January 1990


William S. Galliani

Follow this and additional works at: http://digitalcommons.law.scu.edu/chtlj

Part of the Law Commons

Recommended Citation
Available at: http://digitalcommons.law.scu.edu/chtlj/vol6/iss1/5

This Comment is brought to you for free and open access by the Journals at Santa Clara Law Digital Commons. It has been accepted for inclusion in Santa Clara High Technology Law Journal by an authorized administrator of Santa Clara Law Digital Commons. For more information, please contact sculawlibrarian@gmail.com.
COMMENT

PATENT INFRINGEMENT AMIDST RAPIDLY EVOLVING TECHNOLOGIES: NEW EQUIVALENTS, THE DOCTRINE OF EQUIVALENTS AND THE REVERSE DOCTRINE OF EQUIVALENTS

William S. Galliani†

TABLE OF CONTENTS

I. INTRODUCTION ...................................... 77

II. THE PROGRESS AND PROTECTION OF THE USEFUL ARTS ................................................ 78
   A. The Ideology of the Patent Grant ................ 78
   B. The Infringement Analysis ....................... 82
      1. Claim Interpretation .......................... 82
      2. Literal Infringement .......................... 85
         a. The Reverse Doctrine of Equivalents ..... 86
      3. The Doctrine of Equivalents .................. 87
      4. New Equivalents ................................ 89
   C. The Decision in Texas Instruments ............. 91
      1. The Technology .................................. 91
         a. Input Means .................................. 92
         b. Electronic Means ............................. 92
         c. Display Means ................................ 93
      2. The Federal Circuit’s Analysis .................. 93
      3. The Federal Circuit’s Discussion on Denial of Rehearing .................................. 95
         a. The Pioneer Patent Issue .................... 95
         b. Literal Infringement .......................... 96
         c. The Reverse Doctrine of Equivalents .......... 97

Copyright © 1989 by William S. Galliani. All Rights Reserved.
† Candidate for J.D., May, 1990 at Santa Clara University School of Law; B.A., B.S.E.E., Northwestern University; registered to practice before the United States Patent & Trademark Office.

75
III. Legal Uncertainties Amidst Rapidly Evolving Technologies ........................................ 97
   A. New Equivalents ........................................... 97
   B. Literal Infringement and the Reverse Doctrine of Equivalents ....................................... 100
   C. The Doctrine of Equivalents ................................. 101
   D. Texas Instruments and Pioneer Patents .............. 102

IV. Toward a Cogent Approach ................................ 103
   A. Literal Infringement and the Reverse Doctrine of Equivalents ........................................... 103
   B. New Equivalents ........................................... 108
   C. The Doctrine of Equivalents ................................. 110

V. Conclusion .......................................................... 111
I. INTRODUCTION

Consider the following: A company invests millions of dollars into a research and development project. The expenditure creates no guarantee that a marketable technology will result to recoup the vast investment. Fortunately, the investment does in fact yield a novel invention. In fact, the invention is such an advance that it is considered a "pioneer." To prevent others from exploiting the fruits of this investment, patent protection is sought: a patent application is promptly filed with the Patent Office. Acknowledging the pioneering nature of the invention, the Patent Office proceeds to issue a patent with broad claims which ostensibly offer wide proprietary protection for the technology. The invention immediately becomes a resounding commercial success.

Anxious to exploit the market created by the new technology, a second company introduces a competing product. The originating company, fortified by its patent, counters in court by establishing that the claims of its patent clearly cover the competitor's product. The court acknowledges this clearly established case; however, it ultimately rules that there is no infringement. Its holding is not based on the patent statutes, rather, it is grounded in a judicially created doctrine. The court, acting outside the patent statutes, has nullified the originating company's vast investment.

Judicial precedent makes the foregoing hypothetical a reality. This peculiar and seemingly unjust situation is especially plausible in rapidly evolving technologies such as electronics or biotechnol-
Particularly in those areas, judicial precedent indicates that patent infringement may be avoided when improvements made possible by the evolution of technology are simply integrated into a new product.

This paper examines patent protection amidst rapidly evolving technologies by considering the role of the "reverse doctrine of equivalents," the "doctrine of equivalents," and "new equivalents" in judicial analyses of patent infringement. The paper initially examines the ideological underpinnings of the patent system. Subsequently, judicial infringement analyses are considered. This entails scrutiny of claim construction, literal infringement, the reverse doctrine of equivalents, the doctrine of equivalents, and new equivalents.

From those foundations, the paper endeavors to demonstrate that as rapidly evolving technologies generate improvements which constitute new equivalents, this is in turn compelling a diminishing role for the widely used doctrine of equivalents and a concomitant increasing role for the sparsely used reverse doctrine of equivalents. The paper proposes that, at least in the realm of rapidly evolving technologies, this is a salutary transition which should be fostered, notwithstanding recent precedent which arguably misapplies the respective doctrines.

II. THE PROGRESS AND PROTECTION OF THE USEFUL ARTS

A. The Ideology of the Patent Grant

That inventors are entitled to be rewarded for their efforts is a longstanding, equitable proposition. In reference to his discovery of

form of storage of information, sorting, computation, information retrieval, and transmission of data. Applications of information manipulation are almost unlimited; presently, information manipulation is routinely used in a variety of disciplines: law, engineering, education, defense, publishing, management control, reservation systems, banking and medicine. Id. at xxvii.

6. "[B]iotechnology" refers to recombinant DNA (deoxyribonucleic acid), monoclonal antibody technology and similar technology primarily used in the pharmaceutical industry. The end-result of such laboratory manipulation may take the form of a genetic sequence intentionally encoded in the DNA. It may also take the form of: 1) a substance which will locate and attach to designated cells; 2) a means of mass producing a particular cell line; or 3) a new chemical marketable as a drug."


7. See infra p. 86.
8. See infra p. 87.
9. See infra p. 89.
a machine for inexpensively and conveniently irrigating land, in 1594 Galileo suggested to the Doge of Venice:

It not being fit that this invention, which is my own, discovered by me with great labor and much expense, be made the common property of everybody, I humbly petition Your Serene Highness that you deign to favor me with that which by your benignity is readily granted to any expert in every profession in similar cases; that is, that no one but myself or my heirs or those obtaining the right from me or from them be allowed to make, cause to be made, or, if made, use my said new instrument, nor with alterations to apply it to other uses. By reason thereof, I shall the more attentively apply myself to new inventions for universal benefit.10

The law in the United States has accommodated the longstanding interests of Galileo and other inventors. Today, inventors need not "humbly petition" the government because the Constitution grants Congress "the power to promote the progress of . . . the useful arts by securing for . . . inventors the exclusive rights to their . . . discoveries."11

This Constitutional provision acknowledges that inventors' "great labor and much expense" should be rewarded. Thomas Jefferson recognized the importance of this type of remuneration stating, "ingenuity should receive a liberal encouragement."12

The Constitutional provision also embraces the idea that given a proprietary interest in an invention, an inventor "shall the more attentively apply [himself or herself] to new inventions for universal benefit."13 Abraham Lincoln expressed this idea in another way, maintaining that patents provide "the fuel of interest to the fire of genius."14

The Supreme Court has also acknowledged the ideology that a patent provides universal benefit while rewarding individual effort:

The economic philosophy behind the clause empowering Con-

10. 1 DELLER, DELLER'S WALKER ON PATENTS § 6, at 38 (2d ed. 1964).
11. U.S. CONST. art. I, § 8, cl. 8 states in its entirety that: "Congress shall have the power . . . to promote the progress of science and the useful arts, by securing for limited times to authors and inventors the exclusive right to their respective writings and discoveries." The references to "science," "authors," and "writings" form the bases of the copyright laws, while the references to "useful arts," "inventors," and "discoveries" serve as the bases for the patent laws. See 1 DELLER, DELLER'S WALKER ON PATENTS § 10, at 75-77 (2d ed. 1964).
14. 1 DELLER, DELLER'S WALKER ON PATENTS § 9, at 61 (2d ed. 1964).
gress to grant patents... is the conviction that encouragement of individual effort by personal gain is the best way to advance public welfare through the talents of... inventors in... useful Arts. Sacrificial days devoted to such creative activities deserve rewards commensurate with the services rendered.  

Pursuant to the Constitutional grant of authority and its surrounding ideology, Congress has enacted a series of statutes to provide patent protection for acquired technology. If an invention satisfies the statutory requirements for a patentable invention, the government rewards the inventor, for a limited period, with a grant of exclusive rights in the invention.

In exchange for this grant of exclusive rights, the inventor provides a written disclosure of the invention. The written disclosure forms part of the application for a patent. This disclosure, generally known as a specification, must include: a description of the invention, a description of the manner of making and using the invention, and a description of what the inventor considers to be the “best mode” of the invention.

Upon expiration of the patent, the specification will entitle and “enable any person skilled in the art to which [the invention] pertains... to make and use the same.” The teaching or “enabling” nature of the patent is generally referred to as “enablement.”

---


First, patent law seeks to foster and reward invention; second, it promotes disclosure of inventions to stimulate further innovation and to permit the public to practice the invention once the patent expires; third, the stringent requirements for patent protection seek to assure that ideas in the public domain remain there for the free use of the public.


19. A patentee has the right to exclude others from making, using or selling her patented invention. 35 U.S.C. § 154 (1989).

20. “In return for a patent, the inventor gives as consideration a complete revelation or disclosure of the invention for which protection is sought.” U.S. PATENT & TRADEMARK OFFICE, MANUAL OF PATENT EXAMINING PROCEDURE, § 608, at 600-26 (11th ed. 1989).

21. These requirements are set forth in 35 U.S.C. § 112, ¶ 1 (1989) which states:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor of carrying out his invention.

ablement extracts the nuances of the invention and places it in the possession of the public. Enablement, coupled with the right to use the invention upon expiration of the patent term, is the benefit the public receives in return for the detriment of granting time delimited exclusive rights.23

The specification also includes “one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.”24 The claims describe the “metes and bounds” of the invention.25 An analogy between metes and bounds in real property and intellectual property is readily made. As articulated by the Supreme Court, “[a] patent for an invention is as much property as a patent for land. The right rests on the same foundation and is surrounded and protected by the same sanctions.”26 The patent holder’s property rights are protected from trespassing through a variety of sanctions imposed upon those who infringe those property rights.27 The power to preclude others from infringing is the essence of the patent grant.28 Infringement
occurs when the metes and bounds of a claim are transgressed. Attention now turns to the inquiry surrounding an infringement analysis.

B. The Infringement Analysis

While it is presumed that a patent is valid, it is incumbent upon the patent holder to establish infringement. The proof in that regard must represent a preponderance of the evidence.

A determination of patent infringement entails a two-prong analysis: first, the scope of the relevant claim is established; second, it is determined whether the claim, interpreted as such, covers the accused device. Claim scope, or claim interpretation, is a question of law which involves many factual inquiries. On the other hand, the second prong, whether a claim covers an accused device — whether the accused device infringes — is a question of fact.

Attention now turns to the first prong of the analysis — claim interpretation. The second prong will be analyzed subsequently. In the latter case, particular attention will be focused upon two situations: first, where a claim literally covers a device, but infringement does not occur — reverse doctrine of equivalents; second, where a claim does not literally cover a device, but infringement nevertheless occurs — doctrine of equivalents.

1. Claim Interpretation

The claims establish the metes and bounds of the patent right. Once the metes and bounds of the claim are established, the

Galileo's request was for the exclusive right to make and use his invention, United States patent law grants the exclusive right to exclude others from making, using or selling a patented invention. 35 U.S.C. § 154 (1989).


36. See supra p. 81.
remainder of the analysis is routine.  

In interpreting claims, the language is assumed to represent its ordinary meaning. The patentee, however, is said to be her own "lexicographer" and therefore can employ any desired terminology so long as its meaning is clear. The claim language is construed in light of the specification. Other claims in the patent may be used to determine the scope of a particular claim. Where the prosecution history sheds light on claim meaning, it too may be utilized for claim interpretation.

Since most inventions include a number of elements, claims are commonly written in the form of a combination. Each element of a claim represents a limitation on claim scope. Thus, claim interpretation dictates that the more elements in a claim, the narrower its metes and bounds.

Close scrutiny of the specification is required when interpreting claims which include elements written in "means-plus-function" form. Such elements call for a function to be performed. The means for accomplishing that function are set forth in the specifica-

43. Prosecution history is the record of proceedings in the Patent Office. When an examiner rejects claims, the patentee will offer arguments and/or amendments to overcome the examiner's rejections. These documents become a part of the prosecution history or "file wrapper." See generally 4 D. CHISUM, PATENTS, § 18.05 (1989).
46. See supra note 24.
47. Jamesbury Corp. v. Litton Indus. Prod., Inc., 586 F.2d 917, 924, 199 U.S.P.Q. 641, 647 (2d Cir. 1978) "The aphorism that 'in a patent claim, more means less' is true."
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.
The patentee is not restricted to the disclosed means, rather, when construing the claims, one must consider equivalent means which accomplish the same function.

"Equivalent" in a means-plus-function sense is distinct from "equivalent" in terms of the doctrine of equivalents. A means-plus-function equivalent is determined by the claim language, the patent specification, the prosecution history, other claims in the patent, and expert testimony.

Since claims are construed before applying them to the allegedly infringing device, a particularly intractable problem arises, especially in relation to interpreting means-plus-function claims. Specifically, one interpreting such claims must consider a plurality of "means" which will perform each specified function. In other words, for each means-plus-function element of the combination claimed, one must consider hypothetical means which are equivalent to those disclosed in the specification. Thus, a non-technologically trained judge or jury is forced into an exercise of inventing what would represent a technological equivalent to the invention disclosed in the patent. This practice of determining equivalents by drawing the metes and bounds of such equivalents in some abstract sphere, detached from the accused device, has been criticized.

A finding of identical function without a finding of equivalent...
structure is insufficient to establish means-plus-function equivalence.\(^4\) Means-plus-function form of claim drafting is widely used in electronic and biotechnology patents since this form is perceived as providing the broadest protection.\(^5\)

2. Literal Infringement

Once the breadth of the claims are construed using the foregoing criteria, the second prong of the infringement analysis requires a determination of whether the claims cover the accused device. The Supreme Court has stated: "In determining whether an accused device or composition infringes a valid patent, resort must be had in the first instance to the words of the claim. If accused matter falls clearly within the claim, infringement is made out and that is the end of it."\(^5\) In other words, if the claims "read on" the accused device, literal infringement exists. While literal infringement requires that the accused device embody every element of the claim, "this does not require a slavish conformity to words of insignificance."\(^5\)

---


a. The Reverse Doctrine of Equivalents

Even if the accused matter clearly conforms to the words of the claim, that is not necessarily the end of the infringement inquiry. The Supreme Court has set forth that once it is established that the words of a claim read on a device, the accused infringer is entitled to prove non-infringement under the "reverse doctrine of equivalents."58

The reverse doctrine of equivalents is a judicially created equitable doctrine which prevents a patentee from claiming exclusive rights to inventive material dissimilar from her own, yet still within the literal parameters of her claims. The seminal articulation of the doctrine was enunciated by the Supreme Court in Graver Tank & Mfg. Co. v. Linde Air Prod. Co.59 where the Court stated that:

[Where a device is so far changed in principle from a patented article that it performs the same or a 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.]

In Westinghouse v. Boyden Power Brake Co.,60 the Court analogized the situation to where one has violated the letter of a statute, but "has done nothing in conflict with its spirit and intent."

58. Graver Tank & Mfg. Co. v. Linde Air Prod. Co., 339 U.S. 605, 85 U.S.P.Q. 328 (1950); SRI Int'l v. Matsushita Elec. Corp. of Am., 775 F.2d 1107, 227 U.S.P.Q. 577 (Fed. Cir. 1985). Graver Tank and SRI establish that the reverse doctrine of equivalents is utilized by the accused infringer after a finding of literal infringement. Thus, it is incorrect to require the patentee to establish equivalence between the patented invention and the accused matter prior to a finding of literal infringement, as some courts and commentators have suggested. In Lockwood v. Langendorf United Bakeries, Inc., 324 F.2d 82, 88, 139 U.S.P.Q. 220, 224-25 (9th Cir. 1963), the court stated:

Even if a claim can be read in terms upon an accused article, infringement does not necessarily follow unless it can be found as an ultimate fact that the article uses the inventor's idea as embodied in the inventor's design and drawings and that there is sameness or equivalence of function and means.

Similarly, in Pigott, Equivalents in Reverse, 48 J. PAT. OFF. Soc'y 291, 291-92 (1966), the author stated:

It is well settled that merely because the claims in suit taken literally read element by element on the accused device does not establish infringement, nor does it establish a presumption of infringement. [The patentee] must establish substantial identity of means, operation and result.


60. 170 U.S. 537, 568 (1898).
The sound policy undergirding the reverse doctrine of equivalents provides that the patentee is entitled to exclusive rights only for that material which he has enabled. He should not be able to claim something far removed in principle from his own teaching. This policy is embraced in one court's statement: "The patent law is designed to protect the originality and technical merit of the device, not to reward the literary skills of those drafting patent claims."

3. The Doctrine of Equivalents

If a patentee applies the claims to the accused device and those claims do not literally read on the device, the patentee may still establish infringement under the doctrine of equivalents. The doctrine of equivalents is also judicially created; it is "devised to do equity" where literal infringement is absent, but liability is appropriate "to prevent what is in essence a pirating of a patentee's invention."

In Graver Tank, the Supreme Court stated that the doctrine is in response to the fact that: "[o]ne who seeks to pirate an invention . . . 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." The Court went on to hold that when a device "performs substantially the same function in substantially the same way to obtain the same result" as the patented device, then infringement occurs, notwithstanding the literal language of the claims.

61. In S. Bent, Intellectual Property Rights in Biotechnology Worldwide, 322 (1987), the author states that the reverse doctrine of equivalents:

[It]s a doctrine of considerable practical significance when it comes to interpreting broad claims in any field of technology, including biotechnology, especially claims that employ functional expressions for the very purpose of seeking a broad scope of protection. In essence, the RDE stands for the proposition that the patentee has overclaimed his or her invention, and the scope of protection will be restricted to what was actually invented. (emphasis in original).


In Kinzenbaw v. Deere & Co., 741 F.2d 383, 222 U.S.P.Q. 929 (Fed. Cir. 1984) the court suggested that the doctrine of equivalents also serves to protect the patentee from the development of new equivalents. See infra p. 89.

Galileo also requested a type of doctrine of equivalents, he asked that his invention not be practiced "with alterations." See supra note 10 and accompanying text.


65. Id. at 607, 85 U.S.P.Q. at 330.

66. Id. at 609-10, 85 U.S.P.Q. at 330. The Court also stated that:
When a court employs the doctrine of equivalents it is expanding the outer periphery of the claims. In other words, there is no literal infringement, but in the name of equity, the court endeavors to expand the metes and bounds of the claims to encompass the accused device. This is done by assuming that the specification enabled the permutations of the accused device. Claim scope is expanded in proportion to the instructive contribution of the invention. Thus, a "pioneer" patent is entitled to a broad range of equivalents.67 This privilege naturally stems from the principle that the inventor who has enabled a vast improvement in the useful arts should be rewarded commensurately.

The range of equivalents is professed to be distinct from means-plus-function equivalents.68 This range is determined by the pioneer or non-pioneer status of the invention, the prosecution history and the prior art.69

While the doctrine intends to do equity, it introduces uncertainty into the law. As a result of the doctrine, claim language alone is not sufficient to determine the scope of the invention: mutable equivalents must be considered. Consequently, the public does not know where the patent boundary terminates.70 Tension also

---


68. See supra note 51 and accompanying text.


Hereafter a manufacturer cannot rely on what the language of a patent claims. He must be able, at the peril of heavy infringement damages, to forecast how far a court relatively unversed in a particular technological field will expand the claim's language after considering the testimony of technical experts in that field. To burden business enterprise on the assumption that men possess such a prescience bodes ill for the kind of competitive economy that is our professed goal.

Similarly, the dissenting opinion in Winans v. Denmead, 56 U.S. (15 How.) 338, 347 (1853) admonished:

Fulness, clearness, exactness, preciseness, and particularity, in the description of the invention, its principle, and of the matter claimed to be invented, will alone fulfill the demands of congress or the wants of the country. Nothing, in the administration of this law, will be more mischievous, more productive of oppressive and costly litigation, of exorbitant and unjust pretensions and vexa-
surrounds the application of the doctrine. The articulation of the doctrine—whether the device "performs substantially the same function in substantially the same way to obtain the same result"—provides little in terms of an analytical framework. There is even disagreement over whether the test is for the "same work" or "substantially the same work."71

Recently, the Court of Appeals for the Federal Circuit has struggled with the question of whether the doctrine of equivalents is applied to "the invention as a whole" or on an "element by element" basis.72 The "element by element" faction requires that the accused device possess each element of the claim or an equivalent thereof. The opposing viewpoint concentrates on equivalents in a broader sense: as the "invention as a whole". This faction would not require literal correspondence between every element of the claims and the accused device; it would find infringement if the "invention as a whole" read on the accused device. The dispute seems to have been resolved in favor of the "element by element" faction.73

4. New Equivalents

The idea of "new equivalents" is readily appreciated. Take, for example, a situation wherein an inventor obtains a patent for a combination in which one element of that combination is a high intensity light that is to be utilized as part of the invention. Suppose further, that subsequent to the patenting of the invention, lasers are developed. Utilization of the laser in the combination enables more efficient operation of the invention. In such a circumstance the laser is a new equivalent to the high intensity light source.74

Substitution of a new equivalent element into a combination of elements once avoided infringement.75 However, the Federal Cir-

---


75. See 7 DELLER, DELLER'S WALKER ON PATENTS § 546, at 545-46 (2d ed. 1964).
circuit has stressed that an inventor is not required to predict all future developments which enable another to practice his invention in substantially the same way. Thus, "mere substitution of an embellishment made possible by technological advances does not avoid infringement." This dictates that equivalence is determined as of the time the infringement takes place.

The principle of new equivalents is graphically revealed in *Hughes Aircraft Co. v. United States*. The patent at issue was for a satellite claimed in combination form. In the patented device, a signal was sent to earth, calculations were then performed based on that signal. Afterwards, a responding signal was sent back to the satellite which used the signal to adjust its direction. Subsequently developed microprocessor technology allowed certain calculations to simply be made on board the satellite, obviating certain communications with the ground crew. The Federal Circuit did not allow this improved element to be utilized to avoid infringement.

*Hughes* suggests the importance of the concept of new equivalents in rapidly evolving technologies. In *Hughes*, rapidly evolving electronic technology enabled a dramatic improvement in the manner in which an invention was practiced. It is readily appreciable that other improvements in technology will alter the manner in which other inventions are practiced.

Substitution of a single element of the combination in *Hughes* was not enough to circumvent infringement. However, what if a number of improved elements are integrated into a claimed combination? This was the situation facing the Court in *Texas Instruments, Inc. v. United States International Trade Commission*. This case is particularly scrutinized as it provides recent appellate court analysis of claim interpretation, the reverse doctrine of equivalents, the doctrine of equivalents and new equivalents.

---

77. *Id.* at 1365, 219 U.S.P.Q. at 483.
81. A microprocessor is a single-chip computer element that contains a control unit, central processing circuitry, and arithmetic and logic functions, it is suitable for use as the central processing unit of a microcomputer or a dedicated automatic control system. R. Turner & S. Gibilisco, THE ILLUSTRATED DICTIONARY OF ELECTRONICS 365 (4th ed. 1988).
C. The Decision in Texas Instruments


1. The Technology

The '921 patent embodies the technology representing the first hand-held calculator. The court acknowledged the patent's pioneering nature by noting that the prototype is presently part of the permanent collection at the Smithsonian Museum of History and Technology.

The primary claim calls for a combination with the first three elements written in means-plus-function form. Those elements include: (a) input means; (b) electronic means responsive to the signals from the keyboard; and (c) means for providing visual display of the resultant calculations.

TI urged that its enumerated means-plus-function elements directly read on an analogue in the accused devices. TI further averred that although the accused devices did not utilize the precise embodiments found in its specification, in light of the patent's pioneering nature, it was entitled to a broad range of equivalents. In response to these arguments, the court reviewed the lower court's analysis of the technology of the '921 patent in contrast to that technology embodied in the accused devices.


86. The judgment below also held, ironically, that TI does not produce calculators in accordance with the '921 patent. Id. at 1558, 231 U.S.P.Q. at 833.


88. The fourth element of the combination stipulates that the calculator be contained within a "pocket sized" housing. Id. at 1561, 231 U.S.P.Q. at 834.

89. See supra note 67.
a. Input Means

The accused devices plainly possessed the "one set of decimal number keys" claimed in the '921 patent, conflict stemmed from the underlying operation of the keyboard. The '921 specification teaches a method wherein pressure on a key causes a conductive layer beneath the key to produce a unique binary signal that is encoded and transmitted. In contrast, the accused keyboards utilized a technology which scans the keyboard at time intervals and determines which key is pressed. The resultant signal is identical to that used in the '921 patent. The ITC ruled that the keyboard systems were not equivalent: they operated in substantially different ways.

b. Electronic Means

The second means-plus-function element was an "integrated semiconductor circuit array." The inventors described this as means for "performing arithmetic calculations on the number entered into the calculator and for generating control signals." The specification revealed an array of four integrated semiconductor circuits, three integrated semiconductor shift registers, and two resistors interconnected by printed conductors located in one plane on an insulating substrate. These discrete, interconnected devices were contrasted to the equivalent means in the accused device.

The ITC ruled there was neither identity nor equivalence of means for performing the electronic function since the accused devices used a single integrated circuit. The ITC buttressed its decision by the fact that the accused devices used "MOS" technology, as opposed to "bipolar" technology.

90. Digital systems, such as a calculator, operate in a binary manner. That is, the components of the system are in one of two states: on or off. The system's signals are comprised of pulsed on-off states. See generally H. Taub, Digital Circuits and Microprocessors (1982).

91. An encoder is an electronic device with a number of inputs. When one input is activated, for instance by a key being pressed, the encoder generates a binary signal output comprising various on-off states. Id. at 112-16.

92. Ironically, this technology is patented and assigned to TI. Texas Instruments, 805 F.2d at 1565, 231 U.S.P.Q. at 836.


94. MOS (Metal Oxide Semiconductor) technology enjoys important advantages over Bipolar (bipolar junction transistor) technology. Such benefits include easier fabrication,
c. Display Means

The display means exhibit the results of the calculations. The specification of the '921 patent calls for a thermal printing means whereby semiconductor heater elements are selectively energized to create dots on heat sensitive tape. These dots form numbers and symbols. The ITC maintained that the patent was limited to these means; therefore, it concluded that the accused devices which employed Liquid Crystal Displays (hereinafter LCD) did not infringe this element of the combination. 95

2. The Federal Circuit’s Analysis

After setting forth the foregoing technological analysis, the court ruled that by limiting each means to the embodiment shown in the specification, the ITC interpreted the claims too narrowly. 96 The court went on to state: “While the scope of patent claims under section 112 paragraph 6, is a legal determination, it is not devoid of equitable considerations, particularly when determining the breadth of ‘means’ claims on complex and rapidly-evolving technologies.” 97 The court pointed out that:

As an aid in determining the breadth of equivalents to be afforded means plus function clauses under section 112, the prosecution history, the other claims in the patent, expert testimony, and the language of the asserted claims may be considered in addition to the specification. The pioneer status of the invention also requires consideration. 98

These considerations are balanced against the idea that:

There must be outer boundaries to the scope of these rules, as for most rules, when the factual situation strains their rote application and requires a fresh look at the rules in the new context in which they are presented. There is no abstract guide to determining when a modified device crosses the boundary with respect to the reasonable scope of patent claims. Indeed, the determina-

---

lower power dissipation, and smaller circuit size allowing higher circuit density. See generally J. MILLMAN, MICROELECTRONICS DIGITAL AND ANALOG CIRCUITS AND SYSTEMS (1979).

The inventors of the ’921 used bipolar technology because at the time of their invention “MOS was not yet reliable.” Texas Instruments, 805 F.2d at 1566, 231 U.S.P.Q. at 838. Thus, the inventors would have utilized the new equivalent if it had been feasible. The ITC found that MOS and bipolar transistor technology were not interchangeable because of differences in surface area and power consumption. Id. That is, the new technology, although contemplated by the original inventors, was much more efficient, and thus, not an equivalent.

96. See supra note 50.
98. Id. at 1568, 231 U.S.P.Q. at 839.
tion of infringement is not made in the abstract, but in the context of the claimed invention and the accused devices.  

The court then acknowledged that in light of the pioneering nature of the invention, emphasis should be placed on the function of each element, not the specific means for its realization. The court stated that each of the claimed functions was present in the infringing devices. The court also suggested that when each changed means is considered separately, infringement occurs. Specifically, the court stated: "we conclude that when each changed means is considered separately, as part of the overall device as described by the inventors, substantial evidence may not support the finding that the resultant device is not an infringement of the '921 claims." However, it went on to hold that:

It is not appropriate in this case, where all of the claimed functions are performed in the accused devices by subsequently developed or improved means, to view each such change as if it were the only change from the disclosed embodiments of the invention. 

... [V]iewing all of the modifications in the accused devices, we conclude that they reflect more than mere substitution of 'an embellishment made possible by [improved] technology'.

... [T]hese accumulated differences distinguish the accused calculators from that contemplated in the '921 patent and transcend a fair range of equivalents of the '921 invention.

... We conclude that the total of the technological changes beyond what the inventors disclosed transcends the equitable limits. TI did not sustain its burden of proving infringement by the accused calculators under 35 U.S.C. section 112 paragraph 6.

Having considered the question of literal infringement, the court considered whether there was infringement under the doctrine of equivalents. The court stated:

Whether the issue is equivalency of a means that is described in the specification to perform a function in a 'means' clause of a combination claim (i.e., literal infringement), or equivalency to

99. Id. at 1569, 231 U.S.P.Q. at 839-40.
100. "TI correctly states and the ALJ so found, that every function described in the '921 patent claims is performed by the accused calculators. There was not substantial evidence to the contrary." Id. at 1568, 231 U.S.P.Q. at 839.
101. Id. at 1569, 231 U.S.P.Q. at 840.
102. Id. at 1570-71, 231 U.S.P.Q. at 840-41.
the claimed invention as a whole (i.e., infringement by the doctrine of equivalents), the test is the same three-part test of history: does the asserted equivalent perform substantially the same function in substantially the same way to accomplish substantially the same result.

In the case of literal infringement of a claim containing a ‘means’ clause in terms of section 112 paragraph 6, the accused structure, composition, or process is compared with that described in the specification for performing the claimed function. In the case of infringement under the doctrine of equivalents, the accused structure, composition, or process is compared with the claimed invention as a whole.\(^{103}\)

Subsequently, the court summarily ruled that in light of its previous discussion of the extensive technological advances in all the claimed functions, the accused devices were not equivalent under the doctrine of equivalents.

Three additional aspects of the decision are noteworthy. One, the court “caution[ed] that the incentive to innovation that flows from ‘inventing around’ an adversely held patent must be preserved.”\(^{104}\) The court also stated that “[w]e do not pass at all on the infringement status of devices embodying less than the full combination of changes.”\(^{105}\) In addition, the court rejected the argument that in “fast-moving” arts alleged infringers should be liable even if the improved elements substituted in the patented combination operate in a different way.\(^{106}\)

3. The Federal Circuit’s Discussion on Denial of Rehearing

Petition for rehearing was denied.\(^{107}\) Although the court denied rehearing, it nevertheless addressed the issues of pioneer patents, literal infringement, and the reverse doctrine of equivalents.

a. The Pioneer Patent Issue

TI argued that given its invention’s pioneering status, its claims should be given enhanced breadth, such that the extensive technological changes that have occurred since the invention was made should be deemed not only functional equivalents but also struc-

\(^{103}\) Id. at 1571, 231 U.S.P.Q at 841.

\(^{104}\) Id. at 1572, 231 U.S.P.Q. at 842.

\(^{105}\) Id. at 1570, 231 U.S.P.Q. at 840.

\(^{106}\) Id.

tural equivalents in terms of 35 U.S.C. section 112, paragraph 6. The court responded:

The judicially "liberal" view of both claim interpretation and equivalency accorded a "pioneer" invention is not a manifestation of a different legal standard based on an abstract legal concept denominated "pioneer." Rather, the "liberal" view flows directly from the relative sparseness of prior art in nascent fields of technology.108

Thus, according to the court, pioneer status does not alter claim interpretation nor equivalency analysis in an infringement determination.

b. Literal Infringement

In its petition for rehearing, TI characterized the court as holding that "every claim element found corresponding equivalent structure in the accused devices."109 The court clarified its position stating:

[T]hough every function of the claimed combination was performed in the accused devices, the structures performing those functions were not equivalents of the structures disclosed in the patent. . . .

. . . [T]he functions of input, electronics, and display, viewed solely as functions, were in the calculator prior art; the patentability of the combination depended on the totality of changes in the structure by which the functions were performed. (Indeed the separate structures described in the '921 patent are individually the subject of patents). It is the totality of means that achieved the claimed pocket-sized calculator, as it is the totality of modified means that constitutes the accused calculators. Thus, the equivalency of each changed means is evaluated in the context of the accused device as a whole. . . .

. . . As in all cases involving assertions of equivalency, wherein the patentee seeks to apply its claims to structures not disclosed by the patentee, the court is required to exercise judgment. In cases of complex inventions, the judgment must take account of situations where the components of the claimed combination are of varying importance or are changed to varying degrees. This is done by viewing the components in combination.110

108. Id. at 1370, 6 U.S.P.Q.2d at 1887.
109. Id. at 1371, 6 U.S.P.Q.2d at 1888.
110. Id. at 1371, 6 U.S.P.Q.2d at 1888-89 (emphasis in original).
Thus, the court persisted in its view that under a literal infringement analysis one is compelled to view components in combination. That is, elements must be equivalent individually and as they interact in combination (or operate as a whole) before literal infringement exists.

c. The Reverse Doctrine of Equivalents

The American Intellectual Property Association's amicus brief suggested that the reverse doctrine of equivalents could have been applied by the court. The court took exception to the suggestion, stating:

[L]iteral infringement of means-plus-function claims requires both that the same function be performed and that the same or equivalent means be used. The reverse doctrine of equivalents comes into consideration only when literal infringement is apparent. Since the '921 claims are not literally infringed, the reverse doctrine of equivalents does not apply.\(^{111}\)

Thus, the court maintained that the TI claims did not “read on” the accused device in such a manner as to establish literal infringement - the condition precedent for a reverse doctrine of equivalents analysis.

III. LEGAL UNCERTAINTIES AMIDST RAPIDLY EVOLVING TECHNOLOGIES

As Texas Instruments examined infringement issues in the context of a rapidly evolving technology, namely electronics, it is an ideal window through which to view extant and forthcoming issues of patent protection in rapidly evolving technologies. Particularly, the case encompassed the issues of new equivalents, the reverse doctrine of equivalents, and the doctrine of equivalents. Attention now turns to those individual issues.

A. New Equivalents

In its literal infringement analysis, the court strongly suggested that the new equivalents, or new means, utilized in the allegedly infringing calculators, when viewed individually, were equivalent to those means used in the patented calculator.\(^{112}\) A suggestion, alone, of the equivalency of the respective means was an unsatisfactory

\(^{111}\) Id. at 1372, 6 U.S.P.Q.2d at 1889.

\(^{112}\) See supra note 101 and accompanying text.
analysis on behalf of the court.\textsuperscript{113} If equivalency was in fact present, as the court suggested, then literal infringement existed. Consequently, the court was presented with a situation similar to the improved microprocessor means utilized in \textit{Hughes}.\textsuperscript{114} That is, notwithstanding the utilization of new equivalents, infringement existed.

Unlike \textit{Hughes}, where a single element was replaced, in \textit{Texas Instruments} three elements were replaced and equivalence was not found. While the court in \textit{Texas Instruments} intimated that equivalents were present, it did not follow the precedent observed in \textit{Hughes} which dictates that new equivalents do not avoid infringement.

Given the rulings in \textit{Hughes} and \textit{Texas Instruments}, ostensibly, the Federal Circuit will find equivalence when one new equivalent is introduced, but will balk when new equivalents are introduced for all of the elements of the patented combination.\textsuperscript{115} In the latter situation, a novel analysis is pursued. Specifically, it is not sufficient for infringement purposes that the replaced elements individually represent new equivalents. When multiple integration of new equivalents is present, in addition to equivalence of corresponding substituted elements, there must be a transcendence of a fair range of equivalents. It is uncertain when a fair range of equivalents is transcended. As the court acknowledged, "there is no abstract

\begin{itemize}
\item \textsuperscript{113} The court was reviewing an administrative finding of fact: "The determination whether an accused device is a section 112 equivalent of the described embodiment is a question of fact." Durango Assocs., Inc. v. Reflange, Inc., 843 F.2d 1349, 1357, 6 U.S.P.Q.2d 1290, 1295 (Fed. Cir. 1988). In reviewing this finding of fact, the court merely needed to determine whether the record could reasonably support the finding. See K. DAVIS, \textit{ADMINISTRATIVE LAW TEXT}, Chap. 29 (3d ed. 1972). The court suggested that even this minimal standard had not been met in the ITC's determination on 112 equivalents. See supra note 101 and accompanying text. In intimating a rejection of a finding of fact, which is normally accepted as a matter of course, the court should have illuminated its reasoning. However, if the court exposed its reasoning, it would have been compelled to acknowledge the individual equivalency of the respective means. This finding would then dictate the conclusion which the court suggested: the existence of literal infringement. Thus, by merely suggesting equivalency, without explicitly deciding the issue, the court circumvented a finding of literal infringement. 
\item \textsuperscript{114} See supra p. 90. However, \textit{Hughes} considered equivalency in the context of the doctrine of equivalents, not literal infringement.
\item \textsuperscript{115} A mode of analysis contingent upon the number of replaced elements has been criticized: "The 'accumulated differences' language in the opinion is dangerous in that it tempts trial courts to merely tally the number of altered elements in an accused device, thereby substituting a mechanical, quantitative approach for equitable considerations." Loughran, \textit{Texas Instruments, Inc. v. United States International Trade Commission: The Federal Circuit's Prescription for Infringement Without Fear?}, 5 \textit{COMPUTER L. REP.} 512, 514 (1987).
\end{itemize}

The court treated the complete substitution of new equivalents as unique: "We do not pass at all on the infringement status of devices embodying less than the full combination of changes." \textit{Texas Instruments}, 805 F.2d at 1570, 231 U.S.P.Q. at 840.
guide to determine when a modified device crosses the boundary with respect to the reasonable scope of patent claims." Operating pursuant to this nebulous standard, the court concluded in *Texas Instruments* that the accused devices "transcend a fair range of equivalents of the '921 invention."

This aspect of the holding introduces considerable uncertainty into an infringement analysis. Naturally, in rapidly evolving technologies, there will be ongoing opportunities to replace elements in a patented combination with new equivalents. Counseling clients as to when their patent is infringed, or in the alternative, when their competing product is infringing, entails entry into an ethereal realm wherein one searches for a transcendence of a fair range of equivalents. Consequently, the infringement analysis no longer terminates when a straightforward substitution of new elements occurs.

Another problem arising from *Texas Instruments* is that the case muddles the taxonomy of "equivalents". The Federal Circuit has emphasized that "equivalence" in terms of the doctrine of equivalents is different from "equivalence" as it relates to equivalents in a means-plus-function sense. Namely, it has been held that equitable ranges of equivalents are not considered in a means-plus-function equivalence analysis. However, in *Texas Instruments*, the court stated that in interpreting means-plus-function equivalents, especially in the areas of "complex and rapidly evolving technologies," there are "equitable considerations." Specifically, the court indicated that "[t]he pioneer status of the invention also

116. *See supra* note 99 and accompanying text.
117. *See supra* note 102 and accompanying text.
118. Previously, equivalents under the doctrine of equivalents were determined by inquiry into the prosecution history, the pioneer or non-pioneer status of the invention and the prior art. *See supra* note 69 and accompanying text. On the other hand, means-plus-function equivalents were ascertained by considering the claim language, the patent specification, the prosecution history, other claims in the patent and expert testimony. *See supra* note 52 and accompanying text.
119. *See supra* note 51 and accompanying text.

Thus, the concept that there are equitable considerations in a means-plus-function equivalence analysis has previously surfaced. However, it is curious that *Graver Tank* concepts could be authoritatively applied to a means-plus-function analysis. *Graver Tank* was a doctrine of equivalents case, the court's decision did not entail analysis of a means-plus-function clause. Indeed, *Graver Tank* was decided prior to the statutory authorization of means-plus-function clauses. *Id.*
requires consideration." If equitable considerations inform the means-plus-function equivalence analysis, the difference between the two types of equivalents is now uncertain.

B. Literal Infringement and the Reverse Doctrine of Equivalents

Precedent clearly establishes that claims are interpreted and then applied to the accused device. If the claims read on the accused device, literal infringement occurs. Liability can be circumvented by the application of the reverse doctrine of equivalents.

In Texas Instruments, the court strongly suggested that the elements of the imported calculators, considered separately, employed substituted new equivalents for each of the elements of the patented combination. Consequently, the court implied that the claims read directly on the imported calculators. In other words, there was literal infringement. The reverse doctrine of equivalents should have been utilized at that juncture.

The court did not find literal infringement because it failed to complete its analysis which suggested that there was a substitution of new equivalents for each element of the claims. Instead of answering this central question in its determination of literal infringement, the court engrafted an additional "device as a whole" inquiry as part of its literal infringement analysis. It stated specifically that "the equivalency of each changed means is evaluated in the context of the accused device as a whole."

This "device as a whole" inquiry was undertaken before find-

---

122. Judge Nies, in her dissenting opinion on denial of rehearing in banc, states that: This court has not, in its case law, set out general guidelines with respect to what constitutes an equivalent element either where section 112 ¶ 6 is involved or where it is not. It appears to be the intent of the Texas Instruments opinion to provide such guidance where numerous changes have been made from the disclosed embodiment of the invention and the elements of the claim are expressed in means-plus-function language.

Texas Instruments, 7 U.S.P.Q.2d at 1415. Contrary, to the judge's suggestion, the court has repeatedly proffered general guidelines to distinguish between the two types of equivalents. See supra note 118. Clearly, Texas Instruments does not provide "guidance" on the difference between the two types of equivalents. The case only obfuscated the issue.

123. See supra pp. 82-89.
124. See supra pp. 82-86.
125. See supra p. 86.
126. See supra note 101 and accompanying text.
127. See supra note 113 and accompanying text.
128. See supra note 110 and accompanying text.
ing literal infringement. Curiously, this inquiry is suspiciously similar to a reverse doctrine of equivalents analysis. Application of the reverse doctrine of equivalents requires a generalized inquiry into the wholistic nature of the accused device to determine whether it is "so far changed in principle" from the patented device that while performing a similar function, it does so "in a substantially different way."129 In other words, the court performed a reverse doctrine of equivalents analysis before finding literal infringement.

The court was correct in stating that the reverse doctrine of equivalents applies only when there is a finding of literal infringement. However, the court incorrectly undertook a reverse doctrine of equivalents analysis before finding literal infringement.

The court's new literal infringement analysis is unsupported by precedent.130 Under the new analysis, the reverse doctrine of equivalents will never be a meaningful inquiry after a finding of literal infringement, since the finding of literal infringement was already realized after a device as the whole inquiry.

The court's approach is also problematic because it places an additional burden of proof upon the patentee. Once the claims are deemed to cover the accused device, the patentee must come forward once again to establish that the invention as a whole covers the accused device, this additional burden of proof contravenes established precedent.131

C. The Doctrine of Equivalents

After failing to find literal infringement, the court considered whether there was infringement under the doctrine of equivalents. The court stated that "[i]n the case of infringement under the doctrine of equivalents, the accused structure, composition, or process

129. See supra note 59 and accompanying text.

Note that the so-called 'reverse' doctrine can only be applied to the invention viewed as a whole, since by definition all of the elements of the claim are literally present in the accused device, and the issue is whether the device as a whole is so far changed that it nevertheless avoids infringement. Pennwalt Corp. v. Durand-Wayland, Inc., 833 F.2d 931, 970 n.8, 4 U.S.P.Q.2d 1737, 1767 n.8 (Fed. Cir. 1987) (Newman, J., dissenting) (emphasis in original).

130. In his concurring opinion on denial of rehearing, Judge Davis states: "[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." Texas Instruments, 846 F.2d at 1372, 6 U.S.P.Q.2d at 1889. Why an unprecedented approach, which does not establish definitive guidelines, would be "proper" is uncertain, at least to this commentator.

is compared with the claimed invention as a whole.”

Similarly, in its recent opinion on denial of rehearing, it stated that the “equivalency of each changed means is evaluated in the context of the accused device as a whole.”

The court had already undertaken this “invention as a whole” type analysis as part of its literal infringement inquiry. Since the court had factored equitable considerations into its means-plus-function equivalence analysis, the question of infringement under the doctrine of equivalents was summarily disposed.

The Texas Instruments case thus introduces a literal infringement analysis which obviates the doctrine of equivalents analysis. Through its “device as a whole” inquiry during its literal infringement analysis, the court concomitantly determines the issue of infringement under the doctrine of equivalents.

Given the nature of the doctrine of equivalents, it is curious that the court in Texas Instruments would even undertake such an analysis. The literal language of TT's claims was broad enough to encompass the accused device. There was no need to expand the scope of the claims as is done under the doctrine of equivalents. Again, this intimates that the reasoning in Texas Instruments is erroneous.

The Texas Instruments opinion on denial of rehearing reintroduces the conflict between the “invention as a whole” faction of the Federal Circuit and the “element by element” faction. It was thought that the issue was settled, but the court’s opinion, stressing

---

133. Texas Instruments, 846 F.2d at 1371, 6 U.S.P.Q.2d at 1888. The reference to the “device as a whole” in the rehearing opinion was in the context of its literal infringement analysis. If the court is willing to undertake an invention as a whole analysis in its literal infringement analysis, it is not unreasonable to suggest that such an analysis has not been completely exorcised from the doctrine of equivalents realm. This observation is supported by the fact that, while clearly called for, the court neglected to step back from the invention as a whole doctrine. Judge Nies, in her dissenting opinion on denial of rehearing in banc, argued that the case should have been accepted for rehearing insofar as “the original Texas Instruments opinion appeared to adopt a different standard on infringement from that [element-by-element approach] adopted in Pennwalt.” Texas Instruments, 7 U.S.P.Q.2d at 1415. Judge Nies explained:

The Pennwalt court rejected the view of a minority of the court that only literal infringement required an element by element analysis, and that infringement under the doctrine of equivalents could be found under an 'invention as a whole' standard, even though an element of the claim was not present, at least by an equivalent, in the accused device or process.

Id. The judge, ignoring the fact that Pennwalt was a split in banc decision, concluded optimistically: “That debate has ended.” Id.

134. See supra notes 101 and 113 and accompanying text.
135. See supra note 133.
its "invention as a whole" analysis, indicates that the issue still must be resolved.

In addition to creating confusion on the new equivalents and reverse doctrine of equivalents issues, this case also takes a step backwards on the doctrine of equivalents issue. The uncertainty created on all three fronts is disquieting. Moreover, other uncertainties arise out of the case. Attention, therefore, turns to those issues.

D. Texas Instruments and Pioneer Patents

The court acknowledged the TI invention as a pioneer patent in the rapidly evolving electronic arts. It is ironic that the court stated that the existence of a pioneer patent does not change the infringement analysis, yet it proceeded to create a new literal infringement test in response to its encounter with this pioneer patent.

The fact that the court extolled the patent as a pioneer and then failed to enforce it is also noteworthy. The term pioneer patent is vacuous when it fails to accord patent protection. Texas Instruments indicates that broad claims do not in fact provide extensive protection in rapidly evolving arts.

Finally, it is important to note that the claims for the TI invention were drafted in means-plus-function form. This form is thought to offer the broadest protection, but the court's holding suggests that this expanded protection may be illusory.

IV. Toward a Cogent Approach

A. Literal Infringement and the Reverse Doctrine of Equivalents

As set forth above, Texas Instruments should have been decided as a reverse doctrine of equivalents case. In addition to the reality that the factual circumstances in Texas Instruments demanded application of the reverse doctrine of equivalents, the equi-

136. See supra note 108 and accompanying text.

137. In In re Hogan, 559 F.2d 595, 606, 194 U.S.P.Q. 527, 537 (C.C.P.A. 1977) the court criticized: "a policy against broad protection for pioneer inventions, a policy both shortsighted and unsound from the standpoint of promoting progress in the useful arts, the constitutional purpose of the patent laws." Accord Loughran, Texas Instruments, Inc. v. United States International Trade Commission: The Federal Circuit's Prescription For Infringement Without Fear?, 5 COMPUTER L. REP. 515, wherein the author criticizes the court's emphasis on the incentive to "invent around" a patent; the author states that an invention's pioneer status should not be considered "a threat to others' 'incentive' rather than an accomplishment that should be rewarded by the courts."

138. See supra note 55.
table nature of the doctrine, grounded in its focus on enablement considerations, is especially relevant in rapidly evolving technologies. The court bypassed an opportune context to herald the expanded role the doctrine should exercise in rapidly evolving technologies.

Instead of applying the reverse doctrine of equivalents, the court in Texas Instruments discusses abstract notions of a “fair range of equivalents” without focusing on the fact that it is enablement which gives substance to the range of equivalents.

The court seemingly relied on enablement in its discussion of equivalents, but failed to focus its holding upon it. Enablement considerations should distinctly guide every equivalence analysis; particularly in rapidly evolving technologies, the equivalence analysis should be steered by enablement considerations.

The importance of enablement in the equivalence analysis is closely related to the importance of enablement when considering a pioneer patent. This relationship stems from the fact that a pioneer patent is entitled to a broad range of equivalents. The court failed to cultivate the importance of enablement as the basis of broad claims in pioneer patents by emphasizing that the broad claims associated with these patents stem from the “relative sparseness of prior art in nascent fields of technology.” That is, in light of the paucity of prior art, the Patent Office granted broad claims. This much is true; nevertheless, it should be moot in the context of the court’s analysis. The court should not be concerned with how a sparseness of prior art resulted in broad claims being issued. The court’s role in infringement litigation is to determine whether broad protection is warranted; in other words, whether the broad claims are supported by broad enablement in the specification. As in the case of its equivalence analysis, the court’s treatment of the pioneer

139. See supra note 102 and accompanying text.
140. In S. Bent, INTELLECTUAL PROPERTY RIGHTS IN BIOTECHNOLOGY WORLDWIDE 253 (1987), the authors state:

Especially as applied to biotechnology inventions, we believe that the standard of enablement (that which the patentee has taught others to do without their own exercise of inventive effort) is the principle criterion applicable to the determination of equivalents. The enablement concept appears to be a unifying principle which underlies, for example, both doctrine of equivalents and reverse equivalents determinations under U.S. practice. (emphasis in original).
141. See supra note 67.
142. See supra note 108 and accompanying text.
143. No one expects the art to stay the same for the whole seventeen year term of the patent. If the patent is to mean anything at all while the state of the art marches on, it has to be interpreted in light of later developments - and only a court can do this.
The Texas Instruments holding seems less confounding when viewed in light of enablement considerations. That is, since the TI calculator failed to enable the imported calculators, infringement did not occur. The electronic means in the accused device was a single integrated circuit, as opposed to the discrete elements in the patented calculator. The sophistication of an integrated circuit stands in stark contrast to the discrete elements of the original calculator. Similarly, the LCD is a dramatic improvement over what appears to us now as the fatuous thermal printing means of the TI device. Finally, the electronic scanning method of the accused devices appears to be a salient improvement over the manual conductive connection of the original calculator.

Since the imported devices were manifestly more sophisticated than the technology revealed in the TI patent application, it was unjust for TI to claim proprietary protection for technology it had not enabled. "Broad protection must be earned by broad direction." Since the TI patent was no longer providing enablement in electronic calculator technology, it should not have been placed in a position to foreclose advancements in that useful art. Viewed in this way, the result in Texas Instruments is reasonable.

The court's analysis in this context assumes elevated importance since it is interpreting broad claims; the analysis is likely to result in a narrowing of the effective boundaries of those claims:

A one percent expansion or reduction of a description of North America has dramatically greater total gross significance than a one percent expansion or reduction of a description of a residential lot most of us might live on. Further, any initial description of North America after its discovery is much more likely to be subject to error than a description of a residential lot in a housing development.


145. At least one commentator has argued that the result is not reasonable: "It would seem that piracy has been mistaken for innovation in this opinion, where success in 'inventing around' is determined by the number of modifications used in an accused device without regard to their obviousness, then or now." Loughran, Texas Instruments, Inc. v. United States International Trade Commission: The Federal Circuit's Prescription For Infringement Without Fear?, 5 COMPUTER L. REP. 512, 513 (1987). See Texas Instruments brief for rehearing reprinted in 5 COMPUTER L. REP. 610, 616 (1987) "[T]here is no evidence in this case that the Hong Kong respondents did any 'inventing around' to come up with the infringing products. They simply copied technology which has been developed and improved by others (including Texas Instruments) and cannot be viewed sympathetically as innovators." Id.
The court's holding flares the clear signal that without concomitant enablement it will not allow broad claims to forestall the march of progress. While the TI application provided proper enablement for the claims at the time of filing, subsequent developments in the rapidly evolving electronic arts resulted in new meaning for those claims: The claims fortuitously covered a host of developments never contemplated in the patent. Those developments could not be used against TI at the time of infringement to display a lack of enablement for its claims, thus, TI should not be heard to plea that its claims nevertheless cover the new technology.\footnote{146}{Note that the claims are valid despite the fact that they are so broad that they cover technology well-beyond the scope of enablement provided in the specification. This lack of enablement does not render the claims invalid. In re Hogan, 559 F.2d 595, 607, 194 U.S.P.Q. 527, 538 (C.C.P.A. 1977) ("The courts have consistently considered subsequently existing state of the art as raising questions of infringement, but never of validity . . . . If in the light of all proper evidence, the invention claimed be clearly enabled as of [the date of filing], the inquiry under [enablement] is at an end."); See Winner, \textit{Enablement in Rapidly Developing Arts—Biotechnology}, 70 J. PAT. \& TRADEMARK OFF. SOC'Y 608 (1988).}

Consequently, as witnessed in \textit{Texas Instruments} and the opening hypothetical, a paradox is present in patent law's rapidly evolving technologies. Broad claims may be valid, may encompass an accused device, but nevertheless result in an equitable finding of noninfringement.

This paradox is compelled by the ideology that patents are to promote the progress of the useful arts. Progress is fostered when creative activity is remunerated. Such compensation, however, should not result in the windfall that ensues when rapidly evolving technology conveniently falls within the scope of a claim issued in the infancy of a technology. In this situation, a disincentive to research is created and the professed universal benefit of the patent system is suspect.

As a result, patent claims in rapidly evolving technologies cannot be taken at their face value. It would be imprudent for a patent holder to blindly depend upon broad claims which serendipitously cover a myriad of technologies developed subsequent to issuance of the patent.

Thus, there is the quandary of how to accurately gauge the scope of patent claims in rapidly evolving technologies. The \textit{Texas Instruments} decision, unfortunately, is of no help. The court failed to apply the reverse doctrine of equivalents when it was plainly called for and instead promulgated a new test of unknown parameters.
Despite the court's protestations to the contrary, *Texas Instruments* is best viewed as a reverse doctrine of equivalents case. The court suggested, without deciding, that there existed new equivalents for each element of the claims, thereby indicating literal infringement. What the court called a device as a whole inquiry pursuant to its literal infringement analysis was, in reality, a reverse doctrine of equivalents analysis.\textsuperscript{147}

Interpretation of the case in this manner is not inconsistent with the court's result. More importantly, viewed in this way, *Texas Instruments* provides a framework by which one may interpret claims in rapidly evolving technologies. As a reverse doctrine of equivalents case, it falls into an established line of precedent with familiar parameters.

The reverse doctrine of equivalents' focus on enablement will provide a definitive context in which to judge claim scope. In fact, only enablement can narrow the broad claims routinely issued in a rapidly evolving art.\textsuperscript{148} Thus, under the reverse doctrine of equivalents' enablement standard, a patentee will not enjoy benefits he does not bestow.

Under this approach, claim interpretation will be more predictable as the claims will represent a definitive outer periphery. Although the outer periphery of the claims will be definitive, claim breadth will be subject to a de facto contraction in light of the reverse doctrine of equivalents. The extent of contraction is gauged in light of enablement considerations.

The foregoing reasons clearly suggest that the reverse doctrine of equivalents can, and should, play a large role in infringement analyses in rapidly evolving technologies.\textsuperscript{149} The doctrine allows

---


\textsuperscript{148} A claim is construed in light of the claim language, the other claims, the prosecution history and the specification. See supra pp. 82-85. In a pioneer patent the claim language is broad and the prosecution history will be slim because there is little prior art on which the examiner may base rejections or which can be used to narrow the claims. Thus, only the specification remains available to narrow the scope of the claims.


The Federal Circuit has never relieved an accused infringer under the reverse doctrine of
accurate demarcation of claim scope and provides adequate protection for enabled matter while not foreclosing the advancement of the useful arts when claim breadth is inconsistent with enablement.

The Federal Circuit's response to its first case dealing with a true pioneer patent in a rapidly evolving technology was to disregard precedent and fabricate a new infringement analysis. The court should retreat from its approach in *Texas Instruments*. In subsequent cases considering patent protection in rapidly evolving technologies, the court should acknowledge the important role the reverse doctrine of equivalents can serve.

**B. New Equivalents**

Prior to *Texas Instruments* it was clear that substitution of a new equivalent into a combination did not avoid infringement. After the decision one is compelled to undertake a novel determination of whether the substituted element or elements, as a whole, transcend a "fair range of equivalents." The case also introduces the proposition that in determining means-plus-function equivalents en route to a literal infringement determination, equitable considerations are entertained. Thus, there are now *equitable* considerations in a *literal* infringement analysis and the difference between the two types of equivalents is uncertain. Further, the problem of construing means-plus-function equivalents without reference to the accused device persists.

Although these issues must be resolved in future litigation, within the court's *Texas Instruments* decision is the seed of a reasonable denouement. In the decision, the court acknowledged that in light of equitable considerations, the equivalent means of each means-plus-function equivalent should be interpreted as nearly all means which perform the stated function. The court should take this reasoning a step further. When construing combination claims with multiple means-plus-function elements, the court should simply look for identity of individual functions. If all functions of a

---

claim are found in the accused device, literal infringement should result. At this point, a reverse doctrine of equivalents analysis, with its equitable considerations, should be undertaken.

Under this proposed approach, the court does not have to factor equitable considerations into its literal infringement analysis. The equitable considerations are subsumed in the reverse doctrine of equivalents analysis.

In addition, it would be far easier for the practitioner and the trier of fact to first consider whether the new equivalent represents the same function as that performed in the patented device. A function is easily defined. For instance, in *Texas Instruments* one would simply consider whether the LCD was a functional equivalent to the thermal printing means. That is, whether they both served the function of displaying the result of a calculation.

Equivalent structures to the means of a means-plus-function element are essentially impossible to define; this is especially true when there is no reference to the accused device, as is required in proper claim construction. In other words, relying on the previous example, in proper claim construction, one would be forced to hypothesize as to equivalent structural means to the thermal printing means. Without reference to the LCD of the accused device, a non-technologically trained judge or jury is forced to hypothesize or invent a physical structure which could be used as an equivalent to the claimed means.

In a pragmatic scheme, there is a search for functional equivalence. If the trier of fact does find functional equivalence, then a more difficult task is undertaken: determining equivalent structure in light of equitable considerations. However, in this context, the

---

151. See supra note 53 and accompanying text.
152. In *Pennwalt Corp. v. Durand-Wayland*, Inc., 833 F.2d 931, 934, 4 U.S.P.Q.2d 1737, 1739 (Fed. Cir. 1987) the court rejected the argument that "if an accused structure performs the function required by the claim, it is per se structurally equivalent." This proposition was also rejected in the opinion on denial of rehearing. *Texas Instruments*, 846 F.2d at 1371, 6 U.S.P.Q.2d at 1888. The author is not attempting to resurrect the rejected proposition that functional equivalence is tantamount to structural equivalence. Rather, it is suggested that functional equivalence be temporarily deemed literal equivalence in a literal infringement analysis. Subsequently, a determination of structural equivalence may be undertaken in the reverse doctrine of equivalents context.

A determination of functional equivalence is already integral to the infringement analysis: "A finding of literal infringement of a claim expressed in terms of a series of means for performing particular functions . . . involves interpreting the claim to define the recited function. If, as a threshold matter, the recited functions are not performed by the accused device, there can be no literal infringement." *Spindelfabrik Suessen-Schurr v. Schubert & Salzer*, 829 F.2d 1075, 1085, 4 U.S.P.Q.2d 1044, 1052 (Fed. Cir. 1987).
determination of equivalence of structure is guided by the reverse doctrine of equivalents and its enablement considerations.

While this approach may expand the breadth of the claims in initially determining literal infringement, the reverse doctrine of equivalents analysis will subsequently generate a focus on enablement limits and provide only that protection which is warranted. Consequently, there is no basis to fear that a patentee will enjoy undue protection, that is, protection approximating the function of the claim.\textsuperscript{153}

In addition, under this approach, one need not encounter the questions of whether all elements of the combination were replaced with new equivalents or whether the accused device satisfies a new "transcendence of a fair range of equivalents" test. Instead, after a finding that the substituted elements are equivalent in function to the old elements, the court can simply apply the familiar vehicle of the reverse doctrine of equivalents to determine whether infringement is avoided. In this way, the issue of new equivalents falls into a familiar analysis.

C. The Doctrine of Equivalents

\textit{Texas Instruments} should have been decided in terms of literal infringement and the reverse doctrine of equivalents. Thus, the doctrine of equivalents issue should have been avoided altogether. Instead, the court generated considerable confusion in the patent community with its doctrine of equivalents "invention as a whole" analysis. This confusion must be rectified in future litigation.\textsuperscript{154}

That litigation is unlikely to be resolved in the area of rapidly evolving technologies since the doctrine of equivalents should not exercise a large role in this context. As discussed, the claims in this area, issued in the infancy of a technology, are generally broad and the specifications supporting the claims are relatively narrow. Since the claims are broad there will be more findings of literal infringement (and subsequent reverse doctrine of equivalents analyses).

\textsuperscript{153} In \textit{Texas Instruments}, the court allowed equivalence approximating the function of the claim. See supra note 150 and accompanying text. Despite the nearly functional equivalence apportioned, in the end, protection was limited since there was a finding of noninfringement. "The outcome is likely to be the same whether infringement is found by literal interpretation of the claim language as of a later date or by the 'doctrine of equivalents' applied to claim language objectively interpreted to have a frozen meaning as of the filing date." Winner, \textit{Enablement in Rapidly Developing Arts -Biotechnology,} 70 J. PAT. & TRADEMARK OFF. SOC'Y 608, 631 (1988).

\textsuperscript{154} See supra note 133. If the element by element faction has in fact prevailed, then a doctrine of equivalence analysis entails an element by element inquiry, while pursuant to \textit{Texas Instruments}, a literal infringement analysis entails a device as a whole inquiry!
Furthermore, because of the relatively narrow specifications in this area, there is little room for expanding claims as is done under the doctrine of equivalents.

When the doctrine is applied in this realm, there should be a careful inquiry for disguised elements. Evolving technologies will allow the combination of functions into a single means. A cursory application of the claims to an accused device may not reveal literal infringement. Infringement, however, may follow under the doctrine of equivalents once disguised elements or combined functions are uncovered.

V. CONCLUSION

Patent protection amidst rapidly evolving technologies is problematic. Patents issued in rapidly evolving areas tend to be broad enough to cover subsequent advances in those areas. As a result, there is a disincentive to further research. On the other hand, as displayed in Texas Instruments, the enforceability of those broad claims is questionable. Consequently, the extent of patent protection amidst rapidly evolving technologies is difficult to ascertain.

Faced with a specific instance of patent protection amidst a rapidly evolving technology, the Federal Circuit, in Texas Instruments, ostensibly created a novel infringement analysis. To avoid this departure from precedent and the uncertainty it introduces in construing patent claims in this area, it has been argued that the case is best interpreted in light of the reverse doctrine of equivalents. The reverse doctrine of equivalents and its focus on enablement should be increasingly invoked to limit broad claims which literally cover the numerous advances in a rapidly evolving technology.

The reverse doctrine of equivalents should also be relied upon in approaching the problem of new equivalents. Instead of the inherently difficult, if not impossible, task of construing equivalents without reference to the accused device, it has been argued that only the function of the substituted element be considered. If literal infringement results, then a reverse doctrine of equivalents analysis is undertaken, this analysis will focus on enablement limits. Thus, the metes and bounds of the patent are clear to an outer extent, although they may be limited in light of the specification. This approach lends certainty to claim interpretation.

155. For instance, in Hughes, supra p. 90, the microprocessor alone performed a number of steps which were previously undertaken as discrete steps.
The doctrine of equivalents should not play a large role in rapidly evolving technologies. The claims issued in this realm are generally broad. As a result, there will be more findings of literal infringement. Moreover, the courts should not be inclined to expand claims which are relatively broad in contrast to their degree of enablement. In addition, the doctrine will receive even less attention if the author's proposal for expanded utilization of literal infringement and the reverse doctrine of equivalents is realized.

Whether applying the doctrine of equivalents or the reverse doctrine of equivalents, the analysis should be informed by enablement considerations. In rapidly evolving technologies enablement considerations, as opposed to claim language, will define claim scope. Consequently, consistent with its underlying ideology, the patent system will reward an inventor only for the degree of enablement he or she has provided and thereby reward inventive activity without frustrating additional progress.