION

A patent for intellectual property is analogous to a deed to real property.[1] A patent's claims determine the size and shape of the inventor's right to exclude. But because patent claims stake these boundaries with prose, competitors frequently dispute the true scope of a patent's protection. Often, the strength of that protection depends on the definition of a word or phrase within the claims. "Claim construction" is the judicial task of defining a disputed claim term in the context of the invention. Modern claim construction places the greatest emphasis on a patent's claims and specification, looking interchangeably to both when determining the meaning of disputed terms.[2]

Claim construction is not a science but an art. And as artisans develop clever patent drafting techniques, courts are tasked with determining what the words of claims actually mean—and therefore what rights those words actually bestow—when litigation ensues.[3] One such technique is to draft a portion of a claim to cover a function performed by a structure and not the structure itself. This type of drafting, known as "functional claiming," is permitted under 35 U.S.C. § 112(f) (2018) ("§ 112(f)"), and claim elements drafted with this functional approach are known as "means-plus-function" elements. Functional claiming is less common and requires slightly different analysis in litigation. While a court normally looks interchangeably

1. *See, e.g.*, Motion Picture Pats. Co. v. Universal Film Mfg. Co., 243 U.S. 502, 510 (1917) ("[Claims] so mark where the progress claimed by the patent begins and where it ends that they have been aptly likened to the description in a deed . . . .").

2. *See* Phillips v. AWH Corp., 415 F.3d 1303, 1313 (Fed. Cir. 2005) (en banc) (discussing the hierarchy of evidence courts should consider when construing a term).

3. Teva Pharms. USA, Inc. v. Sandoz, Inc., 574 U.S. 318, 325 (2015) (reiterating that the ultimate question of claim construction is a matter of law without creating an exception for underlying factual disputes as set forth in Fed. R. Civ. P. 52(a)); United States v. Line Material Co., 333 U.S. 287, 308 (1948) ("A valid patent excludes all except its owner from the use of the protected process or product.").

to the claims and the specification, when dealing with a means-plus-function claim element, the role of the specification is more limited.

To determine whether § 112(f) applies, courts read the disputed element in the context of the surrounding claim as a whole and "in light of" the specification.[4] If the statute applies, the court then looks *only* to the specification to assess which structures are covered by the claim element.[5] Clever patent drafters, especially those seeking protection in relatively new fields such as computer software, take advantage of confusing precedents, conflicting axioms, and judges who are relatively inexperienced in the field of the invention.[6] The result: inventors offering one novel solution to a general problem are granted rights to *any* solution to that problem.

Part I of this Note defines frequently used terms[7] and introduces an example of how the Federal Circuit's current analysis is inconsistent with Congress's intent in enacting § 112(f).[8] This example is referenced throughout this Note to clarify often-complex patent law issues. This Part continues with a discussion of the claim construction methodologies used by the Federal Circuit, specifically *Phillips* claim construction[9] and the two-step analysis used to evaluate claim elements that may invoke § 112(f).[10]

Part II begins with a discussion of two Federal Circuit cases—*Apple, Inc. v. Motorola, Inc.*[11] and *Williamson v. Citrix Online*[12]—that complicated the two-step analysis outlined in Part I. In *Apple*, when faced with a claim term neither clearly structural nor clearly functional in nature, the court relied too heavily on *Phillips* claim construction.[13] As Judge Sharon Prost pointed out in her dissent-in-part, this analysis would "eviscerate" functional claiming and lead to a "null set" of definite, means-plus-function claim terms.[14] The following year, the en banc *Williamson* decision blurred the distinction between structure and function even more, and incentivized the use of special words—so-called nonce terms—to avoid functional

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4. *E.g.*, Robert Bosch, L.L.C. v. Snap-On, Inc., 769 F.3d 1094, 1099 (Fed. Cir. 2014).

5. *Id.* at 1097.

6. *See generally* James D. Stevens, Jr., Note, *Functional Claiming of Inventions and Related Issues of Indefiniteness*, 94 U. DET. MERCY L. REV. 357 (2017) (discussing how patentees can draft claims to avoid the limiting effects of § 112(f), particularly with computer-related inventions).

7. *See infra* Section I.A.

8. *See infra* Section I.B.

9. Phillips v. AWH Corp., 415 F.3d 1303 (Fed. Cir. 2005) (en banc). *See infra* Section I.C.

10. *See infra* Section I.D. The Leahy-Smith America Invents Act of 2011 ("AIA") made minor substantive changes to 35 U.S.C. § 112 but helpfully reformatted subsections with letters instead of paragraph numbers. Therefore, pre-AIA § 112, ¶ 1 became AIA § 112(a), etc. This Note uses lettered subsections uniformly.

11. 757 F.3d 1286 (Fed. Cir. 2014).

12. 792 F.3d 1339 (Fed. Cir. 2015) (en banc).

13. *See infra* Section II.A.

14. *Apple*, 757 F.3d at 1335 (Prost, C.J., concurring in part and dissenting in part); *see infra* Section II.A.

claiming altogether.[15] Part II then analyzes the § 112(f) claim construction cases decided by the Federal Circuit since the *Apple* and *Williamson* decisions, whose outcomes indicate that Judge Prost's prediction has materialized.[16]

Finally, Part III proposes a limited change to the Federal Circuit's current two-step analysis, when patentees rely on the specification to avoid treatment under § 112(f). A new three-step test—called "Itemize, Minimize, Scrutinize"—would more liberally apply § 112(f) to claim elements whose "structures" amount to a novel solution to a general problem.[17] Then, this Part illustrates two examples of how the new test could improve the outcome of functional claiming disputes, and reconciles the test with existing claim construction axioms.[18] This framework would limit the disputed claim element to cover only that subset of structures present in the specification. Such a rule would more closely adhere to the language and purpose of the statute. More importantly, the rule would encourage drafters to accurately define terms of art and provide detailed examples of operation.

I. DEMYSTIFYING PATENTS IN COURT

A. What's in a Patent?

To understand why the Federal Circuit's current analysis is so detrimental to patent law, one must first decode the specialized language of patent prosecution and litigation. Readers may benefit from brief definitions of some of the technical terms used throughout this Note: "claims," "elements," "functional claiming" (or "means-plus-function claiming"), "person having ordinary skill in the art," and "specification."

The bulk of a patent is its specification, which includes: (1) a written description of the invention; (2) a written or pictorial description of how to make and use the invention; (3) a "best mode" of carrying out the invention, if applicable;[19] and (4) one or more claims that explicitly set out the metes and bounds of the invention.[20] Although there are subtle differences between (1) and (2),[21] courts often use the terms "specification" and "written description" interchangeably to describe the portion of the patent preceding the claims.[22] Here, the inventor describes

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15. *See infra* Section II.B.
16. *See infra* Section II.C.
17. *See infra* Section III.A.
18. *See infra* Sections III.B, III.C.
19. Although an inventor is still required by law to include a "best mode," as of 2012, failure to disclose a best mode is no longer grounds for invalidation of issued patents. *See* PAT. & TRADEMARK OFF., MANUAL OF PATENT EXAMINATION PROCEDURES § 2165 (10th ed. June 2019) [hereinafter MPEP § 2165 (June 2019)].
20. 35 U.S.C. § 112(a)–(b) (2018); *see also* Harrington Mfg. Co. v. White, 475 F.2d 788, 790 n.1 (5th Cir. 1973) (establishing that the claims are the "metes and bounds" of the invention).
21. *See, e.g.*, Vas-Cath Inc. v. Mahurkar, 935 F.2d 1555, 1561–62 (Fed. Cir. 1991) (discussing the severability of the enabling and description components of the specification).
22. *Compare* Multiform Desiccants, Inc. v. Medzam, Ltd., 133 F.3d 1473, 1477 (Fed. Cir. 1998) (examining disputed claim terms in the context of the "specification") *with* Medrad, Inc. v. MRI Devices Corp., 401 F.3d 1313, 1319 (Fed. Cir. 2005) (examining disputed claim terms in the context of the "written description").

how to make and use the invention. In so doing, the inventor addresses a "person having ordinary skill in the art" ("PHOSITA"). Like the "reasonable person" in tort law, for example, the PHOSITA is a legal fiction. Courts assign the PHOSITA a level of education and experience in the science or technology to which the invention belongs and assume the PHOSITA to have knowledge of all relevant prior art.[23]

The patent specification concludes with the claims.[24] Claims are numbered paragraphs which tell a PHOSITA what precisely the inventor regards as his or her invention.[25] The requirements of a claim are called the claim "elements," "terms," or "limitations." For example, in the fictional patent discussed below, the "flight angle correction system" discloses two claim elements: a series of strain gauges and a processing engine.[26] While elements usually define a claim in terms of structure, they can alternatively define a claim in terms of what function the element performs; this is called "functional claiming."[27] Again foreshadowing the example, the "processing engine" is "configured to process."[28] As discussed in Section I.B below, because this drafting style focuses on what the engine *does* (processes data) rather than what it *is* (a computer program of some architecture that includes some formulae or logic), the "processing engine" claim element is arguably a functionally-claimed element.

B. How Can Patent Litigation Go Wrong? An Example.

Imagine that an aerospace engineer at Gulfstream Aerospace Corporation, shaken by the recent crashes of Boeing's 737 MAX 8 aircraft, creates software to track the flight angle of commercial aircraft and to return the aircraft to level flight if appropriate. Data analysis shows the engineer's software is 10% more reliable than software employed throughout the industry, and she files for patent protection.

The patent application describes a system for correcting an aircraft's three-dimensional orientation using, among other components, an arrangement of strain gauges connected with a processing engine that analyzes the stress and strain data (i.e., the applied pressure and resulting elongation across an aircraft body) to determine the flight angle of the aircraft. "Processing engine" is described, within the specification, as a computer in contact with the various stress gauges and the main computer control in the cockpit of the aircraft. The application describes the measurements flowing from the strain gauges into the processing engine; the matrix manipulation performed by the software, which returns mathematical values corresponding to the aircraft's orientation; and any suggested restoring forces to return the aircraft to level flight. At the end of her application, the engineer states the following:

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23. *In re* GPAC Inc., 57 F.3d 1573, 1579 (Fed. Cir. 1995).
24. § 112(b).
25. *Id.*
26. *See infra* Section I.B.
27. § 112(f). This Note uses the shorter term "functional claiming" as shorthand for the more formal "means-plus-function claiming" phrase used by courts. The latter term derives from the legal presumption, discussed in Section I.D *infra*, that the presence of the term "means" in a specification requires application of this alternative claiming method.
28. *See infra* Section I.B.

> *What is claimed is:*
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> . . .
>
> *A flight angle correction system comprising:*
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> . . .
>
> *A series of strain gauges fastened along the aircraft's fuselage, wing, nose, and tail and configured to generate a stress-strain model of the aircraft;*
>
> *A processing engine configured to process the stress-strain data to calculate the three-dimensional orientation of the aircraft.*

The patent (hereinafter the '000 Patent) is granted.[29]

Some years later, a rival engineer at Airbus Group creates another software system for correcting the flight angle. Though his system resembles the '000 Patent and employs a series of strain gauges, the processing device applies substantially different algorithms to process the data. Gulfstream sues Airbus, seeking relief for infringement of Claim 3 of the '000 Patent.

Airbus's argument is as follows: first, an "engine" in this context amounts to a black box and does not reveal its structure to a PHOSITA. The adjective "processing" does not impart any structure, as the "processing engine" is tautologically defined in the claim to mean "configured to process." Thus, the term "processing engine" describes a "processing" function without describing sufficient structure to perform that function. As a result, § 112(f) applies to "processing engine."[30] The specification of the '000 Patent, argues Airbus, only discloses a single set of algorithms that perform this processing function; this is the "corresponding structure" missing from the claims.[31] Because Airbus uses a substantially different set of algorithms, Airbus does not infringe under § 112(f).

Gulfstream responds to Airbus by arguing that the '000 Patent contains sufficient structure to avoid § 112(f) and satisfy § 112(b),[32] pointing to the prose in the specification describing the processing engine's operation. Gulfstream discusses how the processing engine receives input from the gauges and outputs a suggested force to the main control computer. Gulfstream relies on the specification's definition of "processing engine" and its description of the calculations and logic performed by the engine to demonstrate that the term has sufficiently definite structure and avoids the limiting effect of § 112(f).

The district court agrees with Gulfstream. Looking to the patent's written description, the court determines that there is a sufficient showing of how the

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29. Note that the ellipses in the example claims reflects the reality that patents often contain multiple claims, and claim elements, that do not bear on any given claim construction issue. One can imagine a sophisticated patent drafter like Gulfstream would list several claims, and several claim elements within those claims. Those portions are not included here.

30. *See infra* Section I.D (discussing functional claiming under § 112(f)).

31. *See id.*

32. § 112(b).

processing engine operates to inform a PHOSITA of the engine's structure. The '000 Patent is valid, and the judge issues an injunction prohibiting Airbus from using its flight correction system in any aircraft.

This example might seem both unusually specific and overly stylized. In truth, it reflects a common issue in modern patent claiming. In this hypothetical, Gulfstream created a software package using a particular set of algorithms disclosed within the patent specification. Airbus created a similar system using different algorithms and argued that it should have the right to practice its own set of algorithms free of Gulfstream's patent. However, by taking advantage of a simple linguistic trick—claiming a "processing *engine*" instead of a "processing *means*"—Gulfstream is presumed to avoid application of § 112(f) and to hold rights beyond the algorithm described in the specification.[33] Gulfstream draws heavily upon the specification of the '000 Patent, which describes in detail how the processing engine operates in tandem with other claim elements. In so doing, Gulfstream takes advantage of a litany of Federal Circuit precedent holding that this type of evidence can connote sufficiently definite structure to a PHOSITA.[34] Thus, despite Airbus's efforts to rebut this legal presumption, the court is persuaded that "processing engine" is a term of structure when read "in light of" the specification, and the '000 Patent is held valid. This legal presumption created by talismanic formalism, when combined with a misinterpretation of claim construction principles, amounts to a fatal flaw in functional claiming.

C. The (Usual) Method of Claim Construction

The requirements of a patent's specification are set forth in § 112. They include a written description and at least one claim that describes the subject matter claimed as the invention.[35]

While strictly a part of the specification, the claims establish the scope of the patent grant.[36] In litigation, courts give disputed- claim terms their ordinary and customary meaning within the relevant art.[37] This is closely related to the inquiry of how a PHOSITA would understand the claim term.[38]

Patent infringement suits generally consist of two parts. At the first step, known as "claim construction," courts define the disputed claim terms.[39] In the seminal *Markman v. Westview Instruments* case, the Federal Circuit confirmed that

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33. *See infra* Section I.D (discussing nonce terms).
34. *See id.*
35. *See* § 112(a)–(b).
36. Harrington Mfg. Co. v. White, 475 F.2d 788, 790 n.1 (5th Cir. 1973).
37. *See* Phillips v. AWH Corp., 415 F.3d 1303, 1312–13 (Fed. Cir. 2005) (en banc).
38. *See, e.g.*, Ferguson Beauregard/Logic Controls v. Mega Sys., LLC, 350 F.3d 1327, 1338 (Fed. Cir. 2003) (stating that claim terms "are examined through the viewing glass of a person skilled in the art").
39. Markman v. Westview Instruments, 52 F.3d 967, 976 (Fed. Cir. 1995), *aff'd*, 517 U.S. 370 (1996).

claim construction is a matter of law to be decided by the district court.[40] On appeal, the Federal Circuit may review a district court's construction de novo.[41]

There are a few principles in claim construction pertinent to this discussion. First, claims are generally given their ordinary and customary meaning.[42] Ordinary meaning is the meaning a term would have to a PHOSITA at the time of the invention.[43] In some cases, these meanings are apparent and require merely the application of the accepted, common meanings of the words.[44] More frequently, the meanings are not clear, and courts must look to publicly-available sources that show what a PHOSITA would understand the claim terms to mean.[45] The Federal Circuit devised a hierarchy of sources that courts may examine when construing a disputed claim term, the most important being the claims, the specification, and the file history.[46]

The Federal Circuit, however, has not reached a consensus on whether the claims or the specification should play the most prominent role in claim construction. The Federal Circuit has stated that it regards the written description as the "single best guide" to claim construction.[47] As a result, it encourages courts to construe disputed elements to cover what the inventor actually invented.[48] At times, this requires limiting the scope of the claim element, if such a limitation is necessary "to tether the claims" to what the intrinsic evidence indicates is the actual invention.[49] On the other hand, the Federal Circuit has said that it is improper to import, or "read in," a limitation into a claim from the specification's general discussion, preferred embodiments, or examples.[50] Importing limitations from the specification into the claims has been deemed "one of the cardinal sins of patent law."[51]

These two approaches to claim construction often find themselves in tension.[52] For example, when construing claim terms, the specification's written

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40. *Id.* at 988.

41. *See, e.g.*, *id.* at 979. However, to the extent a district court judge resolves factual disputes underlying claim construction, those decisions are reviewed for "clear error." Teva Pharms. USA, Inc. v. Sandoz, Inc., 574 U.S. 318, 321–22 (2015).

42. *Phillips*, 415 F.3d at 1312–13.

43. *Id.* at 1314.

44. *Id.*

45. *Id.*

46. *See infra* Section I.C.

47. *Phillips*, 415 F.3d at 1321 (quoting Vitronics Corp. v. Conceptronic, Inc., 90 F.3d 1576, 1582 (Fed. Cir. 1996)).

48. *See, e.g.*, Retractable Techs. v. Becton, Dickinson, and Co., 653 F.3d 1296, 1305 (Fed. Cir. 2011).

49. *Id.*

50. *See, e.g.*, Arlington Indus., Inc. v. Bridgeport Fittings, Inc., 345 F.3d 1318, 1327 (Fed. Cir. 2003).

51. SciMed Life Sys., Inc. v. Advanced Cardiovascular Sys., Inc., 242 F.3d 1337, 1340 (Fed. Cir. 2001).

52. *See Phillips*, 415 F.3d at 1323 (recognizing that the distinction between these two axioms "can be a difficult one to apply in practice").

description may act as a dictionary to define unclear terms.[53] However, courts may not narrowly dispense with a generally broad claim term by limiting its scope to a preferred embodiment illustrated in the specification.[54]

Short of offering a concrete test, the court has provided several guides for traversing this common pitfall. Some panels of the Federal Circuit have attempted to forge a middle ground, holding that "the patentee's choice of preferred embodiments can shed light on the intended scope of the claims."[55] As another panel framed the role of the specification:

> [The] balance turns on how the specification characterizes the claimed limitation. In this respect, this court looks to whether the specification refers to a limitation only as a part of less than all possible embodiments or whether the specification read as a whole suggests that the *very character of the invention requires the limitation be a part of every embodiment*.[56]

And generally, the Federal Circuit has advised that these principles of claim construction can be reconciled if "the court's focus remains on understanding how a [PHOSITA] would understand the claim terms."[57]

These principles are the bedrock upon which claim construction analyses rest. Without more, however, they do not create a reliable, standardized framework for handling the volume of patent litigation directed to infringement.[58] However, with the Federal Circuit's en banc decision in *Phillips.* came a definitive guide for claim construction that emphasized the specification.[59]

Edward Phillips was granted a patent for a type of modular, steel-shell panel ("the '798 Patent").[60] Claim 1 of the '798 Patent recited "further means disposed inside the shell . . . comprising internal steel baffles extending inwardly

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53. Markman v. Westview Instruments, Inc., 52 F.3d 967, 979 (Fed. Cir. 1995), *aff'd*, 517 U.S. 370 (1996).

54. *E.g.*, CCS Fitness, Inc. v. Brunswick Corp., 288 F.3d 1359, 1367–69 (Fed. Cir. 2002) (rejecting the district court's construction of "reciprocating member," which was limited to single-component, straight-bar members illustrated in the specification drawings, because nothing in the specification clearly limited the otherwise broad, ordinary meaning of the term).

55. AstraZeneca AB v. Mut. Pharm. Co., 384 F.3d 1333, 1340 (Fed. Cir. 2004).

56. Alloc, Inc. v. Int'l Trade Comm'n, 342 F.3d 1361, 1370 (Fed. Cir. 2003) (emphasis added) (citations omitted).

57. *Phillips*, 415 F.3d at 1323. In the years since *Phillips*, this general decree has proved insufficient; panels of the Federal Circuit vary wildly in opinions mere months apart. *Compare* Arlington Indus., Inc. v. Bridgeport Fittings, Inc., 632 F.3d 1246, 1256 (Fed. Cir. 2011) (finding that the district court erroneously imported a "split" limitation from the specification into the "spring steel adapter" claim term) *with* Retractable Techs., Inc. v. Becton, Dickinson & Co., 653 F.3d 1296, 1304–05 (Fed. Cir. 2011) (limiting the construction of "body" to a one-piece body based on disclosures in the patent's specification).

58. A search of the Lexis Advance database returned several hundred patent infringement cases litigated in U.S. district courts in 2019 alone.

59. 415 F.3d at 1312.

60. *Id.* at 1309.

from the steel shell walls."[61] In construing the term "baffles," the district court looked to the '798 Patent specification and noted that every reference and diagram included baffles at angles other than 90 degrees. The court therefore construed "baffles" to mean a baffle "extending inward . . . at an oblique or acute angle to the wall face."[62] A panel of the Federal Circuit affirmed on appeal that Phillips used "baffles" in a "restrictive manner" and held that the term excluded structures extending at 90 degrees from the wall face.[63] The court agreed to rehear the case en banc and ultimately reversed the panel's decision.[64] In so doing, the full court restated the basic principles of claim construction set forth in its earlier decisions.[65]

The court began by reiterating that claim construction begins with the "objective baseline" of inquiring how a PHOSITA would understand the claim term.[66] PHOSITAs are "deemed to read the claim term . . . in the context of the entire patent, including the specification."[67] The court enumerated the sources that may be used to glean what a PHOSITA would have understood a disputed claim language to mean: the claims themselves, the specification, the prosecution history, and extrinsic evidence on the relevant scientific and technical terms and the state of the art.[68]

The *Phillips* court began by reiterating the "bedrock principle" that the patent's claims define the right to exclude.[69] However, "because the meaning of a claim term as understood by [a PHOSITA] is often not immediately apparent," the court must often look to other available sources to show what a PHOSITA would have understood the disputed claim terms to mean at the time of the invention.[70] *Phillips* first instructs courts to look to surrounding claim language and other claims of the patent.[71] And because the claims "are part of a 'fully integrated written instrument' consisting principally of a specification," the specification "is the single best guide to the meaning of a disputed term."[72] The specification may reveal a special definition given to a term by the inventor or an intentional disavowal of the ordinary scope of the claim.[73]

Beyond the specification, *Phillips* encouraged courts to consider the patent's prosecution history, which consists of the complete record of proceedings

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61. *Id.*
62. *Id.*
63. *Id.*
64. *Id.* at 1328.
65. *Id.* at 1312.
66. *Id.* at 1313.
67. *Id.*
68. *Id.* at 1314.
69. *Id.* at 1312.
70. *Id.* at 1314.
71. *Id.*
72. *Id.* at 1315 (first quoting Markman v. Westview Instruments, Inc., 52 F.3d 967, 978 (Fed. Cir. 1995), *aff'd*, 517 U.S. 370 (1996); and then quoting Vitronics Corp. v. Conceptronic, Inc., 90 F.3d 1576, 1582 (Fed. Cir. 1996)).
73. *Id.* at 1316; *see also* Thorner v. Sony Comput. Ent. Am. LLC, 669 F.3d 1362, 1365–67 (Fed. Cir. 2012) (discussing the standards for disclaimer and special definitions in more detail).

before the Patent and Trademark Office and all cited prior art throughout the examination period.[74] This expansive record includes evidence as to how both the patent examiner and the inventor understood the patent.[75] However, because the prosecution history is merely a history of "an ongoing negotiation between the [Patent and Trademark Office] and the applicant . . . it often lacks the clarity of the specification and thus is less useful for claim construction purposes."[76] Nonetheless, during claim construction, *Phillips* placed an emphasis on the intrinsic evidence, including the prosecution history.[77]

After discussing the value of the intrinsic evidence, the court spent substantial time discussing extrinsic evidence: expert and inventor testimony; dictionaries, especially technical dictionaries; and learned treatises.[78] Though *Phillips* admitted extrinsic evidence can be useful in claim construction, it is less important than the intrinsic evidence.[79] Such evidence is generally less reliable because it may not reflect the understanding of a PHOSITA and may suffer from bias that is not present in the intrinsic evidence.[80] Furthermore, parties will naturally cherry-pick extrinsic evidence favorable to their construction, "leaving the court with the considerable task of filtering the useful extrinsic evidence from the fluff."[81]

The sources of evidence set forth in *Phillips* follow this general hierarchy of importance and helpfulness: (1) the patent's claims and specification; (2) its prosecution history; and (3) relevant extrinsic evidence.[82] However, as discussed in the next Section, this hierarchy reflects different policy goals from those of § 112(f). As a result, under § 112(f) the roles of these types of evidence become more defined.

D. The Curious Case of Functional Claiming

Patents are usually drafted to state what form or structure the invention takes.[83] However, modern patent law provides inventors with an alternative: draft a claim in terms of what the invention *does*, rather than what the invention *is*, and the claim may survive.[84] Section 112(f) recognizes the importance of this alternative claiming scheme yet provides a limiting clause to prevent the proliferation of overbroad patents:

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74. *Phillips*, 415 F.3d at 1317.
75. *Id.*
76. *Id.*
77. *Id.*
78. *Id.* at 1317–19.
79. *Id.* at 1317.
80. *Id.* at 1318.
81. *Id.*
82. *See id.* at 1314–19.
83. *See supra* Section I.C.
84. 35 U.S.C. § 112(f) (2018) ("A [claim element] may be expressed as a means or step for performing a specified function without the recital of structure, material, or acts in support thereof . . . ."). The Patent Act of 1952 included for the first time the language now known as § 112(f), reigning in the Supreme Court's previously liberal view of functional claiming. *See, e.g.*, Valmont Indus. v. Reinke Mfg. Co., 983 F.2d 1039, 1042 (Fed. Cir. 1993) ("Congress added [§ 112, ¶ 6, now § 112(f)] to the Patent Act of 1952 to change the doctrine enunciated in *Halliburton Oil Well Cementing Co. v. Walker* . . . .").

> An element in a claim . . . may be expressed as a means or step for performing a specified function without the recital of structure . . . in support thereof, and such claim shall be construed to cover the corresponding structure . . . described in the specification.[85]

The quid pro quo for this functional claiming is to include a description in the patent specification of some corresponding structure that performs the claimed function and a link between that structure and the claimed function.[86] This requirement "'confines the breadth of protection otherwise permitted by' purely functional claiming."[87]

By the mid-1900s, a considerable body of law from a variety of circuit courts recognized the attractiveness of functional claiming.[88] However, in *Halliburton Oil Well Cementing Co. v. Walker*, the Supreme Court pushed back, rejecting claims that use functional language "at the exact point of novelty."[89] Section 112(f) was codified in response to the Supreme Court's restrictive view of functional claiming.[90] While the exact limits of this expansion (if it was an expansion in light of the caselaw existing before *Halliburton*) were yet to be determined when the statute was first enacted,[91] the second clause of the statute places an upper bound on its reach.[92] The Federal Circuit realized that a functional claim element, "if read literally, could encompass any conceivable means for performing the function."[93] Thus, § 112(f) "does not, in any event, *expand* the scope of the claim" and limits the protections to those structures recited in the specification for performing the function.[94]

The Federal Circuit developed a two-part test for claim elements that might be subject to § 112(f). First, to clarify whether the statute applies, the court will evaluate whether the element shows "sufficiently definite structure" or merely recites one or more functions performed by the element. Second, if the claim element recites a function without sufficiently definite structure, the court will then look for the "adequate corresponding structure"—the structure that performs the recited function—disclosed in the specification. If there is adequate corresponding structure in the specification, the element is construed to cover only those structures and their

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85. § 112(f).

86. Noah Sys. Inc. v. Intuit Inc., 675 F.3d 1302, 1318 (Fed. Cir. 2012).

87. *Id.* (quoting Valmont Indus., 983 F.2d at 1042).

88. *See, e.g.*, R.M. Hollingshead Co. v. Bassick Mfg., Co., 73 F.2d 543, 547 (6th Cir. 1934); Am. Can Co. v. Hickmott Asparagus Canning Co., 142 F. 141, 146 (9th Cir. 1905).

89. 329 U.S. 1, 8 (1946) (quoting General Elec. Co. v. Wabash Appliance Corp., 304 U.S. 364, 371 (1938)).

90. Warner-Jenkinson Co. v. Hilton Davis Chem. Co., 520 U.S. 17, 27–28 (1997).

91. *See generally* P.J. Federico, *Commentary on the New Patent Act*, 75 J. PAT. & TRADEMARK OFF. SOC'Y 161 (1993).

92. *See, e.g.*, Valmont Indus., Inc. v. Reinke Mfg. Co., 983 F.2d 1039, 1042 (Fed. Cir. 1993) (noting that the second clause "places a limiting condition" on functional claiming).

93. *Id.*

94. Johnston v. IVAC Corp., 885 F.2d 1574, 1580 (Fed. Cir. 1989).

equivalents.[95] Otherwise, the claim is invalid for failing to "particularly point[] out and distinctly claim[]" the invention under § 112(b).[96]

For better or worse, courts have many avenues available to find "sufficiently definite structure" in step one. The first clause of § 112(f) states that an element may be expressed in functional terms without the recital of structure *within the claim*.[97] Though some opinions suggested that courts should only consider the claim language when looking for sufficiently definite structure, the Federal Circuit now authorizes courts to look at intrinsic and relevant extrinsic evidence at this stage.[98]

The hunt for "adequate corresponding structure" naturally relies more on the patent's specification than the search for "sufficiently definite structure." While "sufficiently definite structure" can be found by examining all the types of evidence described in *Phillips*, the second clause states that "adequate corresponding structure" must exist in the specification.[99] A structure qualifies as "adequate corresponding structure" only if the specification "clearly links or associates" the structure to the claimed function(s).[100] Review of the surrounding claim language, the prosecution history, or any other potential evidence is not permitted.

A showing of "adequate corresponding structure" in step two requires more detail than a showing of "sufficiently definite structure" in step one. To establish "sufficiently definite structure," a patentee need only show that the claim term has some structure commonly understood by a PHOSITA.[101] For the specification to provide "adequate corresponding structure," however, a PHOSITA must both

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95. *See id.* This Note does not discuss what constitutes an "equivalent" structure, material, or act in depth. For curious readers, see *Valmont Indus.*, 983 F.2d at 1043, which states:

> An accused device which 'performs substantially the same overall function or work, in substantially the same way, to obtain substantially the same overall results as the claimed invention' [] is an equivalent . . . . In the context of section 112 [], an equivalent results from an insubstantial change which adds nothing of significance to the structure, material, or acts disclosed in the patent specification.

96. 35 U.S.C. § 112(b) (2018); Williamson v. Citrix Online, LLC, 792 F.3d 1339, 1352 (Fed. Cir. 2015) (en banc).

97. *See, e.g.*, TriMed, Inc. v. Stryker Corp., 514 F.3d 1256, 1259–60 (Fed. Cir. 2008) ("Sufficient structure exists when the claim language specifies the exact structure that performs the functions in question without need to resort to other portions of the specification or extrinsic evidence for an adequate understanding of the structure.")

98. Inventio AG v. Thyssenkrupp Elevator Ams. Corp., 649 F.3d 1350, 1357 (Fed. Cir. 2011) (clarifying that "TriMed does not preclude consideration of the written description, prosecution history, and extrinsic evidence" to determine if a claim term connotes sufficiently definite structure); *see also Williamson*, 792 F.3d at 1349–51 (evaluating the claim language, written description, and an expert declaration when determining if the claim term invoked § 112(f)).

99. § 112(f).

100. *Williamson*, 792 F.3d at 1352.

101. Greenberg v. Ethicon Endo-Surgery, Inc., 91 F.3d 1580, 1583 (Fed. Cir. 1996) ("What is important is . . . that the term, as the name for structure, has a reasonably well understood meaning in the art.").

recognize the term's structure and associate it with the corresponding function in the claim to avoid a ruling of indefiniteness.[102]

Careful readers may by now spot the first problem addressed in Part II. Step one of the court's test requires a lesser showing of structure than step two. In both steps the court may examine the specification. If step two requires more precise structure in the specification, but the court has already determined that the specification does not satisfy the lesser showing in step one, how can an element ever satisfy step two? This is the heart of Judge Sharon Prost's critique in *Apple v. Motorola*[103] and underscores the problems with using a general analysis like that of *Phillips* functional claiming.

Understanding the second problem addressed in Part II requires a more detailed discussion of how the court applies its test in practice; specifically, how does a court determine whether a claim element falls under § 112(f) in step one? The court implicitly established twin presumptions for or against applying the statute based on the wording of the claims; at the same time, the court developed a laundry list of ways to avoid applying the statute despite the presumption favoring its application.[104]

The Federal Circuit created a presumption in favor of applying § 112(f) if the disputed claim element includes the phrase "means for."[105] This presumption can be overcome two ways: a patentee showing either that no function was claimed (and therefore cannot be a "means-plus-*function* claim element")[106] or showing that the element nonetheless recites sufficient structure for performing the claimed function.[107]

Similarly, a claim element not including "means" creates a presumption against applying § 112(f).[108] For many years, the court called this a "strong" presumption and required the challenger to show that the term was "essentially devoid of anything that can be construed as structure."[109] The court has since rejected this "strong" presumption against applying § 112(f), which can now be overcome if the challenger "demonstrates that the claim term fails to 'recite

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102. *Id.*

103. *See infra* Section II.A.

104. *See, e.g.*, *Greenberg*, 91 F.3d at 1584; York Prods., Inc. v. Cent. Tractor Farm & Fam. Ctr., 99 F.3d 1568, 1574 (Fed. Cir. 1996).

105. *See, e.g.*, Net MoneyIN, Inc. v. Verisign, Inc., 545 F.3d 1359, 1366 (Fed. Cir. 2008) ("A claim element that contains the word 'means' and recites a function is presumed to be drafted in means-plus-function under [§ 112(f)].").

106. *See, e.g.*, Envirco Corp. v. Clestra Cleanroom, Inc., 209 F.3d 1360, 1365 (Fed. Cir. 2000). In *Envirco*, the court held that the claim element "second baffle means . . . having inner surfaces for directing the airflow . . . " did not recite a function to be performed by the baffle. *Id.*

107. *See, e.g.*, York Prods., Inc., 99 F.3d at 1574 (Fed. Cir. 1996) ("Mere incantation of the word 'means' in a clause reciting predominantly structure cannot evoke [§ 112(f)] . . . .").

108. *E.g.*, Williamson v. Citrix Online, LLC, 792 F.3d 1339, 1349 (Fed. Cir. 2015) (en banc).

109. Flo Healthcare Sols., LLC v. Kappos, 697 F.3d 1367, 1374 (Fed. Cir. 2012) (citing Masco Corp. v. United States, 303 F.3d 1317, 1327 (Fed. Cir. 2002)).

sufficiently definite structure' or else recites 'function without reciting sufficient structure for performing that function.'"[110]

Return to the '000 Patent example. There, Gulfstream claimed a "processing engine."[111] Under the Federal Circuit's analysis, the district court would presume that the claim element does not invoke § 112(f) because the term "means" is absent from the claim language. Airbus, as the challenger, must show that "engine" is nonetheless a means-plus-function claim element. The claim recites at least one function performed by the engine: processing the data from the stress-strain gauges.[112] So, the burden falls on Airbus to show that Claim 3 provides no support for a definite structure that performs the processing function.

Ultimately, neither presumption is dispositive: "whether claim language invokes [§ 112(f)] depends on how those skilled in the art would understand the structural significance of that claim language."[113] Armed with that general charge, the Federal Circuit has developed a laundry list of ways by which an inventor can avoid § 112(f) even if the claim element in dispute includes "means." For example, a claim element with a known structural definition does not invoke § 112(f).[114] The definition may come from the patent specification or be generally known in the relevant art.[115] This is true even if the claim element uses "means."[116]

A claim element that describes a variety or broad class of structures also avoids § 112(f).[117] For software-related inventions, this "structure" need not even be physical; an algorithm, a set of instructions or rules, or even a flowchart can

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110. *Williamson*, 792 F.3d at 1349 (quoting Watts v. Sys. Inc., 232 F.3d 877, 880 (Fed. Cir. 2000)).

111. *See supra* Section I.B.

112. Claim 3 of the '000 Patent also discusses calculating the orientation of the aircraft. *See supra* Section I.B. One could argue that "calculating" is a second function performed by the engine or that it merely further describes the "processing" function.

113. Inventio AG v. ThyssenKrupp Elevator Ams. Corp., 649 F.3d 1350, 1360 (Fed. Cir. 2011), *overruled on other grounds by Williamson*, 792 F.3d at 1349.

114. *See, e.g.*, Apex Inc. v. Raritan Comput., Inc., 325 F.3d 1364, 1373 (Fed. Cir. 2003) (finding, in light of a technical dictionary definition, that the term "circuit" standing alone connotes some structure and did not invoke means-plus-function claiming).

115. *See, e.g.*, Flo Healthcare Sols., LLC v. Kappos, 697 F.3d 1367, 1374 (Fed. Cir. 2012) (finding sufficient structure in the specification for designating a class of structures encompassed by the disputed term "height adjustment mechanism," including a gas-spring mechanism, a rack and pinion mechanism, and cable and pulley mechanism); Personalized Media Commc'ns, L.L.C. v. Int'l Trade Comm'n, 161 F.3d 696, 704–05 (Fed. Cir. 1998) ("[B]y reference to dictionary definitions, 'detector' had a well-known meaning to those of skill in the electrical arts connotative of structure, including a rectifier or demodulator.").

116. *See, e.g.*, Lighting Ballast Control LLC v. Philips Elecs. North Am. Corp., 790 F.3d 1329, 1338–39 (Fed. Cir. 2015) (holding that "voltage source means" connoted a class of structures to a PHOSITA).

117. *See, e.g.*, Greenberg v. Ethicon Endo-Surgery, Inc., 91 F.3d 1580, 1583 (Fed. Cir. 1996) ("It is true that the term 'detent' does not call to mind a single well-defined structure . . . . What is important is . . . that the term, as the name for structure, has a reasonably well understood meaning in the art.").

suffice.[118] This can be achieved through the use of adjectives that give structure to otherwise functional language.[119]

The patentee may also avoid § 112(f) if the claims and the specification describe the term's inputs, outputs, or connections, and inform how the element operates within the invention as a whole.[120] For example, in *Linear Tech. Corp. v. Impala Linear Corp.*, the Federal Circuit concluded that the claim element—"first circuit for monitoring a signal from the output terminal to generate a first feedback signal"—did not invoke § 112(f).[121] The court reasoned that the claim's description of the circuit's input ("monitoring a signal from the output terminal") and objective ("generat[ing] a first feedback signal"), combined with a definition from a technical dictionary, provided enough structure to a PHOSITA.[122] Similarly, in *Lighting World, Inc. v. Birchwood Lighting, Inc.*, the court looked to a description in the specification of how the "connector" operated with other claim elements and observed that the term had a known structural definition.[123]

The Federal Circuit's claim construction analysis under § 112(f) can at best be described as flexible, and at worst, as a labyrinth of exceptions and workarounds. However, all of these concepts play a role in the *Apple* and *Williamson* decisions.

II. HOW THE FEDERAL CIRCUIT DISMANTLED FUNCTIONAL CLAIMING

By the mid-2010s, the Federal Circuit had two big problems with functional claiming. First, the court was over-relying on the specification to determine whether § 112(f) applied. This threatened the very possibility of inventors receiving the limited protection promised by functional claiming. At the same time, clever patentees began exploiting the "means" presumptions by using terms with little-to-no structural significance that were nonetheless presumed to be terms of structure rather than terms of function. The result: the Federal Circuit has not recognized a means-plus-function term in almost seven years.

This Part first describes the patent specification problem, taken to its extreme in the 2014 *Apple v. Motorola* decision.[124] Then, this Part discusses

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118. *See, e.g.*, Typhoon Touch Techs. v. Dell, Inc., 659 F.3d 1376, 1385 (Fed. Cir. 2011) (quoting Finisar Corp. v. DirecTV Grp., Inc., 523 F.3d 1323, 1340 (Fed. Cir. 2008)) ("Precedent and practice permit a patentee to express that procedural algorithm 'in any understandable terms including as a mathematical formula, in prose, or as a flow chart . . . [T]he patent need only disclose sufficient structure for a [PHOSITA] to provide an operative software program for the specified function.").

119. *See, e.g.*, *Greenberg*, 91 F.3d at 1583 (Fed. Cir. 1996) (using "detent" to successfully modify the term "mechanism"). *But see, e.g.*, Mass. Inst. of Tech. v. Abacus Software, 462 F.3d 1344, 1354 (Fed. Cir. 2006) (finding that the phrase "colorant selection" in "colorant selection mechanism" was not enough to avoid § 112(f) because the phrase had no generally understood meaning to a PHOSITA).

120. *See, e.g.*, Linear Tech. Corp. v. Impala Linear Corp., 379 F.3d 1311, 1320–21 (Fed. Cir. 2004).

121. *Id.* at 1319–21.

122. *Id.* at 1320–21.

123. 382 F.3d 1354, 1361–63 (Fed. Cir. 2004).

124. 757 F.3d 1286 (2014); *see infra* Section II.A.

Williamson v. Citrix Online,[125] a decision issued one year after *Apple* that alleviated some aspects and worsened other aspects of the presumption-exploitation problem.[126] Finally, Section II.C takes an empirical approach to the effect of these decisions by analyzing cases on either side of the divide to determine whether the Federal Circuit effectively eliminated functional claiming under § 112(f).[127]

A. Apple*: New Direction and Dire Warning*

In *Apple*, plaintiff Apple and defendant Motorola brought claims and counterclaims, respectively, alleging infringement of several patents.[128] The district court judge construed "heuristic," as used in Apple's patents, to mean "one or more rules to be applied to data to assist in drawing inferences from that data."[129] The court concluded that this described a function without describing the necessary structure for performing the function, and the court applied § 112(f) to the "next item heuristic" claim element.[130] "Next item heuristic" was construed to cover only "heuristics" using a user's finger tap on the right side of the device's touch screen.[131] The parties appealed the district court's claim construction decision, disputing whether "heuristic" invoked § 112(f).[132]

A Federal Circuit panel ultimately reversed, holding that "heuristic" connoted sufficiently definite structure and avoided § 112(f).[133] At this time, there was a strong presumption against applying § 112(f) when "means" was absent from the claim; the court emphasized this presumption and dismissed the dissent's argument that the use of "means" is a "minor drafting decision" meriting little weight.[134] The court then recited the many ways a claim element may disclose structure.[135]

While the majority agreed with the district court's definition of "heuristic," the court concluded that this definition amounted to a class of structures.[136] Rather than provide any support for this assertion, the court emphasized how the claim language and the specification described the heuristics' operation.[137] The claims recited the objectives of the heuristics and differentiated between two types of scrolling, depending on the "angle of initial movement" of a user's finger.[138] The

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125. 792 F.3d 1339 (2015) (en banc).
126. *See infra* Section II.B.
127. *See infra* Section II.C.
128. 757 F.3d at 1294.
129. *Id.* at 1294–96.
130. *Id.*
131. *Id.* at 1296.
132. *Id.* at 1294, 1296.
133. *Id.* at 1301.
134. *Id.* at 1297–98.
135. *Id.* at 1298–1300; *see also supra* Section I.D.
136. *Apple*, 757 F.3d at 1301.
137. *Id.* ("Depending upon the circumstances, heuristic is not necessarily a generic, structureless 'nonce word.' . . . We need not decide here whether . . . "heuristic," by itself, connotes sufficient structure to maintain the presumption against means-plus-function claiming because [of the] further description in the remaining claim language and specification.").
138. *Id.*

vast majority of the court's support, however, came from highly technical details within the specification.[139] For example, the specification defined "two-dimensional movement"—one of the two types of scrolling listed in the claims—and discussed "translating content within a frame rather than translating the entire page that includes a frame."[140] The court even reproduced figures from the specification which illustrated the finger contacts that result in scrolling, translating, or turning to the next item.[141] "Accordingly," said the majority, "the heuristic limitations provide 'sufficiently definite structure' to a [PHOSITA] for performing the recited function."[142]

Judge Prost, in her dissent-in-part, disputed the majority's application of the § 112(f) two-step analysis.[143] In particular, Prost took issue with the majority's legal standard for whether to apply § 112(f): that the presumption against applying § 112(f) is rebutted if the claim recites a generic placeholder for "means" *and* the intrinsic and relevant extrinsic evidence provide "no further structural description" to a PHOSITA.[144] Prost argued that the majority impermissibly imported the second step of the analysis—defining the scope of a means-plus-function claim element based on corresponding structure in the specification—into the first step, where a court identifies whether the element is drafted in means-plus-function format in the first place.[145] This analysis implies, said Prost, that a claim element with corresponding structure is not a means-plus-function term at all.[146]

According to Prost, the majority's misapplication had real consequences. "Such a rule," said Prost, "would render *every* means-plus-function claim term indefinite."[147] A disputed claim element would only invoke § 112(f) if it had no corresponding structure.[148] Prost called such a rule "absurd" and warned it would "eviscerate" means-plus-function claiming.[149]

In evaluating Judge Prost's argument, it is helpful to recall the earlier discussion about the required showings of proof at each step of the analysis.[150] At the first step, the issue is whether a PHOSITA would understand the term to have a known structure. At the second step, the PHOSITA must identify the structure *and* clearly link that structure to the claimed function. The majority's hunt for structure in the specification—such as detailed descriptions of the initial angle of a finger contact on the touch screen—could be reasonably interpreted as a search for a

139. *See id.* at 1301–03.
140. *Id.* at 1302.
141. *Id.* at 1302–03.
142. *Id.* at 1304.
143. *Id.* at 1334 (Prost, J., concurring in part and dissenting in part).
144. *Id.* at 1300, 1335 (Prost, J., concurring in part and dissenting in part).
145. *Id.* at 1335 (Prost, J., concurring in part and dissenting in part).
146. *Id.*
147. *Id.* (Prost, J., concurring in part and dissenting in part).
148. *Id.* (Prost, J., concurring in part and dissenting in part).
149. *Id.* (Prost, J., concurring in part and dissenting in part).
150. *See supra* Section I.D.

structure clearly linked or associated with the heuristic's function, which is to "identify a command based upon particular finger contacts."[151]

Such an analysis reduces the number of outcomes from three to two. Traditionally, a disputed claim term could: (1) not invoke § 112(f), and instead follow normal *Phillips* claim construction;[152] (2) invoke § 112(f) and be construed to cover the corresponding structure in the specification;[153] or (3) invoke § 112(f), not contain adequate corresponding structure, and therefore be held invalid as indefinite under § 112(b).[154] According to Prost, the majority's analysis eliminated option (2): any disputed claim term will either contain little or no structure, triggering § 112(f) and eventually leading to a finding of invalidity, or the term will be rehabilitated using the specification and avoid § 112(f) altogether, leading to a broader claim construction.[155]

And what of Apple and Motorola? This appears to be an example of option (1) described above: a term avoids § 112(f) and receives the same treatment as a structural claim element. Apple only disclosed two "next item heuristics": a right-to-left swipe and a right-side tap.[156] However, the majority allowed Apple to exclude any heuristic used by a touch-screen device consistent with the court's construction.[157] This is a prime example of how an inventor can patent a novel solution to a general problem and exclude others from practicing all other novel solutions to the same problem.[158]

The majority and Judge Prost's dissent-in-part in *Apple* dispute the proper recipe for determining whether a non-"means" term invokes § 112(f). The majority opted for a *Phillips*-style hierarchy of evidence, placing greater emphasis on the claims and the specification.[159] Presumably because the claims themselves did not provide enough structure, the court spent considerable time discussing the details of operation in the specification.[160] By contrast, Judge Prost in dissent-in-part placed an emphasis on how the words of the claim were drafted and was critical of examining the specification at this stage.[161] Unfortunately, this dispute was left unresolved in the following year's en banc *Williamson* decision.

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151. 757 F.3d at 1300–01.

152. *See, e.g.*, Zeroclick, L.L.C. v. Apple Inc., 891 F.3d 1003 (Fed. Cir. 2018).

153. *See, e.g.*, Personalized Media Comm'ns v. Int'l Trade Comm'n, 161 F.3d 696 (Fed. Cir. 1998).

154. *See, e.g.*, Williamson v. Citrix Online, LLC, 792 F.3d 1339 (Fed. Cir. 2015) (en banc).

155. *Apple*, 757 F.3d at 1335 (Prost, J., concurring in part and dissenting in part).

156. *Id.* at 1301–02 ("The specification explains how a user can move to the next item in a list via *a finger tap gesture on the right side of the screen, a right-to-left finger swipe*, or by tapping a next image icon.") (emphasis added).

157. *Id.* at 1337 (Prost, J., concurring in part and dissenting in part).

158. *See also id.* ("[T]his case provides a stark example of how patent applicants are able to claim broad functionality without being subject to the restraints imposed by [§ 112(f)].") (Prost, J., concurring in part and dissenting in part).

159. *Compare id.* at 1301–03 *with* Phillips v. AWH Corp., 415 F.3d 1303, 1314–17 (Fed. Cir. 2005) (en banc).

160. *See Apple*, 757 F.3d at 1301–03.

161. *See id.* at 1334–37 (Prost, J., concurring in part and dissenting in part).

B. Williamson *and the Rise of the Nonce Term*

Richard Williamson owned a patent for a network-enabled "virtual classroom."[162] Part of his invention included a distributed learning server, which contained a "distributed learning control module" claim element.[163] Williamson sued a collection of corporate defendants, alleging infringement of all claims in his patent, including the distributed learning server.[164] The district court concluded that the "distributed learning control module" was a means-plus-function element and ultimately held the associated claims invalid.[165]

Williamson appealed, and the Federal Circuit heard the case en banc.[166] The court began by reciting the boilerplate law of functional claiming[167] but then proceeded to overrule the line of cases imposing a "strong" presumption against applying § 112(f) in absence of the word "means."[168] In so doing, the court recognized that a series of cases, beginning in 2004 and including *Apple*, had mischaracterized the presumption, but it did not criticize the outcomes of those cases.[169] The court merely declared that it would return to its pre-2004 standard, "[w]hether the words of the claim are understood by [PHOSITAs] to have a sufficiently definite meaning as the name for structure."[170]

While *Williamson* expressly overruled the heightened standard used in *Apple* and other cases, the court did not ponder whether these outcomes would be different under the new standard.[171] And, as discussed in Section II.A, the "heuristic" element in *Apple* was described in great detail in the patent specification;[172] it was not "essentially devoid of anything that can be construed as structure."[173] The problem in *Apple* stemmed from the majority's willingness to leave no stone unturned in the specification to determine whether § 112(f) applied.[174] One can speculate that the court would not have relied so heavily on the specification in *Apple* if the standard for rebutting the presumption was lower; if *Apple* had evaluated what a PHOSITA would have understood "heuristic" to mean, perhaps less examination of the specification would have been needed to support the majority's

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162. Williamson v. Citrix Online, LLC, 792 F.3d 1339, 1343 (Fed. Cir. 2015) (en banc).

163. *Id.* at 1344.

164. *Id.* at 1345.

165. *Id.*

166. *Id.* at 1345–46.

167. *Compare id.* at 1347–48 *with supra* Section I.D (discussing the presumptions with "means" and the ultimate viewpoint of a PHOSITA).

168. *Williamson*, 792 F.3d at 1348–49 ("Henceforth, we . . . expressly overrule the characterization of that presumption as 'strong.'").

169. *Id.* at 1349.

170. *Id.* (quoting Greenberg v. Ethicon Endo-Surgery, Inc., 91 F.3d 1580, 1583 (Fed. Cir. 1996)).

171. *Id.*

172. *See supra* Section II.A.

173. *Williamson*, 792 F.3d at 1349 (quoting Inventio AG v. Thyssenkrupp Elevator Ams. Corp., 649 F.3d 1350, 1358 (Fed. Cir. 2011)) (describing the heightened standard).

174. *See supra* Section II.A.

position.[175] However, *Williamson* did not address any correlation between a strong presumption and reliance on the specification, nor did it comment on the *Apple*'s heavy reliance on the specification.

In lowering the standard for rebutting "means" presumptions, *Williamson* took a large step toward correcting a problem in functional claiming present in *Apple*. However, by embracing the use of "nonce terms"—terms without recognized structure that reflect nothing more than verbal constructs—the *Williamson* court arguably made another problem worse.[176] The Federal Circuit had previously recognized "generic placeholders" that, like the term "means," do not connote sufficiently definite structure.[177] With *Williamson*, however, the en banc court adopted the use of these nonce terms as a substitute for "means."[178] The court cited the Manual of Patent Examining Procedure (the "MPEP"), a resource relied upon by the U.S. Patent and Trademark Office ("USPTO") which lists several of these nonce terms: "module" (the term at issue in *Williamson*), "mechanism," "device," "unit," "component," "element," "member," "apparatus," "machine," and "system."[179] Moreover, the MPEP reiterates that these terms "may" function as a "means" equivalent.[180] "[T]here are no absolutes in the determination of terms used as a substitute for means," states the MPEP, but rather that each application will turn on the specific facts at issue.[181]

Williamson allows inventors to avoid functional claiming by using generic terms of dubious structure.[182] The two key holdings in *Williamson*—lowering the standard of using a non-"means" term and allowing the use of "means"-equivalent nonce terms—blurred the distinction between structural and functional claiming. On the one hand, the Federal Circuit now recognized a litany of terms that functioned the same as "means."[183] On the other hand, the court still gave these terms a mild presumption against invoking § 112(f) purely because they were not "means."[184] And the heavy reliance on the specification during this first step, as shown in *Apple*, still lurked in the background, with no new guidance from the court.

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175. One could also speculate to the opposite. For instance, even in *Williamson* the court looked to details of operation within the specification to no avail. *See Williamson*, 792 F.3d at 1351 ("Although the 'distributed learning control module' is described in a certain level of detail in the written description, the written description fails to impart any structural significance to the term.") The court went on to invalidate the term for failing to disclose adequate corresponding structure. *Id.* at 1354.

176. *See id.* at 1350–51.

177. *See, e.g.*, Mass. Inst. of Tech. v. Abacus Software, 462 F.3d 1344, 1354 (Fed. Cir. 2006).

178. *Williamson*, 792 F.3d at 1350.

179. *Id.*; PAT. & TRADEMARK OFF., MANUAL OF PATENT EXAMINATION PROCEDURES § 2181 (9th ed. Mar. 2014) [hereinafter MPEP § 2181 (Mar. 2014)].

180. MPEP § 2181 (Mar. 2014), *supra* note 179.

181. *Id.*

182. *Williamson*, 792 F.3d at 1350–51.

183. *Id.* at 1350.

184. *Id.* at 1349.

Return again to the '000 Patent.[185] "Means" is absent from the claim language, so under *Williamson* Airbus need only rebut the mild presumption against applying § 112(f). Airbus's best argument is that the "processing engine," much like the "distributed learning module" in *Williamson*, is a nonce term that amounts to a "black box" recitation of structure.[186] Neither the Federal Circuit nor the USPTO recognize "engine" as a common placeholder term for means;[187] however, as discussed above,[188] these lists are non-exhaustive and fact-dependent. It is difficult to imagine how the term "processing" would impart structure upon the term "engine," especially for a "*processing* engine configured *to process*" data. This redundancy around the "processing" function is arguably little more than a clever patent drafting technique to avoid the limiting effects of § 112(f).

But what of *Apple*? And what of the Federal Circuit's laundry list of exceptions?[189] "Processing engine" is merely defined in the '000 Patent's specification as a computer in contact with other elements.[190] Assuming the term is not well-known among computer scientists or engineers, either as a specific structure or a class of structures, Gulfstream's most viable response is to point to the processing engine's interactions with other elements of the claim and with the invention as a whole. Is that enough to convince the district court judge not to impose § 112(f)? Under *Williamson* and *Apple*, the answer is unclear—the Federal Circuit did not address *Apple*'s heavy reliance on the specification, nor did it give guidance on how courts should treat the specification at this stage. As of *Apple*, the court has embraced a *Phillips*-style approach to determine whether an element invokes § 112(f), relying on all relevant intrinsic and extrinsic evidence, especially the specification.[191]

This Note is admittedly pessimistic in its view of *Apple* and *Williamson* and their combined effect on claim construction. If the court identified means-plus-function terms with about the same frequency both pre- and post-*Apple*, then that negative outlook and fear may be unwarranted even if *Williamson* blurred the line between structural and functional claim elements. The next Section compares these decisions to gauge the impact of *Apple* and *Williamson*.

C. Did the Court Kill § 112(f)?

Research for this Note suggests that the Federal Circuit, post-*Apple*, has operated completely in line with Judge Prost's prediction that § 112(f) would be "eviscerated." Since the *Apple* decision in April 2014, the court has invalidated

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185. *See supra* Section I.B.

186. *Williamson*, 792 F.3d at 1350.

187. *See* MPEP § 2181 (June 2019). *But see* Stragent, LLC v. Amazon.com, Inc., 2011 U.S. Dist. LEXIS 61041, at *20–21 (E.D. Tex. June 7, 2011) (holding that "engine" does not invoke § 112(f) because it is "understood to be a software program").

188. *See supra* text accompanying note 179.

189. *See supra* Section I.D.

190. *See supra* Section I.B.

191. *See supra* Section II.A (juxtaposing the majority and dissent's views on the proper "recipe" for § 112(f); *see also, e.g.*, Inventio AG v. Thyssenkrupp Elevator Ams. Corp., 649 F.3d 1350, 1357 (Fed. Cir. 2011) (allowing examination of the specification, prosecution history, and extrinsic evidence).

every claim containing a disputed term found to invoke § 112(f).[192] This contrasts with decisions issued before *Apple*, where the court would find with some frequency terms that invoked § 112(f) and were nonetheless properly construed to cover only the corresponding structures from the specification.[193]

My working hypothesis was that if the Federal Circuit gave itself authority to consult the details of a patent's specification in step one (the search for "sufficiently definite structure"), then the court could only reach one of two outcomes. Either the term would (1) not satisfy step two (the search within the specification for "adequate corresponding structure") and be held invalid or (2) satisfy step one and avoid the limiting effect of § 112(f) altogether. I predicted that the court would not entertain the third possibility: that it would not find a claim term that did not connote sufficient definite structure in step one but did contain adequate corresponding structure in step two.

I took several steps to preserve the integrity of this limited-scope empirical exercise. The court decided *Apple* on April 25, 2014; my quantitative research spanned decisions issued from July 25, 2007 to December 31, 2020, each bound being 2,442 days before or after the *Apple* decision. To locate all relevant cases, I ran Boolean searches across Westlaw and Lexis databases to find cases from the Federal Circuit containing either "§ 112(f)" or "§ 112, ¶ 6."[194] Only cases published in the Federal Reporter were considered.[195]

My search returned 27 decisions which squarely dealt with judicial claim construction under § 112(f).[196] Of these, 13 were issued before *Apple* and 14 were issued after *Apple*. I then constructed two data sets: pre-*Apple* and post-*Apple*. For each set, I tracked three possible outcomes: (1) the term was found to contain sufficiently definite structure; (2) the term was found to contain insufficient structure, but the specification nonetheless disclosed adequate corresponding structure; and (3) the term contained insufficient structure and the specification disclosed *inadequate* corresponding structure. If my hypothesis held, the only outcomes *post*-Apple would correspond to (1) and (3). In short, the court would only find that § 112(f) did not apply at all or that § 112(f) did apply but the challenged term could not be sustained, thereby invalidating the claim.

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192. *See infra* Appendix A.

193. *Id.*

194. As mentioned in note 10, Congress passed the America Invents Act in 2011, which reformatted 35 U.S.C. § 112. Thus, "pre-AIA § 112, ¶ 6" became "AIA § 112(f)" when the relevant portion of the Act took effect in 2013.

195. I decided to ignore nonprecedential decisions as they only hold persuasive value in litigation. *See* FED. R. APP. P. 32.1. Furthermore, I deemed the task of determining whether a decision was designated nonprecedential because of the § 112(f) issue beyond the scope of this exercise.

196. Two published decisions were excluded because, although they discussed § 112(f), they did not address judicial claim construction. *See* Ring & Pinion Serv. Inc. v. ARB Corp., 743 F.3d 831 (Fed. Cir. 2014) (a pre-*Apple* decision discussing the doctrine of equivalents) *and* MTD Prods. v. Iancu, 933 F.3d 1336 (Fed. Cir. 2019) (a post-*Apple* decision discussing whether the Patent Trial and Appeal Board, not a trial judge, properly applied § 112(f) to the disputed claim term).

I posed three questions for each data set. First, how many unique instances of claim construction under § 112(f) occurred? This number became the denominator for calculating the operative rate. For example, if a single case involved the construction of more than one claim element under § 112(f), each claim element counted as a unique observation.

Second, how many disputed claim elements were found to have sufficiently definite structure? Each claim element with sufficient structure was tallied in outcome (1) listed above.

Third, how did the court resolve disputes over claim elements invoking § 112(f)? To answer that question, I examined the remaining cases not tallied in outcome (1). If the court found adequate corresponding structure, that instance was tallied under outcome (2) discussed above. If the court did not find corresponding structure, that instance was tallied under outcome (3).

For the pre-*Apple* data set, the Federal Circuit construed 13 disputed claim elements under § 112(f).[197] The court found sufficiently definite structure in only 1 of these 13 instances. In the 12 remaining instances, the court found adequate corresponding structure in 4 instances and invalidated the patent in the other 8.[198]

Compare this distribution to that of the post-*Apple* dataset. After the 2014 decision, the Federal Circuit construed 14 disputed claim elements under § 112(f).[199] The court found sufficiently definite structure in 5 of these 14 instances. In 8 of the remaining 9 instances, the court found a lack of corresponding structure and invalidated the claim element. The court never found an instance where a means-plus-function term had adequate structure in the specification to survive under § 112(f).

In one post-*Apple* case, the court did not directly tackle whether the specification contained "adequately corresponding structure."[200] In *Nevro*, the court allowed the "means for generating" term to survive under § 112(f), but the parties did not dispute whether the claim element contained adequate corresponding structure in the specification.[201] Because step two of the § 112(f) analysis was essentially omitted, *Nevro* was not tallied in any of the three outcomes listed above.

The results of this empirical analysis are striking. Before *Apple*, the Federal Circuit arrived at outcome (2) with some regularity, roughly one-third of the time. In the post-*Apple* period, the court never arrived at outcome (2). And while, pre-*Apple*, the court rarely found that a disputed term avoided § 112(f) altogether—in only 1 out of 13 instances—this outcome became more frequent post-*Apple*, with 5 of 14 instances tallied under outcome (1).

What impact does *Williamson* have on this new phenomenon? First, in *Williamson* the Federal Circuit put the presumptions for and against applying § 112(f) on more equal footing, blurring the distinction between functional and

197. *See infra* Appendix.
198. *See id.*
199. *See id.*
200. Nevro Corp. v. Boston Sci. Corp., 955 F.3d 35 (Fed. Cir. 2018).
201. *Id.* at 43.

structural claiming.[202] Second, the court encouraged the use of non-"means" nonce terms while acknowledging that these terms carry a presumption against applying the statute.[203] And finally, the court continued the trend of applying a *Phillips*-style analysis to functional claiming, which is a different context than structural claiming at issue in *Phillips*.[204]

Williamson made it easier to argue that a non-"means" term did not connote structure by popularizing the use of nonce terms to functionally claim an element. However, it provided no guidance on how to identify and distinguish structural terms from nonstructural terms. Defaulting to *Apple*'s heavy emphasis on the specification, these two cases have the combined effect of eviscerating § 112(f) by allowing functionally claimed elements to skirt the limitations imposed by the statute.

One counterpoint in recent Federal Circuit jurisprudence is worth mentioning here. In *MTD Prods. Inc. v. Iancu*, a panel of the Circuit vacated a determination by the USPTO's Patent Trial and Appeal Board ("PTAB") that the "mechanical control assembly" claim term in a disputed patent did not invoke § 112(f).[205] In so doing, the court rejected the PTAB's "conflated" view of the § 112(f) two-step analysis:

> While related, these two inquiries are distinct . . . . The [PTAB's] analysis implies that so long as a claim term has corresponding structure in the specification, it is not a means-plus-function limitation . . . . Indeed, this view would seem to leave [§ 112(f)] without any application: any means-plus-function limitation that met the statutory requirements, i.e., which includes corresponding structure in the specification, would end up not being a means-plus-function limitation at all.[206]

The *MTD* court incorporated the spirit of Judge Prost's dissent-in-part in *Apple* as can be seen by comparing the two:

> The majority's analysis implies that so long as a claim term has corresponding structure in the specification, it is not a means-plus-function limitation. But such a rule would render *every* means-plus-function claim term indefinite. Under the majority's approach, a term would only be deemed a means-plus-function limitation if it has *no* corresponding structure—an absurd result which would eviscerate means-plus-function claiming.[207]

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202. *See supra* Section II.B.

203. *See id.*

204. *See supra* Sections I.C, II.B.

205. MTD Prods. v. Iancu, 933 F.3d 1336, 1344 (Fed. Cir. 2019). While the Circuit ultimately held that the term did invoke § 112(f) and there was adequate corresponding structure in the specification, the parties did not actually dispute what constituted the corresponding structure in the specification. *Id.* at 1345.

206. *Id.*

207. Apple Inc. v. Motorola, Inc., 757 F.3d 1286, 1335 (Fed. Cir. 2014) (Prost, J., concurring in part and dissenting in part) (internal footnotes omitted).

The passage in *MTD*, directed at the PTAB, almost identically copies Judge Prost's critique of the majority in *Apple*. Both recognize the conflation between the two steps in § 112(f) analysis and predict that such a rule would render the statute meaningless.

The impact *MTD* will have on claim construction jurisprudence is debatable. One might credibly argue that the case shows the Federal Circuit's return to pre-*Apple* treatment of means-plus-function claim terms. However, because *MTD* concerned an appeal from the PTAB and not from a district court, its impact is likely to be less robust than the quoted passage suggests. Both parties in *MTD* agreed that the structure in the specification corresponding to the "mechanical control assembly" was a "ZTR control assembly."[208] The parties only disagreed about whether "mechanical control assembly" was expressly defined in the specification.[209] Fundamentally, this was a different inquiry than the one in *Apple* and other claim construction cases, as the Federal Circuit has outlined several methods of avoiding § 112(f) that fall short of explicit definition.[210] Furthermore, although the court acknowledged that the "ZTR control assembly" was corresponding structure, it stopped short of holding the patent valid.[211] Instead, the court remanded the case to the PTAB with instructions to apply § 112(f) to "mechanical control assembly."[212] These facts suggest the court may have been persuaded by an alternative argument or that it may have found the "ZTR control assembly" to be inadequate structure. This would fit the mold of the other post-*Apple* cases.

I do not intend for this exercise to constitute empirical proof that the Federal Circuit has abandoned its claim construction principles regarding § 112(f). Cases dealing with this issue are few and far between, and there likely are not enough published cases to draw any conclusion based on valid statistical methods. Furthermore, my search tools were rudimentary; I chose my start and end dates out of convenience and only logged the answers to three binary yes-or-no questions. More refined methods must be applied to a larger data pool before scholars can comment on the court's trends with mathematical confidence.

Moreover, anecdotal evidence suggests the court's analysis post-*Apple* may self-correct. Of note, Circuit Judge Jimmie Reyna joined the majority in both *Apple* and *MTD*. As discussed above,[213] the majority in *MTD* used language quite similar to that of Judge Prost in her dissent-in-part in *Apple*. As *Apple* itself was a 2–1 panel decision, shifting views on the importance of the specification among the Federal Circuit judges may cause the distribution of outcomes to return to pre-*Apple* levels.

Nonetheless, my research suggests that Judge Prost's prediction in *Apple* materialized and that the Federal Circuit has grown more hostile since *Apple* to claim elements invoking § 112(f). Prior to *Apple*, the court identified corresponding

208. *MTD Prods.*, 933 F.3d at 1344.
209. *Id.*
210. *See supra* Section I.D.
211. *MTD Prods.*, 933 F.3d at 1344–45.
212. *Id.* at 1345.
213. *See supra* text accompanying notes 206–207.

structure for means-plus-function claim terms with some regularity.[214] Since *Apple*, the court has yet to do so.[215]

The consequence of this change in analysis is clear: more inventors are granted overly broad patent protections. As discussed above, while the instances where the court found adequate corresponding structure fell to zero, the instances where it found a claim term outside the scope of § 112(f) *grew* more than 300%.[216]

This drastic increase in cases where disputed terms avoided § 112(f) limitation strongly suggests that the Federal Circuit's loosened standards for "sufficiently definite structure" have led to more inventions gaining patent protections extending well beyond their actual innovative features. Recall the heart of Judge Prost's dissent-in-part—the Federal Circuit's analysis would eliminate the scenario where inventors gained limited protections under § 112(f).[217] That leaves two scenarios: the patent invokes § 112(f) and is invalidated, or the patent does not invoke § 112(f) and receives much broader patent protections. While invalidating a potentially appropriate § 112(f) claim term should be avoided, granting inventors exclusion rights well beyond what they actually invented is a greater injustice to the patent system.

Returning to the example in Section I.B, a fair and just outcome would limit the '000 Patent to cover only those structures disclosed in the specification. Fairness and justice in a post-*Apple* world notwithstanding, the trial judge has two remaining options: either invalidate the '000 Patent for not disclosing adequate corresponding structure in the specification or find that "processing engine" connotes sufficiently definite structure to avoid § 112(f) altogether. Both options fall short of the ideal, but which causes more harm? If the patent is invalidated, then Gulfstream loses a significant investment over the remainder of the patent's life. Airbus and other competitors may copy with impunity the numerical approximations and computer logic contained in Gulfstream's processing engine. However, if the patent avoids § 112(f), as was the case in this hypothetical, Gulfstream may block all competitors from using any system that superficially resembles the system claimed in the '000 Patent. The true value in the "processing engine" lies within those equations and software architectures used to process the data from the aircraft. A different set of equations could take years of work by salaried employees and may be quite valuable. By ruling that "processing engine" does not invoke § 112(f)—and thus is not limited to the equations, logic, or general steps provided in the specification—Gulfstream stifles innovation by preventing competitors from using their own valuable

214. *See, e.g.*, AllVoice Comp. PLC v. Nuance Comm'ns, 504 F.3d 1236, 1240–42 (Fed. Cir. 2007); Welker Bearing Co. v. PHD, Inc., 550 F.3d 1090, 1097–99 (Fed. Cir. 2008); Typhoon Touch Techs., Inc. v. Dell, Inc., 659 F.3d 1376, 1384–86 (Fed. Cir. 2011); Dealertrack, Inc. v. Huber, 674 F.3d 1315, 1328–30 (Fed. Cir. 2012) (for the "central processing means" claim term).

215. *See, e.g.*, Nevro Corp. v. Boston Sci. Corp., 955 F.3d 35 (Fed. Cir. 2018) (finding adequate corresponding structure where the parties did not dispute the structure in the specification).

216. *See infra* Appendix A.

217. *See supra* Section II.A.

intellectual property. This harms the entire industry, not just a particular entity within the industry.

Outcome (1)—where the claim element avoids § 112(f)—tracks the amount of this "overprotection," i.e., inventors gaining overly broad patent protections. However, that is not to say that a claim element is overprotected *every time* it falls outside the scope of § 112(f). The statute is only intended to provide limited protections in limited circumstances. By the same token, every instance of outcome (3)—where the claim term is invalidated—does not correspond to an equivalent "under protection." The point is simply that with the eradication of outcome (2)—a "Goldilocks" level of ideal protection—the only two alternative options reflect either an overprotection or under protection of the right to exclude for a truly functional claim element.

If, as this research suggests, the Federal Circuit has allowed more patents to gain overly broad protections, the next logical question is, "How do we fix it?" The next Part discusses how the Federal Circuit can change its precedent and proposes a change to the court's analysis to bring outcomes back to their pre-*Apple* distribution.

III. A CRITICAL LOOK AT A BAND-AID SOLUTION

The Federal Circuit is unique among the thirteen Circuit Courts of Appeals because it has nationwide jurisdiction over patent issues.[218] Therefore, decisions from a panel of the court bind subsequent panels of the court and all district courts.[219] Binding caselaw may be overturned by federal statute, a decision from the Supreme Court of the United States, or by a decision from the Federal Circuit sitting en banc.[220]

An ideal solution to the problems associated with functional claiming would be for the Federal Circuit, sitting en banc, to issue a rule forbidding a *Phillips*-style analysis for terms that may invoke § 112(f) and instead focus simply on the words used in the claim language. However, because such a ruling would cut against years of court precedent, its adoption is unlikely. This Note proposes a change to claim construction analysis that could likely be implemented by a panel of the court, one that fits within the principles of claim construction and precedent of the Federal Circuit.

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218. *June 2019 Jurisdiction*, UNITED STATES COURT OF APPEALS FOR THE FEDERAL CIRCUIT, http://www.cafc.uscourts.gov/sites/default/files/the-court/June_2019_Jurisdiction.pdf [https://perma.cc/UA66-22ZW].

219. *See* 28 U.S.C. § 1295 (2018); Newell Cos. v. Kenney Mfg. Co., 864 F.2d 757, 765 (Fed. Cir. 1988) ("This court has adopted the rule that prior decisions of a panel of the court are binding precedent on subsequent panels unless and until overturned *in banc*.").

220. *See Newell*, 864 F.2d at 765; *see also* Colin E. Wrabley, *Applying Federal Court of Appeals' Precedent: Contrasting Approaches to Applying Court of Appeals' Federal Law Holdings and* Erie *State Law Predictions*, 3 SETON HALL CIR. REV. 1, 1 (2006).

A. "Itemize, Scrutinize, Minimize": A Three-Step Test to Restore Normalcy

The problem with the current claim construction analysis, this Note argues, is that the court often relies too heavily on the specification to decide whether § 112(f) applies to disputed claim terms.

The motto "Itemize, Scrutinize, Minimize" captures the broad mental steps the court should take to decrease reliance on the specification. While the court has created a laundry list of ways to avoid § 112(f) using pieces of the specification, the current jurisprudence merely indicates that the specification is an appropriate source of structure.[221] Instead, the court should itemize each instance where the specification provides some structure. In each instance, the court should label the type of evidence the specification provides. Potential labels might include "inventor acting as his or her own lexicographer," "example of operation with other elements," "name for a structure or set of structures," and "structural, adjectival modifier."[222] This "itemization" process could be as formal as a two-column chart or a mere discussion in prose.

Once the court dissects the specification in such a manner, it should then closely examine—or scrutinize—combinations of evidence that it deems rise to the level of "sufficiently definite structure," if any. In doing so, the court should also remember a principle of claim construction: the inventor is only entitled to what he or she actually invented.[223]

For purposes of § 112(f), if the evidence in the specification can be established to have significance to a PHOSITA independent from the patent itself, then it can be used to support a finding of "sufficiently definite structure." Using this principle, the court can divide its itemized labels into camps: those that would contain significance outside the patent and those whose significance is necessarily dependent upon the patent.

It's easy to see how, for example, the "structural adjectival modifiers" and "details of operation with other elements" labels fall on opposite sides of this demarcation. Adjectives, such as "steel," connote readily apparent structure to a PHOSITA. And although they may be used in a novel way in a disputed patent, the terms still contain concrete meaning independent of the patent. By contrast, a lengthy discussion of how one widget forces another widget to move or react may contain structure to a PHOSITA outside the context of the patent but more likely provides detail of how the invention accomplishes some new and useful task. In this sense, these details of operation only imply structure because of the patent's existence; without it, their structure would be unknown to a PHOSITA.

This Note suggests that, at a minimum, "details of operation" and "inventor acting as his or her own lexicographer" fall into the camp of evidence that should not be examined until step two, when the court searches for adequate corresponding

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221. *See supra* Section I.D.

222. *See id.* (discussing the laundry list of ways a patentee can overcome the presumption that § 112(f) applies).

223. *See supra* Section I.C.

structure under § 112(f). This list could be expanded at the discretion of the court.[224] When "scrutinizing" the evidence, the court should ensure that only appropriate evidence from the specification—along with evidence from the claims, prosecution history, and extrinsic evidence—supports a finding of "sufficiently definite structure." If other evidence is required, such as examples of an inventor defining or redefining a term, then the court should find insufficient structure and proceed to step two of its analysis.

The court should also scrutinize the evidence used to support the presence or absence of "adequate corresponding structure." Note that the evidence available in step one is not a pure subset of evidence available in step two; although the search for "adequate corresponding structure" includes all possible evidence from the specification, any evidence of structure from surrounding claim language, the prosecution history, or extrinsic sources are not available. Section 112(f) reads: "[A]nd such claim shall cover the corresponding structure [] described *in the specification* . . . ." However, this should not preclude the court from reexamining those sources of structure in the specification used in step one. While such evidence may not amount to "sufficiently definite structure," it may constitute adequate corresponding structure when combined with the types of evidence reserved for step two.

By including a "minimize" step, this Note underscores the fact that no post-*Apple* Federal Circuit case has identified a valid means-plus-function claim element. "Minimize" reflects the principle that overreliance on the specification leads to overbroad patent protections when § 112(f) is at issue; in close questions, the court should opt for a narrower construction of a disputed term. The tradeoff is clear. Narrowing the claim coverage to just those structures in the specification may deprive the patentee of rights to some structures he or she truly did envision as part of the invention. Broadening the claim coverage, however, may deprive an entire industry of rights to many structures which truly are not a part of the patentee's invention. Given that the public policy behind a patent system is to encourage inventors to disclose to the public how to make and use the invention, narrow claim coverage for "stingy" inventors who skimp on disclosure is much more palatable.

These broad methods and ideas just discussed should be a part of any solution to the current § 112(f) debacle. This Note next details in greater depth a three-step process that incorporates the ideas of "Itemize, Scrutinize, Minimize."

First, the court should examine those sources of evidence laid out in *Phillips* and determine if the specification is necessary to establish "sufficiently definite structure." If there is insufficient structure without consulting the specification, the court should then compile a list of all evidence relied upon from the specification, along with labels such as those discussed in this section. Finally, if the disclosed structure only amounts to "sufficiently definite structure" because of either (1) the inventor's own lexicography or (2) examples from the specification

224. It is easy to see the relationship between evidence from the specification allowed in step one and the number of disputed claim terms that avoid step two. As the court excludes more evidence from the specification, fewer terms will connote "sufficiently definite structure."

of the disputed term's operation within the invention, then § 112(f) should be applied to the term.

In some cases, the court may not perform all three steps because there may be sufficiently definite structure from the surrounding claim language. In this case, there is no need to itemize the specification. In other cases, the court may need to itemize such evidence, but it may find that certain, permissible evidence from the specification, either alone or in combination with the claims or extrinsic evidence, connotes sufficiently definite structure. Obviously, in these instances the court would not invoke § 112(f).

In cases that invoke § 112(f), either because they lack sufficiently definite structure or because they achieve it only through the two sources discussed above, the end result should be the same as normal Federal Circuit analysis. If there is no adequate corresponding structure in the specification, the claim is invalid under § 112(b). If § 112(f) was invoked in light of the inventor's own definitions or by examples of operation, then the court should construe the claims to cover only those corresponding structures.

B. Hypothetical Applications

Compare the results from this proposed analysis to those of the Federal Circuit's current analysis. Recalling the facts in Section I.B, Gulfstream's processing engine connects to an arrangement of strain gauges and outputs a suggested restoring force to keep the aircraft level.[225] The specification describes in some detail the matrix manipulation performed by the software when it receives the input values from the strain gauges. The district court in that example, using the claim construction analysis commonly employed by the Federal Circuit today, found that Gulfstream had recited sufficiently definite structure in its '000 Patent to avoid § 112(f) application, and it found that Airbus infringed upon the patent with its strain gauge and processing engine assembly.

Under the proposed analysis, the court would first look to the claim language of the '000 Patent. The relevant claim describes a processing engine "configured to process the stress-strain data to calculate the three-dimensional orientation of the aircraft."[226] The claim also recites a processing function. The mere phrase "processing engine" likely does not connote sufficient structure because "processing" does not add clarity to an engine that is "configured to process."[227] Turning to step two, the court would catalogue all the structure provided by the claims and specification. The court could organize rows of entries that include the word or phrase that provides structure, a label of what type of support it provides, and the location of the support in the intrinsic record. Such a catalogue might take the following form:

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225. *See supra* Section I.B.

226. *See id.*

227. One might argue the two recited functions are actually details of operation, as the engine receives stress-strain data and outputs the aircraft's orientation. If anything, this underscores the shakiness of the overarching claim construction methodology under § 112(f).

Structure	Label	Source
"Processing engine"	Structural adjectival modifier	Claim 3
"Process stress-strain data to calculate orientation of aircraft"	Details of operation	Claim 3
Matrix manipulation performed by engine	Details of operation	Specification
Suggested restoring forces from orientation calculation	Details of operation	Specification
"Processing engine" is a computer in contact with stress-strain gauges and main computer.	Inventor's own lexicography	Specification

Catalogue of Structure Provided for "Processing Engine" Claimed in '000 Patent.

This table shows how the specification provides structure only from those impermissible sources containing no significance outside the patent itself. The details of the processing engine's operation may be "structure," but a PHOSITA would only recognize them as structure because of the patent's existence. Likewise, a PHOSITA would not understand this specific definition of "processing engine" outside the context of the '000 Patent. Because the intrinsic and extrinsic evidence—minus the specification—do not rise to the level of sufficiently definite structure, and because the only sufficient evidence from the specification comes from details of operation and the inventor's own definition, the court should apply § 112(f).

The end result under this new analysis is that, per § 112(f), the '000 Patent would only have the right to exclude the particular method used in its processing engine. How the data is fed into the engine, the architecture of the matrix manipulation, and the suggested restoring forces would make up a distinctive structure to a PHOSITA, and Gulfstream could exclude competitors from using that structure or its equivalents. Assuming the computer logic within Airbus's flight angle correction system is substantially different, Airbus would likely not infringe under this new analysis.

Also, consider the outcome if this new test were applied in *Apple*. There, the majority concluded that "'heuristic' is similar to words that define a class of structures . . . ."[228] However, the court then clarified:

> We need not consider whether the term "heuristic," by itself, connotes sufficiently definite structure . . . because, in this case, the claims do not nakedly recite heuristics without further description in the remaining claim language and specification. To

228. Apple Inc. v. Motorola, Inc., 757 F.3d 1286, 1301 (Fed. Cir. 2014).

> the contrary, [they] disclose the heuristics' operation within the context of the invention, including the inputs, outputs, and how certain outputs are achieved.[229]

After spending a few sentences on the claim language, the court then recited these inputs and outputs, as well as various objectives of the heuristics, from the specification.[230] In passing, near the end of its discussion of structure, the court acknowledged figures within the patent that exemplified these inputs and outputs.[231]

Implicit in the court's reasoning is that the patent's lengthy and detailed description of the heuristics' operation was necessary to finding sufficiently definite structure. Although the majority found "heuristic" to connote structure on its own, the court did not elaborate on its reasoning. Similarly, compared to the several paragraphs spent detailing the heuristics' operation, the figures were mentioned only in passing. Had the court itemized these sources of structure and excluded details of operation, it would have faced the tougher decision of whether these figures, along with the term itself, connoted sufficient structure.

The new test proposed by this Note reinstates § 112(f) to some extent. However, to have lasting effect, the analysis must coexist with longstanding claim construction principles adopted by the court. The next Section discusses why this test can be adopted by a mere panel without disturbing existing precedent.

C. Reconciling the New Test with the Court's Norms

The proposed analysis change poses little challenge to claim construction axioms, meaning it could likely be enacted by a mere panel decision. And because it largely leaves the current two-step analysis undisturbed, it likely does not run afoul of § 112(f).

As discussed in Section I.C, courts often stumble when reading claims in light of the specification without improperly importing limitations from the specification into the claims.[232] The proposed analysis bridges these two often-conflicting concepts with some success.

Take an inventor acting as his or her own lexicographer as an example. If a claim term is defined in the specification, without more, then § 112(f) will apply under the new analysis. Thus, the inventor will only gain protections for those structures apparent to a PHOSITA reading the inventor's definition of the term.[233] This literal, limited scope of protection will encourage inventors to give detailed definitions that contain as much structure as possible. In so doing, their claim coverage will expand. Theoretically, then, a "perfect" definition of a disputed claim term would receive such large protection under § 112(f) that it approaches the coverage that would be granted had the court declined to impose § 112(f) in step one.

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229. *Id.*
230. *See id.* at 1301–02.
231. *See id.* at 1302.
232. *See supra* Section I.C.
233. As well as protections for any equivalent structures. 35 U.S.C. § 112(f). As discussed supra note 95, this "doctrine of equivalents" falls outside the scope of this Note.

Similar logic applies to claim terms which receive § 112(f) treatment because they merely disclose details of operation. If the inventor thoroughly describes the examples of operation, it is easy to see how the protections granted by § 112(f) quickly expand. In this light, the new analysis is similar to existing Federal Circuit analysis regarding algorithms and § 112(f). For software inventions, disclosure of an algorithm can provide sufficient structure under § 112(f). Similarly, for software and non-software inventions alike, thorough disclosure of how the claim term operates within the invention can provide sufficient structure for the inventor to receive generous protections under § 112(f).

This new analysis could also better equip the court to avoid importing limitations from the specification into the claims. Section 112(f) instructs the courts to look to the specification for the corresponding structure of means-plus-function terms. By instructing courts to look only to the specification to find adequate corresponding structure, the legislature, in a sense, gave courts limited authority to import limitations from the specification into the claims. By restricting evidence most likely to contain limitations—a definition or redefinition by the inventor and patent-specific details of operation—the new analysis reduces the chance that courts import limitations outside of the legislatively-created exception.

CONCLUSION

The Federal Circuit's claim construction for means-plus-function terms is nebulous. While § 112(f) provides a very strict rule for how a means-plus-function term can be construed, the court has carved out several avenues and alleys by which it can determine that the statute does not apply. These routes often involve the patent's specification, and this increased reliance upon the specification threatens to eviscerate the meaning of § 112(f) altogether. Over the last seven years, the court appears to have granted several inventors overly broad patent protections by not applying § 112(f) to claim terms lacking structural meaning.

This Note proposes a change in the Federal Circuit's analysis to correct the drift seen over the last few years. By critically examining *how* the specification provides structure to a disputed claim term, the Federal Circuit can make more informed decisions about whether to apply § 112(f) to the term. Because the proposed change respects the principles of claim construction and the court's standard two-step analysis for terms that may invoke § 112(f), this analysis could likely be adopted by a mere panel decision. Moreover, as shown in the hypothetical examples, this new test has the potential to return decisions involving the application of § 112(f) to their pre-*Apple* levels and allow inventors to gain patent protections over what they actually invented, instead of every solution to a general problem.

APPENDIX

Case Name	"Means" Present?	112(f) Applied	Patent Invalidated?
Ring & Pinion Service Inc. v. ARB Corp. Ltd.	-	-	-

Ibormeith IP, LLC v. Mercedes-Benz USA, LLC	Yes	Yes (stipulated)	Yes
Function Media, L.L.C. v. Google, Inc.	Yes	Yes (stipulated)	Yes
Noah Sys., Inc. v. Intuit Inc.	Yes	Yes (stipulated)	Yes – 3 functions
Ergo Licensing, LLC v. CareFusion 303, Inc.	Yes	Yes (stipulated)	Yes
Dealertracker v. Huber	Yes	Yes (stipulated)	No (remanded)
Dealertracker v. Huber	Yes	Yes (stipulated)	Yes -
Typhoon Touch Techs., Inc. v. Dell, Inc.	Yes	Yes	No
Inventio AG v. ThyssenKrupp Elevator Americas Corp.	No	No	-
Blackboard, Inc. v. Desire2Learn, Inc.	Yes	Yes (stipulated)	Yes
Welker Bearing Co. v. PHD, Inc.	No	Yes	No
Finisar Corp. v. DirecTV Group, Inc.	Yes	Yes	Yes
Aristocrat Techs. Australia Pty Ltd. v. Int'l Game Tech.	Yes	Yes (stipulated)	Yes
Allvoice Computing PLC v. Nuance Communications, Inc.	Yes	Yes	No

*Table 2: Federal Circuit Decisions on § 112(f) Claim Construction, Pre-*Apple

Case Name	"Means" Present?	112(f) Applied?	Patent Invalidated?
Triton Tech. of Tex., LLC v. Nintendo of Am. Inc.	Yes (stipulated)	Yes	Yes
Robert Bosch LLC v. Snap-On Inc.	No	Yes	Yes
Williamson v. Citrix Online, LLC	No	Yes	Yes
EON Corp. IP Holdings LLC v. Philips Elecs.	Yes (stipulated)	Yes	Yes
Lighting Ballast Control LLC v. Phillips Elecs.	Yes	No	-
Media Rights Techs. v. Capital One Fin. Corp.	No	Yes	Yes
Advanced Ground Info Sys. v. Life360 Inc.	No	Yes	Yes
Alfred E Mann Found. for Sci. Research v. Cochlear Corp.	Yes	Yes	Yes
Skky Inc. v. Mindgeek	Yes	No	-
Zeroclick LLC v. Apple Inc.	No	No	-
Diebold Nixdorf Inc. v. ITC	No	Yes	Yes
Nevro Corp. v. Boston Sci. Corp.	Yes (stipulated)	Yes	No (parties did not dispute structure)
TEK Global v. Sealant Sys. Int'l	No	No	-

MTD Prods. v. Iancu	No	Yes	No (not at issue, remanded)
Samsung Elecs. Am. v. Prisua Engineering Corp.	No	No	-

*Table 3: Federal Circuit Decisions on § 112(f) Claim Construction, Post-*Apple

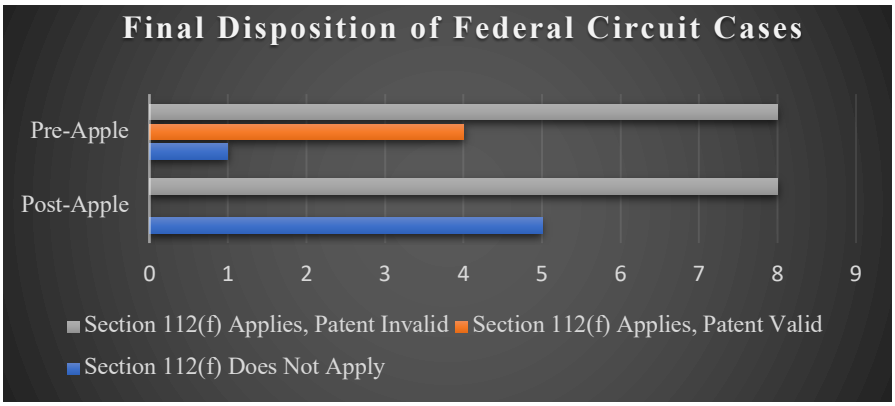

Figure 1: Distribution of Final Dispositions in Federal Circuit Cases Assessing Claim Construction Under § 112(f). Distributions split before and after Apple*. The orange bar, titled "Section 112(f) Applies, Patent Valid" represents cases where the court held that a term invoked § 112(f), but that the specification disclosed adequate corresponding structure under the statute.*