

The Test for Patent Infringement Under the Doctrine of Equivalents After *Pennwalt v. Durand-Wayland*

The scope of a patented invention is defined by the claims in its application. When each element of a claim has been copied by an accused device, the claim is said to "read upon" the new invention, and is literally infringed by that invention.¹ However, this type of infringement is rare. Far more often it is the case that the new invention is substantially similar to the claim and thereby infringes it under the doctrine of equivalents.

Recently there has been much controversy over the judicial standard for infringement analyses under the doctrine of equivalents. Arguably, there are three distinct standards. The first type is known as the "element-by-element" analysis, and consists of comparing each element of the patented claim with the accused device to determine if the accused device infringes upon the patent.² The second type of analysis is a version of the "invention as a whole" approach whereby the accused device is compared with the claimed invention as a whole to determine if it infringes upon that invention.³ Proponents of either standard have heatedly argued the validity of their positions without recognizing one simple concept: the element-by-element standard and the invention as a whole approach are not mutually exclusive. The last type of infringement analysis is an integration of both the element-by-element and invention as a whole standards. The conflict between the different analyses of infringement under the doctrine of equivalents finally culminated in an *en banc* decision of the Court of Appeals of the Federal Circuit, *Pennwalt Corp. v. Durand-Wayland, Inc.*⁴

This Note focuses on the confusion in pre-*Pennwalt* cases that resulted in different analyses of infringement under the doctrine of equivalents, the *Pennwalt* decision, and the framework for infringement analyses after *Pennwalt*. A close examination of case precedent discloses that the correct framework is an integration of both the element-by-element and the invention as a whole standards. This Note concludes with an analysis protocol which should be followed by all federal courts when determining infringement under the doctrine of equivalents.

1. I. KAYTON, PATENT PRACTICE, §§ 2-12, 13 (1985).

2. See *infra* text accompanying notes 58-62, 87-89.

3. See *infra* text accompanying notes 115-16.

4. 833 F.2d 931 (Fed. Cir. 1987), *cert. denied*, 108 S.Ct. 1226 (1988), *cert. denied*, 108 S.Ct. 1474 (1988).

I. BASIC PRINCIPLES OF PATENT INFRINGEMENT

A. *Literal Infringement and Infringement Under the Doctrine of Equivalents*

In a landmark decision, *Graver Tank & Manufacturing Co. v. Linde Air Products*,⁵ the United States Supreme Court enunciated the prima facie case for infringement under the doctrine of equivalents—the two inventions must “do the same work in substantially the same way, and accomplish substantially the same result.”⁶ Through the years, variations in terminology have resulted in a variety of combinations of phrases which express the test for equivalency: “(a) substantially the same result, or end function, or does substantially the same work; (b) in substantially the same way, or manner, or mode of operation, and; (c) using substantially the same means or structure.”⁷ Whichever combination of the above phrases is used, the meaning is the same as originally stated in *Graver Tank*—equivalence must be based upon a substantial identity of result, function, and means.⁸

5. 339 U.S. 605 (1950). The doctrine of equivalents has earlier roots, dating as far back as the 1800s. See *Winans v. Denmead*, 56 U.S. 330 (1853). See also *Morley Machine Co. v. Lancaster*, 129 U.S. 263, 273 (1888) (“Where an invention is one of a primary character, and the mechanical functions performed by the machine are, as a whole, entirely new, all subsequent machines which employ substantially the same means to accomplish the same result are infringements, although the subsequent machine may contain improvements in the separate mechanisms which go to make up the machine.”) However, *Graver Tank* is the Supreme Court decision which is the most often cited in current cases for the enunciation of the doctrine of equivalents.

6. *Id.* at 608. See also Swanson, *A Discussion of the Application of the Doctrine of Equivalents in the Graver v. Linde Case*, 33 J. PAT. OFF. SOC’Y 19 (1951); Tilton, *The Doctrine of Equivalents in Patent Cases*, 32 J. PAT. OFF. SOC’Y 861 (1950).

7. Arnold & Lynch, *Infringement Of Inventions*, THE JOHN MARSHALL LAW SCHOOL 28TH ANNUAL CONFERENCE: MORE DEVELOPMENTS IN INTELLECTUAL PROPERTY LAW 14 (1984).

8. *Id.* at 14-16. But see Harris, *Three Ambiguities Of The Doctrine Of Equivalents In The Federal Circuit*, 69 J. PAT. OFF. SOC’Y 91 (1987). One of the ambiguities which the Harris article addresses is the different terminology the Federal Circuit has used in several opinions, stating the test for equivalence as either “substantially the same result” or “the same result,” or even both in the same opinion. The Harris article finds that “the difference between the two formulations of the basic test is important in those situations in which the accused device achieves substantially the same result, but does *not* achieve the *same* result as the patented item, and in which the accused device satisfies the ‘function’ and ‘way’ legs of the basic test.” *Id.* at 93 (emphasis in original). This ambiguity is outside of the scope of this article, and perhaps can be best summed up by stating, “Only legal theorists worry over the semantic differences, because what the courts are trying to do is articulate their words for ‘substantially the same invention.’” Arnold & Lynch, *supra* note 7, at 16.

A discussion of both literal infringement and infringement under the doctrine of equivalents using hypothetical claims will be helpful for a more complete understanding of the fundamental principles of infringement involved. There are generally two types of clauses in a claim: those using structural language and those using functional (also known as "means-plus function") language.⁹ The following hypothetical claims for a table illustrate both types of clauses.

(1) A device, comprising:

a flat surface; at least three legs perpendicular to the flat surface; and screws securing each leg to the flat surface.

(2) A device, comprising:

a flat surface; at least three legs perpendicular to the flat surface; and means for securing each leg to the flat surface.

The first claim uses structural language, while the second claim uses functional language.

The important difference between the two claims when determining whether the claims have been literally infringed is the leeway statutorily granted to functional clauses by the Patent Act of 1952.¹⁰ Section 112 of the Act provides in pertinent part that:

An element in a claim for a combination may be expressed as a means or step for performing a specified function without the recital of structure, material, or acts in support thereof, and such claim shall be construed to cover the corresponding structure, material, or acts described in the specification and *equivalents thereof*.¹¹

This statute not only permits an element to be set forth in functional language, but it also provides that the claim will be interpreted to include equivalents of that functional element.¹² Therefore, in determining whether an accused device literally infringes a claim, functional language is construed to include equivalents of that element. Structural language is not permitted this leeway in literal infringement.¹³

9. KAYTON, *supra* note 1, at §§ 2-22, 23.

10. Ch. 950, 66 Stat. 797 (codified at 35 U.S.C. §§ 100-135 (1982)).

11. 35 U.S.C. 112 (6) (1982) (emphasis added).

12. KAYTON, *supra* note 1, at §§ 2-23.

13. *Atlas Powder Co. v. E. I. Du Pont De Nemours & Co.*, 750 F.2d 1569 (Fed. Cir. 1984). (Substitution of a certain element in the claim ("water-in-oil type emulsifying agent") for a similar element in the accused product ("oil-in-water emulsifying agent") avoided literal infringement. Both elements are in structural, rather than functional, language. The substitution, however, did not preclude a finding of infringement under the doctrine of equivalents).

To illustrate this point, consider the two hypothetical claims. An accused device which has legs attached to a flat surface by weld, glue, rivets, or joints, does not literally infringe the claim containing structural language. However, it does literally infringe the claim containing functional language, because the "means-plus function" clause is deemed to include equivalent methods of attaching the legs to the flat surface.¹⁴

The doctrine of equivalents is a creature of equity which expands upon this premise and allows a finding of infringement where the accused product does not literally infringe upon the claim, but is substantially equivalent to the entire claim.¹⁵ For example, incorporating the *Graver Tank* test to the above hypotheticals, if a court finds that an accused device which differs from the structural claim only by using rivets rather than screws "[does] the same work in substantially the same way, and accomplish[es] substantially the same result,"¹⁶ then that device infringes under the doctrine of equivalents. Although the doctrine of equivalents is related to statutory "means-plus function" equivalence, statutory equivalence is determinative only on the issue of literal infringement, not infringement under the doctrine of equivalents.¹⁷ "Section 112, paragraph 6, plays no role in determining whether an equivalent function is performed by the accused device under the doctrine of equivalents."¹⁸

The rationale for the doctrine of equivalents is to prevent infringers from practicing fraud on a patent.¹⁹ As the Court explained in *Graver Tank*:

[T]o permit imitation of a patented invention which does not copy every literal detail would be to convert the protection of

14. KAYTON, *supra* note 1, at §§ 2-23, 24.

15. *Id.* at 2-25.

16. 339 U.S. at 608.

17. *Pennwalt Corp. v. Durand-Wayland, Inc.*, 833 F.2d 931, 933-4 (Fed. Cir. 1987).

18. *Id.* at 934. *See also* *D.M.I., Inc. v. Deere & Co.*, 755 F.2d 1570, 1575 (Fed. Cir. 1985).

[T]he word 'equivalent' in 112 should not be confused, as it apparently was here, with the 'doctrine of equivalents.' In applying the doctrine of equivalents, the fact finder must determine the range of equivalents to which the claimed invention is entitled, in light of the prosecution history, the pioneer-non-pioneer status of the invention, and the prior art. It must then be determined whether the entirety of the accused device or process is so 'substantially the same thing, used in substantially the same way, to achieve substantially the same result' as to fall within that range. In applying the 'means plus function' paragraph of 112, however, the sole question is whether the single means in the accused device which performs the function stated in the claim is the same as or an equivalent of the corresponding structure described in the patentee's specification as performing that function.

Id. at 1575 (citations omitted), *later appeal*, 802 F.2d 421 (Fed. Cir. 1986).

19. *Graver Tank*, 339 U.S. at 608.

the patent grant into a hollow and useless thing. Such a limitation would leave room for —indeed encourage— the unscrupulous copyist to make unimportant and insubstantial changes and substitutions in the patent which, though adding nothing, would be enough to take the copied matter outside the claim, and hence outside the reach of law. One who seeks to pirate an invention, like one who seeks to pirate a copyrighted book or play may be expected to introduce minor variations to conceal and shelter the piracy. Outright and forthright duplication is a dull and very rare type of infringement. To prohibit no other would place the inventor at the mercy of verbalism and would be subordinating substance to form. It would deprive him of the benefit of his invention and would foster concealment rather than disclosure of inventions, which is one of the primary purposes of the patent system.²⁰

The doctrine of equivalents is a device used to expand the meaning of the claims in a patent in order to promote the policy of encouraging progress in the arts by protecting the patent owner.²¹ The limitations which courts place on the doctrine of equivalents derive from the policy of giving competitors fair notice of what the patent owner believes to be the boundaries of his invention, so that competitors may design around the patent without open vulnerability to infringement actions.²²

20. *Id.* at 607. See also *Royal Typewriter Co. v. Remington Rand, Inc.*, 168 F.2d 691, 692 (2d Cir. 1948) (Judge Hand stated that courts will apply the doctrine of equivalents to “temper unsparing logic and prevent an infringer from stealing the benefit of the invention.” He described the doctrine of equivalents as an anomaly, but a necessary one, accepted by the courts to prevent inequity and injustice.), *cert. denied*, 335 U.S. 825 (1948), *reh’g denied*, 335 U.S. 864 (1948) and *petition denied* 82 U.S.P.Q. (BNA) 334 (2d Cir. 1949).

21. *Pennwalt*, 833 F.2d at 945 (Bennett, J., dissenting).

22. *Id.* But cf. Adelman and Francione, *The Doctrine of Equivalents in Patent Law: Questions that Pennwalt Did Not Answer*, 137 U. PA. L. REV. 673 (1989).

The doctrine of equivalents is the primary (although not the exclusive) cause of the current uncertainty surrounding the scope of patent claims. This uncertainty has serious consequences. First, uncertainty about the scope of patent protection hinders both patent holders and potential defendants from assessing the possible outcome of litigation or from making other business decisions, such as the direction that research and development efforts should take. Second, a primary purpose of the protection of intellectual property is to encourage the production of inventions, literary works, and the like. Patent law in particular provides a claiming system to put other potential inventors on notice of the precise boundaries of the invention so that they may “design around” the patent other inventive efforts. The uncertainty generated by the doctrine of equivalents frustrates and chills the activities of these other inventors, who must be concerned about whether their efforts will be met by an infringement suit based on the

In light of the rationale underlying the doctrine, it is logical that the range of equivalents allowed under the doctrine of equivalents "depends upon and varies with the degree of invention."²³ The purpose of the doctrine of equivalents is to reward the inventor by protecting his rights to his patent.²⁴ This reward to the inventor in the form of protection of his patent through the application of the doctrine of equivalents is commensurate with the value of the inventor's contribution to the art.²⁵ Generally, there are three categories of ranges of equivalents: (a) pioneer inventions are entitled to a broad range of equivalents; (b) marked improvements are entitled to a substantial range of equivalents; and, (c) narrow improvements are entitled, at most, to a limited range of equivalents.²⁶ Therefore, when determining whether an accused device is substantially equivalent to the claim, and thus infringes it under the doctrine of equivalents, the court will allow the claim of a pioneer invention a much broader range of equivalents than the claim of an invention which is only a small advancement in a crowded field.

B. Procedure for Analysis of Patent Infringement

Courts traditionally follow a two-step approach to analyze patent infringement issues.²⁷ First, the claims are construed by the courts to determine their scope.²⁸ Second, the scope of the claims is then compared

amorphous doctrine of equivalents. Third, the doctrine permits abusive infringement actions claiming that the defendant infringes under the doctrine of equivalents and that a jury must decide the correctness of the claim. The imperative to settle under these circumstances is almost overpowering. Fourth, due process concerns are potentially raised to the extent that pervasive and systemic uncertainty generated by the doctrine of equivalents destroys the ability of patent claims to provide fair notice, so that they effectively provide no notice.

Id. at 682 (citations omitted).

23. *Continental Paper Bag Co. v. Eastern Paper Bag Co.*, 210 U.S. 405 (1908).

24. *Nelson v. Batson*, 322 F.2d 132, 135 (9th Cir. 1963).

25. *Id.* The *Nelson* case states:

Since the purpose of the doctrine of equivalents is to give the inventor an opportunity to secure a just reward for his invention—an opportunity which he would otherwise be denied because of the failure of the language of his claim to include devices which were in fact the same as his own in function, means, and result—the degree of protection afforded beyond the language of the claims will vary directly with the value of the inventor's contribution to the art.

Id. at 135.

26. D. CHISUM, PATENTS, 18.04[2] at 18-36.1-42 (1986) (citations omitted). See also HAYES, THE NATURE OF PATENTABLE INVENTION, 174-181 (1948).

27. *ZMI Corp. v. Cardiac Resuscitator Corp.*, 844 F.2d 1576, 1578 (Fed. Cir. 1988) (quoting *Mannesmann Demag Corp. v. Engineered Metal Products Co.*, 793 F.2d 1279, 1282 (Fed. Cir. 1986)).

28. *Id.*

with the accused device to determine whether the scope of the claims encompasses the accused device.²⁹ Questions of literal infringement or infringement under the doctrine of equivalents arise under the second of the two steps, the comparison of the scope of the claims with the accused device. However, the first step, the determination of the scope of the claims, is integral to a proper analysis of infringement.³⁰ Therefore, in order to gain a more complete understanding of the infringement analysis process, a discussion of how courts determine the scope of a claim is essential.

Courts construe claims by inspecting the language of the claims themselves, the specification, the drawings, and the file wrapper.³¹ The specification is helpful in determining the scope of the claims because "the words must be used in the same way in both the claims and the specification."³² Patents may also contain drawings which can be useful as visual representations to "flesh out" the words used in the claims and specification.³³ The final aid which courts use in determining the scope of a patent is the file wrapper.

The file wrapper is a record of the prosecution history of the patent. It contains "the entire record of the proceedings in the Patent Office from the first application papers to the issued patent."³⁴ In claim construction, file wrapper estoppel (also known as prosecution history estoppel) is used to narrow the scope of the claims to the extent the claims had been narrowed during the prosecution history to avoid prior art rejection.³⁵ During the application process of a patent, the Patent Office may reject the application on the grounds that the invention is too broad, and encompasses prior art.³⁶ In order to have his patent accepted, the inventor will then amend, add, or cancel claims of his patent.³⁷ After making such changes, the inventor is estopped from claiming that the scope of the claims in his patent includes the subject matter that was surrendered during the prosecution history of his patent.³⁸

29. *Id.*

30. *Id.* ("Improper claim construction, i. e., an improper determination of the scope of the claims, can distort the entire infringement analysis." Quoting *Moeller v. Ionetics, Inc.*, 794 F.2d 653, 656 (Fed. Cir. 1986)).

31. *Autogiro Co. v. United States*, 384 F.2d 391 (Ct. Cl. 1967). *Cf.* *SRI International v. Matsushita Electric Corp.*, 775 F.2d 1107, 1118 (Fed. Cir. 1985) ("A claim is construed in the light of the claim language, the other claims, the prior art, the prosecution history, and the specification, *not* in light of the accused device.") (emphasis in original).

32. *Autogiro Co.*, 384 F.2d at 397.

33. *Id.*

34. *Id.*

35. *KAYTON*, *supra* note 1, at 2-27.

36. *CHISUM*, *supra* note 26, at 18.05[2].

37. *Id.*

38. *Hughes Aircraft Co. v. United States*, 717 F.2d 1351 (Fed. Cir. 1983).

During an infringement action, file wrapper estoppel constitutes a powerful limitation on the doctrine of equivalents because the equivalents of the patent's claims may never include material that the patent owner surrendered during the prosecution history of his patent.³⁹

After determining the scope of the claims, the courts will then proceed to the second step of an infringement analysis: comparison of the scope of the claims to the accused device to determine whether such device infringes upon the claims. Within this second step, the first issue is literal infringement.⁴⁰ If the accused device literally infringes the scope of the claims of the patent, then "infringement is made out and that is the end of it."⁴¹ Only if the court finds that the accused device does not literally infringe upon the scope of the claim, does it then proceed to the issue of infringement under the doctrine of equivalents.⁴²

How do courts apply the doctrine of equivalents when determining whether the accused device infringes upon the patented claims? Two schools of thought have developed with respect to the standard of applicability for the doctrine of equivalents. In cases such as *Hughes Aircraft Co. v. United States*⁴³ and *Texas Instruments Inc. v. International Trade Commission*,⁴⁴ the Court of Appeals for the Federal Circuit (hereinafter "Federal Circuit") held that the doctrine of equivalents was to be applied to the "invention as a whole."⁴⁵ These cases appear to contradict other cases such as *Lemelson v. United States*⁴⁶ and *ACS Hospital Systems, Inc. v. Montefiore Hospital*,⁴⁷ in which the Federal Circuit applied the doctrine of equivalents on an element-by-element basis and found that the accused product did not infringe upon the

39. *Townsend Engineering v. HiTec*, 829 F.2d 1086 (Fed. Cir. 1987), *later proceeding*, 117 F.R.D. 612 (N.D. Ill. 1987).

40. *Graver Tank & Mfg. Co. v. Linde Air Products*, 339 U.S. 605, 607 (1950).

41. *Id.* But see *Phillips Petroleum v. U. S. Steel Corp.*, 6 U.S.P.Q.2d (BNA) 1065, 1123 (D. Del. 1987). (Even if the accused product falls within the literal language of the claim, the reverse doctrine of equivalents may preclude a finding of infringement. Under the reverse doctrine of equivalents, "where the device is so far changed in principle from a patented article that it performs the same or similar function in a substantially different way but nevertheless falls within the literal words of the claim," the doctrine is used to restrict the claim, thus preventing a finding of literal infringement. Quoting *SRI International v. Matsushita Electric Corp.*, 775 F.2d 1107, 1123 (Fed. Cir. 1985), *aff'd*, 865 F.2d 1247 (Fed. Cir. 1989).

42. *Id.*

43. 717 F.2d 1351 (Fed. Cir. 1983).

44. 805 F.2d 1558 (Fed. Cir. 1986), *reh'g denied*, 846 F.2d 1369 (Fed. Cir. 1988), *reh'g denied*, (en banc) 7 U.S.P.Q.2d 1414 (Fed. Cir. 1988).

45. See *supra* notes 43 and 44.

46. 752 F.2d 1538 (Fed. Cir. 1985).

47. 732 F.2d 1572 (Fed. Cir. 1984).

patented device because the accused product lacked an element present in the patented device.⁴⁸

Much of the confusion that has been generated over the standard of applicability for the doctrine of equivalents stems from the assumption by many practitioners that these two standards are mutually exclusive—that to choose one is to reject the other. This assumption is not correct. Both standards should be integrated into a single framework in which to apply the doctrine of equivalents. In *Perkin-Elmer Corp. v. Westinghouse Electric Corp.*,⁴⁹ the Federal Circuit hinted at this framework when it applied an element-by-element analysis while simultaneously stating that it is “legal error not to ‘apply the doctrine of equivalents to the claimed invention as a whole.’”⁵⁰

The conflict between the proponents of a single framework, incorporating both the element-by-element analysis and the invention as a whole analysis, and those who chose one standard to the exclusion of the other finally culminated in *Pennwalt Corp. v. Durand-Wayland, Inc.*⁵¹ The majority of the Federal Circuit in *Pennwalt* held in an *en banc* decision, that the standard of application for the doctrine of equivalents incorporates both the element-by-element standard and the invention as a whole standard.⁵² The remainder of this Note discusses the standard of applicability for the doctrine of equivalents as it evolved before *Pennwalt*, the *Pennwalt* decision, and what remains of the doctrine of equivalents after *Pennwalt*. It will be shown that courts have implicitly, if not explicitly, adopted both standards (the invention as a whole standard and the element-by-element standard) into a single framework in which to analyze infringement issues. The evolution of these two distinct standards results in a single workable framework that fulfills the goals of patent law by protecting the patent owner’s right in his

48. See *supra* notes 46 and 47.

49. 822 F.2d 1528 (Fed. Cir. 1987).

50. *Id.* at 1532 (quoting *Hughes Aircraft Co. v. United States*, 717 F.2d 1351, 1364 (Fed. Cir. 1983)). See also Nieman, *The Federal Circuit Resolves Ambiguities in the Doctrine of Equivalents*, 70 J. PAT. OFF. SOC’Y 91, 155 (1987) (“Legitimate distress over the Federal Circuit’s ‘new infringement analysis’ was short-lived. The author of *Hughes Aircraft*, Chief Judge Markey, clarified that opinion’s use of the ‘invention as a whole’ concept in *Perkin-Elmer Corp. v. Westinghouse Electric Corp.*”). But see Hantman, *Doctrine of Equivalents*, 70 J. PAT. OFF. SOC’Y 511, 548 (1988) (“Apparently, all these ‘doctrines of equivalents’ were too much for the Federal Circuit. In *Perkin-Elmer Corp. v. Westinghouse Electric Corp.*, the Federal Circuit appeared to back away from the doctrine of equivalents to the claimed invention as a whole. The Federal Circuit said that every element of a claim is material and every element or its substantial equivalent must be present in the infringing structure.”)

51. 833 F.2d 931 (Fed. Cir. 1987), *cert. denied*, 108 S. Ct. 1226 (1988), *cert. denied*, 108 S. Ct. 1474 (1988).

52. 833 F.2d 931, 935.

invention while giving his competitors notice of what constitutes his patent so that they may compete freely with him, without fear of infringing upon his patent.

II. THE EVOLUTION OF A SINGLE FRAMEWORK FROM THE "INVENTION AS A WHOLE" STANDARD AND THE "ELEMENT-BY-ELEMENT" STANDARD PRIOR TO *PENNWALT*

Until recently, case law concerning the doctrine of equivalents has not expressly addressed whether the standard of applicability is as an invention as a whole, or element-by-element, or a single framework incorporating both standards. Two extensive essays covering the development of the standard of applicability have reviewed case precedent since the Supreme Court's first discussion of the doctrine of equivalents in *Winans v. Denmead*⁵³ in 1853 to the *Graver Tank*⁵⁴ decision in 1950, and have arrived at entirely opposite conclusions. An article written by Hantman takes the viewpoint that not only does the invention as a whole standard have no legal basis in case precedent, but it goes one step further and concludes that the expansive doctrine of equivalents expounded in *Graver Tank* was "an anomaly that should have been overruled with the passage of 35 U.S.C 112(6)" of the Patent Act of 1952.⁵⁵ Judge Newman's dissenting opinion in *Pennwalt* discusses the

53. 56 U.S. 330 (1853).

54. 339 U.S. 605 (1950).

55. Hantman, *supra* note 50, at 551.

In addition to having no legal basis, the 'invention as a whole' approach to the doctrine of equivalents is not a workable doctrine. The approach provides no basis for analysis for infringement determination. It is ambiguous, uncertain and guaranteed to provide much litigation for the courts. Quite simply, it is not understandable. The *Pennwalt* expansive doctrine of equivalents applied on an element by element basis is a retreat from *Hughes* and *Texas Instruments*. However, the *Pennwalt* decision did not go far enough. It should also have retreated from the doctrine of equivalents of *Graver Tank*. The *Graver Tank* decision contradicted the previous one hundred years of Supreme Court precedents and the *Pennwalt* court should have considered it overruled by the last paragraph of Section 112, 35 U.S.C. 112 (6), of the Patent Act of 1952.

Cf. Jessup, *The Doctrine of Equivalents*, 54 J. PAT. OFF. SOC'Y 248, 270 (1972) ("The doctrine [of equivalents] is basically unsound and unfair to the patentee's competitors. Its continued existence is a reproach of the patent bar."); Klitzke, *Patent Law: Equivalency and Validity in the Seventh Circuit*, INTELLECTUAL PROP. L. REV. 49, 53 (1979) ("The doctrine of equivalents is a superfluous gloss on the patent law. The breadth of the generic terms allowed in the claims is the measure of the degree of advancement in the art. Reviewing courts must be cognizant of two facts: (1) the patentee will always generously expand the scope of the discovery in the specification, and (2) regardless of this, the test of patent scope ultimately must be the terms allowed by the Patent Office in the issued claims. To excessively extend the scope of the claims by the doctrine of equivalents may neutralize many months of negotiation in the patent prosecution process.")

same case precedent as the Hantman article. However, the similarity ends there. Newman's opinion is a strong proponent of the invention as a whole standard, and rejects the element-by-element analysis as "contrary to the overwhelming body of precedent."⁵⁶ The inapposite conclusions which these two well-reasoned essays have reached demonstrate how easy it was for two separate standards of applicability to develop and that a review of case precedent prior to recent years is not determinative of this issue.⁵⁷ Rather, a review of more recent cases which detail the evolution of both distinct standards into a unified framework is far more helpful to a determination of the state of case precedent on this issue prior to the *Pennwalt* decision.

A. *Interdent: An Element-by-Element Approach*

In a 1976 decision, *Interdent Corp. v. United States*,⁵⁸ the Court of Claims (whose decisions are binding on the Federal Circuit) applied an element-by-element analysis, and held that the accused product, a Water Pik surgical irrigator, did not infringe on the claim of another surgical irrigator because the accused product lacked the composite switch and valve set forth in the claim of the original device.⁵⁹ Instead, the accused product only used a single switch to turn the unit on, and did not use a valve to control the fluid flow through the outlet conduit.⁶⁰ The lack of an element in the claim of the original device, the valve, prevented a finding of infringement under the doctrine of equivalents. The court in *Interdent* held that "each element of a patented combination is considered to be material and essential. Thus, the omission of any one of the elements of the claimed combination avoids infringement."⁶¹ This is known as the "all elements" rule and typifies the element-by-element approach.⁶²

However, even if the court in *Interdent* had applied the invention as a whole standard of applicability of the doctrine of equivalents, it is doubtful that the court would have arrived at a different conclusion. During the prosecution of the original patent, the claim was accepted by the Patent Office only after it had distinguished itself from existing patents by showing that it had improved upon existing devices by com-

56. 833 F.2d at 974 (Newman, J., dissenting commentary).

57. Hantman, *supra* note 50, at 551. ("However, the dissenting opinion in the *Pennwalt* case shows that one may take a different view of the precedents and arrive at a different conclusion.")

58. 187 U.S.P.Q. (BNA) 523 (Ct. Cl. 1975), *aff'd per curiam*, 531 F.2d 547 (1976).

59. *Id.*

60. 531 F.2d at 553.

61. *Id.* at 552.

62. *Id.*

binning a novel valve and switch structure. The court in *Interdent* stated "in instances such as those at bar, where a patent depends for its novelty on a single feature, courts have been reluctant to expand the coverage of a claim by the doctrine of equivalents to cover a device which lacks that single feature."⁶³ This limitation on the range of equivalents where the patentee has narrowed his claims in order to avoid the prior art is an example of file wrapper estoppel.⁶⁴ It constitutes a valid restriction on the range of equivalents that may be considered when applying the doctrine of equivalents. Thus, even if the court in *Interdent* had viewed the invention as a whole, the original patentee would still have been estopped from claiming infringement where the accused product lacked the one feature that constituted the point of novelty of the original patent.

B. Hughes Aircraft: The Federal Circuit Expresses the Invention as a Whole Standard

A 1983 decision written by Chief Judge Markey, *Hughes Aircraft Co. v. United States*,⁶⁵ was the first time the Federal Circuit expressly set forth the invention as a whole standard.⁶⁶ The court held that it was reversible error to fail to apply the doctrine of equivalents to the invention as a whole.⁶⁷ In *Hughes Aircraft*, the Federal Circuit addressed a claim of infringement concerning a patented satellite which had a unique attitude control system.⁶⁸ The claims included a means for transmitting an orientation signal to a fixed external coordinate system (earth) and a means for receiving control signals from that external location.⁶⁹ The satellite then used the control signals from earth to reorient itself by firing corrective jets.⁷⁰ The accused satellite was equivalent to the original one except that it did not transmit an orientation signal to earth, but rather supplied the orientation signal to an on-board computer which then used a control signal from earth to reorient the satellite.⁷¹

On the issue of infringement under the doctrine of equivalents, the trial court held that because there was "no obvious or exact equivalent" of two elements of the original claim, including the means for transmitting

63. *Id.*

64. *Id.* at 525, 551. See *supra* text accompanying notes 34-39 for a discussion of file wrapper estoppel.

65. 717 F.2d 1351 (Fed. Cir. 1983).

66. *Id.*

67. *Id.* at 1364.

68. *Id.* at 1353.

69. *Id.* at 1355.

70. *Id.* at 1354.

71. *Id.* at 1363-64.

an orientation signal to earth, the accused satellite did not infringe the claims.⁷² The Federal Circuit reversed the holding of the trial court, and found that the two satellites were substantially equivalent.⁷³ In enunciating its decision, the Federal Circuit made the following statement, setting forth the invention as a whole requirement to an infringement analysis under the doctrine of equivalents. "The failure to apply the doctrine of equivalents to the claimed invention as a whole, and the accompanying demand for 'obvious and exact' equivalents of two elements the presence of which would have effectively produced literal infringement, was error."⁷⁴ With this single, seemingly innocent sentence, the Federal Circuit opened up a Pandora's box of future misconstructions and ambiguities. All recent cases which assert that the invention as a whole analysis is the only correct approach to determine infringement under the doctrine of equivalents, do so citing the above sentence from *Hughes Aircraft*.⁷⁵

The above statement from the Federal Circuit in *Hughes Aircraft* actually refers to two distinct errors on the part of the trial court.⁷⁶ The first was the trial court's error in requiring "obvious and exact" equivalents for the two means-plus function clauses that were present in the original patent but were missing from the accused satellite.⁷⁷ The Federal Circuit correctly identified the trial court's requirement of "obvious and exact" equivalents as a more stringent standard than the "substantially the same function, way, and result" test for the doctrine of equivalents under *Graver Tank*.⁷⁸ The "obvious and exact" equivalents test imposes a more onerous burden on the patent owner to show infringement under the doctrine of equivalents than was previously mandated by case precedent. The Federal Circuit held that the trial court's use of the "obvious and exact" equivalents test was no more than a redundant literal infringement inquiry, and not dispositive of the issue of infringement under the doctrine of equivalents.⁷⁹ Moreover, the Federal Circuit was puzzled by why the "obvious and exact" equivalents test was not satisfied by evidence of the accused satellite's use of an on-

72. *Id.* at 1364.

73. *Id.* at 1366.

74. *Id.*

75. See, e.g., *Pennwalt Corp. v. Durand-Wayland, Inc.*, 833 F.2d 931, 940-42 (Fed. Cir. 1987) (Bennett, J., dissenting), 833 F.2d at 972 (Newman, J., dissenting commentary); *Texas Instruments Inc. v. Int'l Trade Comm'n*, 805 F.2d 1558, 1569-70 (Fed. Cir. 1986).

76. 717 F.2d at 1364.

77. *Id.*

78. *Id.*

79. *Id.* ("However the phrase 'obvious and exact' equivalents may be defined, it was effectively and improperly applied here as a substitute for literal infringement, the absence of which was conceded." *Id.* at 1364.)

board computer to perform all of the functions of the two disputed means-plus function claims in the original patent.⁸⁰

The second of the two distinct trial court errors was its failure to apply the doctrine of equivalents to the invention as a whole.⁸¹ Much of the controversy regarding the standard of applicability for the doctrine of equivalents stems from the Federal Circuit's expression in *Hughes Aircraft* of the invention as a whole standard. As the Federal Circuit later clarified in *Perkin-Elmer Corp. v. Westinghouse Electric Corp.*,⁸² the invention as a whole standard merely requires that each element be viewed in the context of the entire patent. There is no language in the *Hughes Aircraft* opinion that indicates that the invention as a whole analysis excludes the element-by-element approach.⁸³

In fact, after stating that the trial court erred in failing to apply the doctrine of equivalents to the invention as a whole, the Federal Circuit then proceeded to compare each of the elements in the original patent to the accused satellite to determine if the elements or their equivalents were present in the accused device.⁸⁴ This is the heart of an element-by-element analysis. In comparing each of the disputed elements of the original patent to the accused satellite, the Federal Circuit viewed each element in the context of the entire claim to determine its appropriate range of equivalents.⁸⁵ This is what the court in *Hughes Aircraft* meant by an invention as a whole approach. The Federal Circuit's use of an element-by-element analysis in conjunction with the invention as a whole standard shows that the "invention as a whole" statement⁸⁶ was not meant to embody the sole type of analysis for infringement under the doctrine of equivalents. Rather, it was meant to express further limitations which courts had already implicitly applied on the element-by-element analysis.

C. *ACS Hospital and Lemelson: The "All Elements" Rule After Hughes Aircraft*

The "all elements" rule states that where "the accused device omits an element of the claimed invention, the accused device may therefore be viewed as failing to function in 'substantially the same way' as the

80. *Id.*

81. *Id.*

82. 822 F.2d 1528 (Fed. Cir. 1987). See *infra* text accompanying notes 123-28.

83. 717 F.2d 1351 (Fed. Cir. 1983).

84. *Id.* at 1364-66.

85. *Id.* See *supra* text accompanying notes 23-26, for a discussion of the range of equivalents to be afforded a claim under the doctrine of equivalents.

86. *Id.* at 1364.

claimed invention.”⁸⁷ This rule is based upon two interrelated premises. First, each element of a claim is material and essential.⁸⁸ Second, because each element is essential to the claim, the omission of any element in the claim prevents a finding of infringement under the doctrine of equivalents.⁸⁹ The “all elements” rule comprises the backbone of any element-by-element analysis, for if the accused device does not contain one of the elements of the original patent (or its equivalents), then it does not infringe upon that patent.

The application of the “all elements” rule to an infringement analysis under the doctrine of equivalents does not preclude the application of the invention as a whole standard. As shown by *Hughes Aircraft*, the invention as a whole standard acts as a limitation on how the element-by-element analysis is applied.⁹⁰ Two cases decided by the Federal Circuit after *Hughes Aircraft* affirm the use of a single framework incorporating both standards.

In 1984, the Federal Circuit, in an opinion written by Judge Smith, held in *ACS Hospital Systems, Inc. v. Montefiore Hospital*⁹¹ that the accused device did not infringe upon the patented rental television system because it did not have one of the elements of the claim—a function for overriding a locked key switch.⁹² In reaching a finding of non-infringement based on the absence in the accused device of an element in the original patent, the Federal Circuit’s analysis typified the element-by-element approach. However, the court also implicitly applied the invention as a whole approach in its determination of the range of equivalents of the missing element.

The original patent only contained three elements: a key operated actuating switch, an override switch, and a signal light to indicate that the override switch has been actuated.⁹³ The Federal Circuit found that the accused device did not contain an override switch.⁹⁴ In construing the range of equivalents, the Federal Circuit viewed the override switch in the context of the entire claim of the original patent. This is the classic invention as a whole approach. Here, where the patented television rental system constitutes only a minor advancement over prior art,⁹⁵ it

87. Harris, *supra* note 8, at 98. See also *Pennwalt Corp. v. Durand-Wayland, Inc.*, 833 F.2d 831, 949-52 (Fed. Cir. 1987) (Nies, J., additional views).

88. *Interdent Corp. v. United States*, 531 F.2d at 552 (Ct. Cl. 1976).

89. *Id.*

90. 717 F.2d 1351 (Fed. Cir. 1983).

91. 732 F.2d 1572 (Fed. Cir. 1984).

92. *Id.*

93. *Id.* at 1574.

94. *Id.* at 1579-81.

95. *Id.* (The trial court held that the original patent was invalid for obviousness

is accorded a narrow range of equivalents. Also, it may be reasoned as a general proposition that when the disputed element is one out of a few total elements in the claim, this element is more important to the patented combination of elements than when it comprises only one element out of a large number of elements in the claim. Logically, the more important the element is to the patented combination, the narrower should be the range of equivalents accorded to that element.⁹⁶ As a result of the narrow range of equivalents for the override switch, the court did not find infringement of the original patent under the doctrine of equivalents.

In 1985, the Federal Circuit again applied an integrated analysis of both the element-by-element and invention as a whole standards, this time in the case of *Lemelson v. United States*.⁹⁷ In *Lemelson*, the Federal Circuit, through an opinion written by Judge Baldwin, affirmed the trial court's finding of non-infringement where an element (manipulation means) of the original claim (surface sensing apparatus) was missing in the accused device.⁹⁸ Citing *Interdent Corp. v. United States*,⁹⁹ the court in *Lemelson* stated that "[i]t is also well settled that each element of a claim is material and essential, and that in order for a court to find infringement, the plaintiff must show the presence of every element or its substantial equivalent in the accused device."¹⁰⁰ This pronouncement of the "all elements" rule in *Lemelson* reaffirms the Federal Circuit's use of the element-by-element analysis in infringement issues under the doctrine of equivalents.

Interestingly enough, although the Federal Circuit in *Lemelson* cited *Hughes Aircraft* for other propositions, it made no mention of the requirement in *Hughes Aircraft* that the invention be viewed as a whole.

in light of prior art. The appellate court reversed this finding; however, a review of the cited prior art indicates that the original patent cannot be construed as more than a minor advancement in the technological area of television rental systems.)

96. See *George v. Honda Motor Co.*, 802 F.2d 432 (Fed. Cir. 1986) (Patent owner claimed that defendant infringed upon his patented internal combustion engine that contained a water-cooled cylinder and an air-cooled cylinder head. The accused device had a water-cooled cylinder head with a water jacket which covered the head. The Federal Circuit held that there was no infringement under the doctrine of equivalents because the air cooled cylinder head was an essential part of the claimed invention.) *George* is similar to *ACS Hospitals* in that the claims of the original patents are both comprised of three elements and the absence of one of these elements in the accused device precluded a finding of infringement. In both cases, the Federal Circuit found that the missing element was highly important to the patented combination, and thus accorded a narrower range of equivalents.

97. 752 F.2d 1538 (Fed. Cir. 1985).

98. *Id.*

99. 531 F.2d 547 (Ct. Cl. 1976); see *supra* text accompanying notes 58-64.

100. 752 F.2d at 1551 (Fed. Cir. 1985).

However, a review of the court's infringement analysis reveals that it impliedly adopted the invention as a whole approach when determining the range of equivalents to be accorded the manipulation means.¹⁰¹ Both *ACS Hospital* and *Lemelson* demonstrate the implicit integration of the invention as a whole approach in cases where the apparent application of the "all elements" rule would lead the unwary to believe that only the element-by-element analysis was used.

D. Texas Instruments: Extension of the Invention as a Whole Standard to Preclude Infringement Even When All Elements Are Substantially Similar

In a decision rendered in 1986 and written by Judge Newman,¹⁰² *Texas Instruments, Inc. v. International Trade Commission*,¹⁰³ the Federal Circuit applied the invention as a whole approach, not only in the context of infringement under the doctrine of equivalents, but also in the issue of literal infringement.¹⁰⁴ The Federal Circuit's opinion in *Texas Instruments* has been criticized by the patent community for its interpretation of the invention as a whole standard that was ambiguously set forth in *Hughes Aircraft*.¹⁰⁵ Rather than using the invention as a whole requirement as an admonition to view each element in the context of the entire claim, the Federal Circuit instead used it as authority for comparing the accused device with the claimed invention as a whole.¹⁰⁶ It was this novel use of the invention as a whole requirement in *Texas Instruments* that has caused much of the current confusion over the standard of applicability for the doctrine of equivalents.

In *Texas Instruments*, the Federal Circuit upheld a decision of the United States International Trade Commission that the means-plus function claims of a pioneer patent for a portable electronic calculator were

101. *Id.*

102. Judge Newman, as shown by her dissenting commentary in *Pennwalt*, is one of the strongest proponents of the invention as a whole standard to the exclusion of the element-by-element analysis.

103. 805 F.2d 1558 (Fed. Cir. 1986), *reh'g denied* 846 F.2d 1369 (Fed. Cir. 1988), *reh'g denied*, (en banc) 7 U.S.P.Q.2d (BNA) 1414 (Fed. Cir. 1988).

104. *Id.*

105. See Nieman, *supra* note 50, at 154-5.

The *Texas Instruments* opinion was greeted by a firestorm of criticism from the patent bar The [American Intellectual Property Law Association] interpreted the *Texas Instruments* opinion as signalling a rejection of an element-by-element infringement analysis under Section 112 (6), or the doctrine of equivalents in favor of viewing the claimed invention 'as a whole' divorced from adherence to the claim language.

Id.

106. 805 F.2d at 1571.

not infringed by imported calculators.¹⁰⁷ First, the Federal Circuit found that the functional claims of the original patent were not literally infringed by the accused device.¹⁰⁸ The court reviewed each of the functional clauses in the original patent¹⁰⁹— the input means, the electronic means, and the display means — and concluded that although the Commission's finding of nonequivalence was not supported by the evidence when each element is considered separately, "the accused devices do not infringe properly construed claims when the invention and the accused devices are viewed as a whole."¹¹⁰ This is similar to the reverse doctrine of equivalents¹¹¹ where the court will apply the doctrine of equivalents to defeat a finding of infringement where the accused device falls within the literal language of the claims but is so far changed from the original invention that the patent owner of the original claims has no right to the accused device.¹¹² The Federal Circuit's use of the "invention as a

107. *Id.*

108. *Id.*

109. *Id.* at 1570.

To summarize the totality of changes: The input means in the '921 patent is a keyboard encoder that operates through conductive strips under the keys, whereas in the accused devices it is a scanning matrix encoder. The electronic means in the '921 patent is an integrated semiconductor array based on bipolar semiconductor technology; the accused devices use metal oxide semiconductors and embody significant advances in chip design and integrated circuitry. The display means in the '921 patent is a thermal printer, whereas the accused calculators use liquid crystal displays.

Id.

110. *Id.* at 1564, 1570.

[The] accumulated differences distinguish the accused calculators from that contemplated in the '921 patent and transcend a fair range of equivalents of the '921 invention. Each individual difference, standing alone, could conceivably lead to a different result, by application of this court's precedent. It is to the invention as a whole to which this same precedent directs our analysis.

Id.

111. *See supra* note 41.

112. *See supra* note 41. Remember that equivalents of means-plus function clauses are deemed to fall within the literal language of the claims, and comprise an analysis that is separate from the determination of the functional equivalence in the doctrine of equivalents. *See supra* text accompanying notes 11-14. In her denial of petition for rehearing, Judge Newman later refuted suggestions by the amicus that the reverse doctrine of equivalents was applicable. 846 F.2d 1369, 1371 (Fed. Cir. 1988). She explained that the court had held that there was no literal infringement even though the functions of the accused devices and the original patent were equivalent because the structures performing those functions were non-equivalent. *Id.* Therefore, Judge Newman flatly concluded that without the prerequisite of literal infringement, the reverse doctrine of equivalents cannot be invoked. *Id.*

This conclusion ignores the underlying meaning of the reverse doctrine of equivalents—that literal infringement is precluded when the accused device falls within the literal

whole'' language in its literal infringement analysis¹¹³ is merely a somewhat careless substitution for the usual reverse doctrine of equivalents language that the accused device does not lie within the scope of the claims of the original patent because "it performs the same or similar function in a substantially different way."¹¹⁴

Second, in the Federal Circuit's analysis of whether the accused device infringed the original patent under the doctrine of equivalents, the Federal Circuit states that the proper analysis consists of a comparison of the accused device with the claimed invention as a whole.¹¹⁵ To follow this usage of the invention as a whole requirement would in effect, exclude any element-by-element analysis. Under the *Texas Instruments* approach to the invention as a whole requirement, an accused device could be found to infringe a patented claim even if it failed to contain an element of the claim. This potential outcome is in clear derogation of the "all elements" rule which states that a finding of infringement is precluded against all accused devices that do not contain an essential

language of the claims, but performs the same or similar function in a different way. In holding that the same functions were performed by the accused device but that the structures performing those functions were different, the court basically held that the same functions were performed in a different way. This is the essence of the logic behind the reverse doctrine of equivalents.

Even Judge Davis, who joined in both the original opinion and part of the denial of petition for rehearing, stated that in deciding the original case, he applied an analogy to the reverse doctrine of equivalents. *Id.* at 1372.

I agree with the result and join all of Judge Newman's opinion except the last portion, headed 'The Reverse Doctrine of Equivalents.' My view is that both the original opinion in this case (which I joined) and the opinion on rehearing (the greater part of which I have joined) reflect principles comparable to (though distinct from) the reverse doctrine of equivalents I have considered it proper to apply here an analogue or parallel of the reverse doctrine of equivalents—though not that doctrine in and of itself.

Id. Therefore, the literal infringement analysis in *Texas Instruments* may fairly be read as embodying the spirit of the reverse doctrine of equivalents principles. *See also* Nieman, *supra* note 50, at 160. ("Texas Instruments must be deemed to be a *sub silentio* 'reverse doctrine' case in light of the *in banc* decision in *Pennwalt*.")

113. *Texas Instruments*, 805 F.2d at 1568-71.

114. *Graver Tank*, 339 U.S. 605, 608-9 (1950). *See also* *Mead Digital Systems, Inc. v. A. B. Dick Co.*, 723 F.2d 455, 462 (6th Cir. 1983).

[T]he doctrine of equivalents is a two-edged sword: 'where a device is so far changed in principle from a patented article that it performs the same or similar function in a substantially different way, but nevertheless falls within the literal words of the claim, the doctrine of equivalents may be used to restrict the claim and defeat the patentee's action for infringement.' The doctrine thus may be applied in favor of as well as against a patentee.

Id. (citations omitted.)

115. 805 F.2d at 1571.

element of the patented claim.¹¹⁶ This inconsistency with prior case law renders completely unviable any analysis of infringement under the doctrine of equivalents that consists solely of a comparison of the accused device and the patented invention as a whole.

Despite the court's statement that its analysis of infringement under the doctrine of equivalents depended solely on a comparison of the accused device with the invention as a whole, the court impliedly used an element-by-element analysis. In the section of the opinion discussing the doctrine of equivalents, the court referred to its reasoning on the issue of literal infringement.¹¹⁷ A review of the court's discussion of the issue of literal infringement reveals that the court examined each claim in the original patent to determine if it or its equivalent was present in the accused device.¹¹⁸ This type of analysis is indicative of an element-by-element analysis. In sum, the court addressed the issue of literal infringement using an element-by-element analysis, then incorporated this analysis by reference in its determination of infringement under the doctrine of equivalents. The court has, in actuality, not relied solely on an invention as a whole analysis, but has relied on an element-by-element analysis as well.¹¹⁹ Therefore, *Texas Instruments* may be viewed as standing for the following proposition: in an infringement analysis under the doctrine of equivalents, after determining by an element-by-element analysis that the accused device contains an equivalent for each element in the patented claim, a court may still deliver a finding of non-infringement if it finds that a comparison of the accused device with the claimed invention as a whole reveals that the totality of the differences renders the two nonequivalent.¹²⁰

E. Perkin-Elmer: Federal Circuit Explicitly Integrates Both Invention as a Whole and Element-by-Element Standards in the Same Case

Finally, a few months before the *Pennwalt* case was decided, the Federal Circuit in *Perkin-Elmer Corp. v. Westinghouse Electric Co.*¹²¹

116. See *supra* text accompanying notes 59-62, 87-89.

117. 805 F.2d at 1572.

In this case, the determination turns on the totality of change in the accused devices from that described in the '921 specification. For the reasons discussed in part A [literal infringement], the extensive technological advances in all of the claimed functions support the ALJ's finding that the accused devices are not equivalent to the claimed invention, applying the criteria of *Graver Tank*.

Id.

118. *Id.* at 1561-71.

119. *Id.*

120. *Id.*

121. 822 F.2d 1528 (Fed. Cir. 1987).

expressly sanctioned the use of an integration of both the invention as a whole standard and the element-by-element standard in infringement analyses.¹²² Chief Judge Markey explained that his adoption of the invention as a whole approach in *Hughes Aircraft* did not reject the element-by-element analysis.¹²³

In *Hughes Aircraft Co. v. United States*, this court noted that it was legal error not to 'apply the doctrine of equivalents to the claimed invention as a whole.' That statement dealt with an infringement inquiry implicating an entire claim, as distinguished from a section 112 (6) inquiry implicating only a "means plus function" limitation of a claim. That statement also was a recognition that, in applying the doctrine of equivalents, each limitation must be viewed in the context of the entire claim. The statement should not be interpreted as sanctioning the treatment of claim limitations as insignificant or immaterial in determining infringement.¹²⁴

Chief Judge Markey then reiterated the now familiar "all elements" rule, adding that in order to be considered a substantial equivalent for purposes of the rule, the element substituted in the accused device for the element set forth in the claim must not substantially change the manner in which the original invention functions.¹²⁵

In clarifying the invention as a whole language as it was presented originally in *Hughes Aircraft*, the Federal Circuit has affirmed the usage of both the invention as a whole standard and the element-by-element standard into a single framework for analyzing issues of infringement under the doctrine of equivalents. According to *Perkin-Elmer*, these two distinct standards intertwine in the following way. The first tier of inquiry is whether the plaintiff can show the presence of every element of his claim in the accused device.¹²⁶ If certain elements in his claim are missing from the accused device, the inquiry now becomes whether he can show the presence of substantial equivalents of those elements.¹²⁷ To determine the range of equivalents to be accorded the disputed elements, each element must be viewed in the context of the entire claim.¹²⁸

In *Perkin-Elmer*, the patent in question is a resonant coupler for an electrodeless discharge lamp.¹²⁹ The original invention uses an au-

122. *Id.*

123. *Id.* at 1532-33.

124. *Id.* (citations omitted).

125. *Id.*

126. *Id.*

127. *Id.*

128. *Id.*

129. *Id.* at 1322-33.

totransformer-type tap coupling, while the accused device uses a transformer-type loop coupling.¹³⁰ In these two types of couplings, the connecting points between the helical coil and the power source and the coupling arrangements are different.¹³¹ The majority held that these differences establish that the two types of couplings do not work in substantially the same way, and thus, there is no infringement under the doctrine of equivalents.¹³² In a dissenting opinion, Judge Newman argued that the accused device does infringe under the doctrine of equivalents, based on a finding that the two types of couplings work in substantially the same way.¹³³

Judge Newman contended that the majority failed to follow case precedent, and misapplied the invention as a whole standard.¹³⁴ This criticism of the majority's opinion is not unexpected when considering that the majority impliedly disapproved of the application of the invention as a whole standard to means-plus function inquiries, such as was done in *Texas Instruments*.¹³⁵ Although *Perkin-Elmer* clarifies the application of the invention as a whole standard in *Hughes Aircraft*,¹³⁶ it still leaves unresolved the applicability of the invention as a whole standard in *Texas Instruments* to means-plus function clauses in issues of literal infringement. It also does not address the fate of the holding in *Texas Instruments* that the invention as a whole standard can be applied to prevent a finding of infringement even where the elements, when viewed separately, are substantially equivalent.

F. District Court Opinions

The ambiguities in the Federal Circuit's treatment of the standard of applicability for the doctrine of equivalents have been echoed in district court opinions.¹³⁷ A review of recent opinions prior to *Pennwalt* reveals that most district courts are unclear as to what the standard of analysis for the doctrine of equivalents is, thereby explicitly adopting one standard while implicitly integrating it with the reasoning of the other.¹³⁸ Most opinions explicitly adopt an element-by-element analysis.¹³⁹

130. *Id.*

131. *Id.* at 1323.

132. *Id.* at 1326-27.

133. *Id.* at 1329 (Newman, J., dissenting).

134. *Id.* at 1327 (Newman, J., dissenting).

135. 805 F.2d 1558 (Fed. Cir. 1986).

136. 717 F.2d 1351 (Fed. Cir. 1983).

137. *See infra* notes 139-40.

138. *Id.*

139. *Amicus Inc. v. American Cable Co.*, 660 F. Supp. 161 (E.D. La. 1987); *Weber v. Ford Motor Co.*, 664 F. Supp. 631 (D. Mass. 1987); *Westnafa USA Inc. v. Whole*

Only a few opinions explicitly apply the invention as a whole approach.¹⁴⁰

III. PENNWALT CORP. V. DURAND-WAYLAND, INC.

In *Pennwalt Corp. v. Durand-Wayland, Inc.*,¹⁴¹ Pennwalt sued Durand-Wayland for alleged infringement of Pennwalt's patented fruit sorter.¹⁴² The majority opinion of the Federal Circuit written by Judge Bissell, and joined by Judges Friedman, Rich, Davis, Nies, Archer, and Chief Judge Markey (author of the *Hughes Aircraft* and *Perkin-Elmer* decisions), affirmed the trial court's finding that Durand-Wayland's fruit sorter did not infringe Pennwalt's claims either literally or under the doctrine of equivalents.¹⁴³ Instrumental to the majority's decision was the following quote from *Lemelson*:

[I]n applying the doctrine of equivalents, *each limitation must be viewed in the context of the entire claim* It is . . . well settled that each element of a claim is material and essential, and that in order for a court to find infringement, the plaintiff must show the presence of *every element or its substantial equivalent* in the accused device.¹⁴⁴

In relying upon the above quote from *Lemelson*, the majority adopted an infringement analysis that combines both the invention as a whole approach and the element-by-element standard.

The majority rejected Pennwalt's arguments that the accused devices performed substantially similar functions in substantially the same way to achieve the same result, in this case, the sorting of fruit.¹⁴⁵ In doing so, the majority relied upon the trial court's findings that the accused device was missing certain functions of the patented fruit sorter and that the functions which were performed by the accused device were

Life Co., 3 U.S.P.Q.2d 1352 (D. Mass. 1987); *Intra Corp. v. Hamar Laser*, 662 F. Supp. 1420 (E.D. Mich. 1987), *cert. denied*, 109 S. Ct. 1746 (1989); *Baker Oil Tools v. TRW Inc.*, 673 F. Supp. 1061 (N.D. Okla. 1987).

140. *Moleculon Research v. CBS*, 666 F. Supp. 661 (D. Del. 1987), *rev'd*, 872 F.2d 407 (Fed. Cir. 1989); *Key Manufacturing Group Inc. v. Microdot*, 679 F. Supp. 648 (E.D. Mich. 1987), *aff'd in part, vacated in part*, 854 F.2d 1328 (Fed. Cir. 1988). *But cf.* *Intra Corp. v. Hamar Laser*, *supra* note 139; *Simmons Fastener Corp. v. Illinois Tool*, 663 F. Supp. 697 (N.D.N.Y. 1987).

141. 833 F.2d 931 (Fed. Cir. 1987), *cert. denied*, 108 S. Ct. 1226 (1988), *cert. denied*, 108 S. Ct. 1474 (1988).

142. *Id.*

143. *Id.*

144. *Id.* at 935 (quoting *Lemelson v. United States*, 752 F.2d 1538, 1551 (Fed. Cir. 1985)) (emphasis added).

145. *Id.* at 935.

substantially different.¹⁴⁶ “[T]he district court correctly relied upon an element-by-element comparison to conclude that there was no infringement under the doctrine of equivalents, because the accused devices did not perform substantially the same functions as the Pennwalt invention.”¹⁴⁷ The language of the majority opinion makes it clear that the backbone of an infringement analysis under the doctrine of equivalents is the element-by-element standard.

However, the majority also used the invention as a whole approach implicitly when it viewed each element in the context of the entire claim.¹⁴⁸ For example, the majority agreed with the trial court’s finding that the range of equivalents for the position-indicating means is narrow for two reasons.¹⁴⁹ The first reason is because the entire invention was not a pioneer, but only “an improvement in a crowded field,” thereby permitting only a narrow range of equivalents.¹⁵⁰ The second limitation upon the range of equivalents results from the prosecution history which indicated that the addition of the position-indicating means was crucial to the invention’s patentability.¹⁵¹ Therefore, the inventor is estopped from obtaining a range of equivalents that expands upon the specific functional limitations that were necessary in order to secure his patent.¹⁵²

The majority in *Pennwalt* also resolved an ambiguity that arose in case precedent after the *Texas Instruments* opinion: the application of a means-plus function equivalents analysis to the doctrine of equivalents.¹⁵³ Means-plus function equivalence in a literal infringement inquiry requires exact equivalence.¹⁵⁴ “If the required function is not performed exactly in the accused device,” then means-plus equivalents for the purposes of literal infringement are not involved.¹⁵⁵ The majority in *Pennwalt* then proceeded to state that means-plus equivalents inquiries for literal infringement play no role in determining whether the accused device performs an equivalent function for purposes of the tripartite *Graver Tank* test under the doctrine of equivalents.¹⁵⁶

146. *Id.*

147. *Id.*

148. *Id.* at 934-39.

149. *Id.* at 937.

150. *Id.* (“The claims are ‘broad’ with respect to what type of product can be sorted, i.e., ‘items’ and, thus, sorters of all types fall within the relevant prior art. The claims are *narrow*, however, with respect to how the claimed sorter operates.”) (emphasis in original).

151. *Id.*

152. *Id.* at 938.

153. See *supra* text accompanying notes 117-18.

154. 833 F.2d at 934.

155. *Id.*

156. *Id.*

The dissenting opinion written by Judge Bennett and joined by Judges Cowen, Smith and Newman (the author of the *Texas Instruments* opinion) expressed concern that an element-by-element comparison would undermine the concept of the doctrine of equivalents.¹⁵⁷ Such an analysis, the dissent feared, would be the equivalent of literal infringement and would be "so unduly restrictive and inflexible as to end its usefulness as a judicial doctrine."¹⁵⁸

In fact, the majority's current analysis under the doctrine of equivalents amounts to nothing more than the search of 'obvious and exact equivalents' that this court denounced in *Hughes*. . . . In my view, the majority's adoption of a rigid element-by-element analysis for the doctrine of equivalents skews the balance well toward a slavish and formalistic adherence to the words of a claim to the detriment of both the patent owner and the public.¹⁵⁹

The dissent protests that in requiring an element-by-element analysis, the majority overruled *Hughes Aircraft* without even addressing the case in its opinion.¹⁶⁰

The basic principle underlying the dissent's argument, that the element-by-element standard and the invention as a whole standard are mutually exclusive, is incorrect. In stating that the trial court correctly applied an element-by-element analysis, the majority was merely reiterating the well-established "all elements" rule.¹⁶¹ By approving the element-by-element standard, the majority did not reject the invention as a whole approach *sub silentio*. The majority implicitly incorporated the invention as a whole approach in its determination of the range of equivalents to be accorded the disputed elements.¹⁶² The dissent failed to recognize the majority's usage of the invention as a whole restriction simply because the dissent never started with an accurate picture of invention as a whole restriction. The dissent views the invention as a whole standard which was first set forth in *Hughes Aircraft* to require a comparison of the accused device and the claimed invention as a whole to determine if the tripartite test of *Graver Tank* is satisfied.¹⁶³ As *Perkin-Elmer* indicates, this is an inaccurate view of the invention as a whole standard.¹⁶⁴ The invention as a whole standard is merely a re-

157. *Id.* at 939-40 (Bennett, J., dissenting).

158. *Id.* at 940.

159. *Id.* at 942, 948.

160. *Id.* at 941.

161. *Id.* at 949-52 (Nies, J., additional views).

162. See *supra* text accompanying notes 148-152.

163. 833 F.2d at 948.

164. 822 F.2d 1528 (Fed. Cir. 1987).

quirement that each element be viewed in the context of the entire claim.¹⁶⁵ Its integration into the element-by-element analysis is not only possible but required.

Furthermore, the dissent's view of the invention as a whole restriction invites short-sighted policy considerations. Although the doctrine of equivalents was created to prevent inequity, courts are not free to disregard the statutory requirement that patent claims set forth the boundaries of what the applicant regards as his invention.¹⁶⁶ If courts are permitted to find infringement even where the accused device lacks an element of the patented claim, then the competitors' due process rights are violated because they no longer have notice of what constitutes a technological advance sufficient to avoid infringement.¹⁶⁷

Nor will the dissent's view of the invention as a whole standard aid patent owners because they will likewise be uncertain where the courts will draw the line on the issue of infringement. An approach that allows a court to find infringement based upon its view of what the invention encompasses rather than what the elements in the claim set forth may even encourage sloppy drafting of claims because the vaguer the claim, the more leeway the court has in interpreting what the claim encompasses. One of the fundamental goals of patent law is to promote consistency and predictability in case decisions so that patent owners and competitors alike can know what is currently protected by patents and what is not. An infringement analysis that leaves the determination of what the patented claim encompasses to the subjective views of the court will only serve to add uncertainty to case law.

IV. FRAMEWORK FOR ANALYSIS OF INFRINGEMENT ISSUES AFTER *PENNWALT*

The *Pennwalt* decision, together with *Perkin-Elmer*, greatly clarified the standard of analysis for infringement issues under the doctrine of equivalents. Both cases show that the correct method of analysis is an integration of the element-by-element standard and the invention as a whole approach. The following algorithm suggests the framework which the Federal Circuit will apply in future cases involving infringement issues.¹⁶⁸

165. *Id.*

166. 35 U.S.C. 112 (1982).

167. *Pennwalt Corp. v. Durand-Wayland, Inc.*, 833 F.2d 931, 954 (Fed. Cir. 1987).

168. A recent case, *May v. Carriage*, adopts the following methodology for infringement analyses after *Pennwalt* which was set forth in the Nieman article, *see supra*

(1) Claim Construction—Determine scope of the claims by examining:

- (a) the language of the claims themselves,
- (b) the specification,
- (c) the drawings, and

(d) the file wrapper.¹⁶⁹ File wrapper estoppel will prevent the inventor from claiming that subject matter which he surrendered during the prosecution of his patent application lies within the scope of his claims.¹⁷⁰

(2) Literal Infringement

(a) After ascertaining the scope of the claims, compare each element of the claims to the accused device. If all the elements in the claim read upon the accused device, then there is literal infringement of the claims.¹⁷¹

(1) Structural elements must be copied in order to be literally infringed.¹⁷²

(2) Means-plus functional elements are deemed to be literally infringed if the accused device contains equivalents of the means clauses.¹⁷³

note 50. 688 F. Supp. 408 (N.D. Ind. 1988).

Before *Pennwalt*, it was unclear whether, from an analytical viewpoint, the doctrine of equivalents was to be applied on an 'element-by-element basis' or to the invention 'as a whole.' Under *Pennwalt*, a doctrine of equivalents analysis should proceed as follows:

1. Determine whether the accused device achieves substantially the same result as the claimed invention.
2. Determine whether the accused device performs substantially the same work as the claimed invention.
3. Determine whether the accused device operates in substantially the same manner as the claimed invention. In so doing, compare each element of the claim with the accused device to determine whether the accused device contains each element or its substantial equivalent. *Pennwalt*, therefore, has adopted the element-by-element analysis.

688 F. Supp. at 422-23.

The above methodology is based on the erroneous view that the element-by-element standard and the invention as a whole standard are mutually exclusive. Because this methodology fails to incorporate any consideration of the invention as a whole standard, it fails to state the entire algorithm necessary for an infringement analysis under the doctrine of equivalents. Moreover, the issue of infringement in *May v. Carriage* is dicta because the court held that the patent was invalid for obviousness and thus cannot be infringed. *Id.* at 422.

169. See *supra* note 31.

170. See *supra* notes 34-39 and accompanying text.

171. *Graver Tank & Mfg. Co. v. Linde Air Products Co.*, 339 U.S. 605, 608-09 (1950).

172. See *supra* notes 12-14 and accompanying text.

173. See *supra* notes 12-14 and accompanying text.

To determine equivalence, the court will compare "the accused structure with the disclosed structure, and must find equivalent structure as well as identity of the claimed function for that structure."¹⁷⁴

(b) Before reaching a conclusion of literal infringement, ensure that the defense of the reverse doctrine of equivalents does not apply. If the accused device falls within the literal language of the claim but is "so far changed in principle from the patented article that it performs the same or similar function in a substantially different way," then a finding of literal infringement is precluded by the reverse doctrine of equivalents.¹⁷⁵

(c) Only if there is no literal infringement of the claims should the court then proceed to the infringement analysis under the doctrine of equivalents.

(3) Infringement under the Doctrine of Equivalents

(a) View the claimed invention as a whole to determine the range of equivalents to be accorded the entire invention on a continuum from a broad range of equivalents for a pioneer invention to a minimal range of equivalents for a small advancement.¹⁷⁶

(b) Compare the claimed invention to the accused device to determine whether they accomplish substantially the same results. This is the first part of the tripartite *Graver Tank* test, and unless the two inventions perform substantially the same end results, there is no infringement under the doctrine of equivalents.¹⁷⁷

(c) Compare each element of the claimed invention to the accused device to determine whether they accomplish substantially the same functions in substantially the same manner. This is a combination of the second and third part of the tripartite *Graver Tank* test, and unless it is satisfied, there is no infringement under the doctrine of equivalents.¹⁷⁸

(1) All elements of the claimed invention are material and essential.¹⁷⁹ Therefore, omission of any element or its equivalents by the accused device precludes a finding of infringement.¹⁸⁰ To determine whether the disputed element has an equivalent in the accused device:

174. *Pennwalt*, 833 F.2d at 934.

175. *See supra* note 114.

176. *See supra* notes 23-6 and accompanying text. *See also Corning Glass Works v. Sumitomo Electric, U.S.A., Inc.*, 868 F.2d 1251, 1260 (Fed. Cir. 1989) ("[T]he court made a subsidiary analysis comparable to the overall function/way/result analysis mandated for determining infringement of the claim under the doctrine of equivalents.")

177. *See supra* text accompanying notes 5-8.

178. *See Graver Tank & Mfg. Co. v. Linde Air Products*, 339 U.S. 605 (1950).

179. *See supra* notes 87-90 and accompanying text.

180. *See supra* notes 87-90 and accompanying text.

(a) Determine the range of equivalents of each element by viewing it in the context of the entire claim.¹⁸¹

(b) Accord elements which are the major features of the claimed invention a narrower range of equivalents, while elements that are minor features should be accorded a broader range of equivalents.¹⁸² As a general proposition, note that when the total number of elements in a claim diminishes, each element becomes more important to the claim as a whole, and should be accorded a narrower range of equivalents.¹⁸³

(c) One-to-one equivalence between the corresponding components of the accused device and the original patent is not necessary for a finding of elemental equivalence.¹⁸⁴ So long as an equivalent is

181. See *supra* text accompanying notes 124-28.

182. R. ELLIS, *PATENT CLAIMS*, 33 (1949) ("An invention, however, usually has minor as well as major features. The doctrine of equivalents may be invoked as to either or both the minor and major features. . . . The less important the minor feature is relatively to the main feature, the wider the range of equivalents as applied to the minor feature. This is due to the fact that a subsidiary feature of an invention can be radically changed with less effect on the invention as a whole than a relatively minor change in the main feature of the invention.")

183. See *supra* note 96 and accompanying text.

184. A post-*Pennwalt* decision, *Corning-Glass Works v. Sumitomo Electric, U.S.A., Inc.*, demonstrates the Federal Circuit's application of the doctrine of equivalents to reach a finding of infringement. 868 F.2d 1251 (Fed. Cir. 1989). In *Corning-Glass*, the inventions under scrutiny relate to the structure and method for making optical waveguide fibers. *Id.* at 1253-55. The original patent disclosed an optical fiber in which a certain dopant in the core increased the refractive index of the core (a "positive dopant"), and caused a specific refractive index differential between the core and the cladding. *Id.* It was this specific refractive index differential which, together with a selected core diameter, allowed light to be transmitted for far greater distances than was previously possible with optical fibers. *Id.* at 1254.

The accused device was similar to the original patent except that instead of adding a dopant to the core to increase the refractive index of the core, it contemplated adding a dopant to the cladding to decrease the refractive index of the cladding (a "negative dopant"). *Id.* at 1259. The accused infringer argued that because it did not substitute an element which increased the refractive index of the core, an element required by the original patent is missing. *Id.* Therefore, the accused infringer concluded that because the "all elements" rule requires the presence of every element of the original patent or its equivalent in the accused device before infringement can be found, it did not infringe the original patent. *Id.*

Ruling that one-to-one equivalence between corresponding components is not mandatory, the Federal Circuit held that the element of a positive dopant in the core is not entirely missing from the accused device. *Id.*

'Element' may be used to mean a single limitation, but it has also been used to mean a series of limitations which, taken together, make up a component of the claimed invention. In the All Elements rule, 'element' is used in the sense of a limitation of a claim. . . . *An equivalent must be found for every limitation*

found for every limitation of the claim somewhere in the accused device, the "all elements" rule is satisfied.¹⁸⁵

(2) A finding of infringement will not be precluded merely because the accused device contains elements which the patented claim does not have.¹⁸⁶

(d) If the above analysis for the tripartite *Graver Tank* test for equivalence is satisfied, then the accused device infringes the claimed invention under the doctrine of equivalents. However, the effect of *Texas Instruments* on this outcome is somewhat uncertain at this date. Courts may follow *Texas Instruments* and hold that there is no infringement where a comparison of the accused device with the claimed invention as a whole reveals that the totality of the differences renders the two nonequivalent.¹⁸⁷

of the claim somewhere in an accused device, but not necessarily in a corresponding component, although that is generally the case.

Id. (citations omitted) (emphasis added). The court then approved the district court's analysis which compared the substituted limitation with the limitation in the context of the invention through the use of the tripartite *Graver Tank* test. *Id.* at 1260. Agreeing that the negative dopant in the cladding "performs substantially the same function in substantially the same way as the use of a positive dopant in the core to produce the same result of creating the refractive index differential between the core and cladding of the fiber which is necessary for the fiber to function as an optical waveguide," the Federal Circuit affirmed the district court's finding of the infringement under the doctrine of equivalents. *Id.*

A recent article suggests that *Corning-Glass* stands for the proposition that an accused device may be held to be the equivalent of the original patent even if the substitute element performs the opposite function of the claim element. Player, *Elemental Equivalence: Interpreting "Substantially the same way" in Pennwalt after Corning Glass*, 71 J. PAT. OFF. SOC'Y 546 (1989). Because the negative dopant in the accused device lowered the refractive index of the cladding while the positive dopant in the original patent increased the refractive index of the core, the article writer reasoned that for purposes of the doctrine of equivalents, the two performed opposite functions. *Id.* at 553. This analysis, however, ignores the admonition that the claims be construed in the context of the entire invention. In *Corning-Glass*, the lowering of the refractive index of the cladding performs the same function as the raising of the refractive index of the core: the creation of a refractive index differential which traps light within the optical fibers. To require the plaintiff to show infringement under the doctrine of equivalents by demanding the presence of a positive dopant in the core is precisely the type of redundant literal infringement inquiry which the Federal Circuit has consistently struck down. See *Hughes Aircraft*, 717 F.2d 1351.

185. *Id.*

186. *Uniroyal, Inc. v. Rudkin-Wiley Corp.*, 837 F.2d 1044, 1057 (Fed. Cir. 1988) ("Adding features to an accused device will not result in noninfringement if all the limitations in the claims, or equivalents thereof, are present in the accused device."), *cert. denied*, 109 S. Ct. 75 (1988).

187. See *supra* text accompanying note 120.

V. CONCLUSION

The standard for an infringement analysis under the doctrine of equivalents is a combination of both the element-by-element standard and the invention as a whole approach. This integrated standard not only reconciles case precedent on this controversy, but more importantly, best fulfills the purpose of the doctrine of equivalents. Case law addressing the doctrine of equivalents reflects the tension between the competing policies of expanding the meaning of the claims in a patent and thereby protecting the patent owner, and giving competitors fair notice of what the patent owner believes to be the boundaries of his invention. Adoption of the misinterpretation of the invention as a whole restriction set forth by the court in *Texas Instruments* would skew the analysis in favor of the patent owner and deprive his competitors of fair notice of what constitutes protected material. Likewise, adoption of the element-by-element analysis without the pragmatic requirement that each element be viewed in the context of the invention as a whole would lead to inequitable results because minor deviations could be viewed disproportionately and vice versa. An analysis that utilizes both the element-by-element standard and the invention as a whole requirement supplies both consistency and fairness—two sought-after qualities in any area of the law.

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