

RECONSIDERING THE INTERCHANGEABILITY FACTOR UNDER THE DOCTRINE OF EQUIVALENTS

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ABSTRACT

The United States Supreme Court has indicated that the doctrine of equivalents essentially prohibits the practice a fraud on a patent. To permit imitation of a patented invention that does not copy every literal detail is to deem patent-grant protection hollow and useless. This deprives the inventor of the benefit of his invention and fosters invention concealment rather than disclosure, which is one of the primary purposes of the patent system. An important factor in determining equivalency is to assess whether persons skilled in the art would have known of the interchangeability of an ingredient not contained in the patent with one that was. Therefore, the Federal Circuit often cites interchangeability as a factor that may influence an equivalency decision. However, the effect of the interchangeability approach is ambiguous. This article reviews the Supreme Court and Federal Circuit decisions on the interchangeability factor, and provides a critical analysis. Because of the uncertainty of interchangeability, the article proposes to reconsider the effect of interchangeability factor under the doctrine of equivalents.

Keywords: Doctrine of equivalents, interchangeability, tri-partite test, triple identity test

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I. Introduction

According to patent law, patent right protection should be limited in its scope of patent claims.¹ The patentee should pay the price if patent claims are unable to cover foreseeable variations. However, the doctrine of equivalents allows the patentee to exclude others to practice the patent invention beyond the patent-claim scope.² The dilemma is the conflict result between two patent policies. The first protects the patent system from the consequences of allowing the free practice of insubstantial changes. The second provides adequate public notice of patent-conferred rights.³

In 1950, the Supreme Court first applied the modern doctrine of equivalents in *Graver Tank & Mfg. Co. v. Linde Air Prods. Co.*⁴ In restating the doctrine of equivalents, the Supreme Court considered "an important factor" to be "whether persons reasonably skilled in the art would have known of the interchangeability of an ingredient not contained in the patent with one that was." Therefore, the decisions by the Federal Circuit often cite "interchangeability" as a factor that may influence a decision on equivalency.⁵

However, interchangeability effect is ambiguous. One commentator believes that the "interchangeability approach" is an independent test, which is parallel to the "triple-identity" test.⁶ Another commentator believes that known interchangeability may support an infringement finding under the doctrine of equivalents, but it will not necessarily do so, and known interchangeability is unnecessary for infringement.⁷ Still one other commentator believes that interchangeability should be used to reject, rather than support, applying the doctrine of equivalents.⁸

This Article provides a critical analysis of interchangeability under the doctrine of equivalents and proposes reconsidering the interchangeability factor. Part I of this Article provides a brief introduction to the doctrine of equivalents and the interchangeability factor under the doctrine of

¹ Sage Prods., Inc. v. Devon Indus., Inc., 126 F.3d 1420, 1425 (Fed. Cir. 1997).

² Lee Petherbridge, *On the Decline of the Doctrine of Equivalents*, 31 CARDOZO L. REV. 1371, 1374 (2010).

³ DONALD S. CHISUM ET AL., PRINCIPLES OF PATENT LAW 906 (3rd ed. 2004).

⁴ Warner-Jenkinson Co., Inc. v. Hilton Davis Chem. Co., 520 U.S. 17, 21 (1997).

⁵ DONALD S. CHISUM, CHISUM ON PATENTS § 18.05 (2011).

⁶ John Cordani, *Reviving the Federal Circuit's Dead Letter Teaching, Suggestion, or Motivation Test for the Doctrine of Equivalents*, 39 AIPLA Q.J. 163, 164 (2011).

⁷ Charles W. Adams, *The Doctrine of Equivalents: Becoming a Derelict on the Waters of Patent Law*, 84 NEB. L. REV. 1113, 1150-1151 (2006)

⁸ Martin J. Adelman & Gary L. Francione, *The Doctrine of Equivalents in Patent Law: Questions That Pennwalt Did Not Answer*, 137 PA. L. REV. 673, 696-697 (1989)

equivalents. Part II presents a review of landmark judicial decisions on the doctrine of equivalents and the interchangeability factor. Part III presents a discussion on the role of interchangeability for determining equivalency under the doctrine of equivalents and explains why the interchangeability factor should be abolished. Part IV offers a conclusion.

II. Judicial Underpinnings for the Interchangeability Factor

A. The Graver Tank Triple Identity Test and Interchangeability Factor

In *Graver Tank*,⁹ the Supreme Court set the modern contours of the doctrine of equivalents.¹⁰ The Court indicated that the doctrine essentially prohibits the practice of a fraud on a patent¹¹ and recognized that to permit imitation of a patented invention that does not copy every detail is to deem patent-grant protection hollow and useless.¹² This encourages the unscrupulous copyist to make unimportant and insubstantial changes and substitutions in a patent that suffice to take the copied matter outside the reach of law.¹³ This deprives the inventor of the benefit of his invention and fosters invention concealment rather than disclosure, which is one of the primary purposes of the patent system.¹⁴ To prevent an infringer from stealing the benefit of the invention, the patentee may invoke the doctrine of equivalents to proceed against the producer of a device if it performs substantially the same function in substantially the same way to obtain the same result.¹⁵ The theory on which it is founded is that “if two devices do the same work in substantially the same way, and accomplish substantially the same result, they are the same, even though they differ in name, form, or shape.”¹⁶ This test is known as the triple-identity test.¹⁷

The Court further indicated that equivalency must be determined against the patent context, prior art, and the particular circumstances of the case. Equivalence is not a prisoner of a formula and is not an absolute to be considered in a vacuum.¹⁸ To determine equivalency, an important factor is to assess whether persons reasonably skilled in the art would have known of the interchangeability of a component not contained in the patent with one

⁹ *Graver Tank & Mfg. Co. v. Linde Air Prods. Co.* 339 U.S. 605 (1950).

¹⁰ *Warner-Jenkinson Co., Inc. v. Hilton Davis Chem. Co.*, 520 U.S. 17, 21 (1997).

¹¹ *Graver Tank*, 339 U.S. at 608.

¹² *Id.* at 607.

¹³ *Id.*

¹⁴ *Id.*

¹⁵ *Id.* at 608.

¹⁶ *Id.*

¹⁷ CHISUM, *supra* note 5, at § 18.04 [1][a][iii].

¹⁸ *Graver Tank*, 339 U.S. at 609.

that was.¹⁹

The key issue in this case is whether substituting manganese for magnesium is a substantial change to make the doctrine of equivalents inapplicable.²⁰ The Court found that the accused product and the patent composition in the suit were substantially identical in operation and in result, and the accused product was also in all respects equivalent to the patent for welding purposes. For practical purposes, the composition, manganese silicate, in the accused product can be efficiently and effectively substituted for calcium and magnesium silicates as the major constituent of the welding composition in the patent.²¹ Prior art disclosures clearly show that manganese silicate is a useful ingredient in welding compositions. Specialists familiar with the problems of welding compositions understand that manganese is equivalent to and can be substituted for magnesium in the composition of the patented flux, observations confirmed by chemistry literature.²² Therefore, the Court determined that applying the doctrine of equivalents is appropriate.²³

In this case, the Supreme Court also stated that the doctrine does not operate only in favor of the patentee. When a device is largely 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 infringement action.²⁴

B. The Application of Interchangeability Factor after Graver Tank

In *Graver Tank*, the Supreme Court ruled that known interchangeability is an important factor in determining equivalence. Therefore, decisions by the Federal Circuit often cite "interchangeability" as a factor that may influence a decision on equivalency.²⁵ However, interchangeability factor had various legal effects in different cases.

In *Pennwalt Corp. v. Durand-Wayland, Inc.*²⁶ the patent was an apparatus that rapidly sorted items such as fruit by color, weight, or a combination of the two.²⁷ The claims-at-issue in the patent were expressed

¹⁹ *Id.*

²⁰ *Id.* at 610.

²¹ *Id.* at 611-12.

²² *Id.* at 612.

²³ *Id.*

²⁴ *Id.* at 608-09

²⁵ CHISUM, *supra* note 5, at § 18.04[5].

²⁶ *Pennwalt Corp. v. Durand-Wayland, Inc.* 833 F.2d 931(Fed. Cir. 1987).

²⁷ *Id.* at 933.

in means-plus-function language. The patent specification describes a hardwired network consisting of electrical components that perform each step of the claims.²⁸ The accused device used computer software programs.²⁹ The Federal Circuit, sitting en banc, noted the hardware and software interchangeability by stating that if the accused devices differ only in substituting a computer for hardwired circuitry, the patentee might have a stronger position for arguing that the accused devices infringe the claims.³⁰ The Federal Circuit Court recognized interchangeability as an important factor in determining equivalency. The interchangeability in the decision seemed to be a complete approach to determine equivalence.

However, in *Perkin-Elmer Corp. v. Westinghouse Electric Corp.*,³¹ the Federal Circuit did not consider the interchangeability factor a complete approach that is as strong as the “triple identity” test. In this case, the patentee sued for patent infringement involving a resonator coupler for an electrode-less discharge lamp used in various types of chemical analyses. The patent claimed a particular type of coupling, called tap-coupling, for connecting a helical coil and the power source. The accused device used a different type of coupling, called loop-coupling.³² The tap-coupling operated by frequency-tuning to obtain a high voltage within the lamp and by impedance-matching to maximize power transferred from the power source to the lamp. In the accused device, the connecting point between the helical coil and the power source in the loop-coupling was non-fixed for frequency-tuning or impedance-matching.³³ In attempting to invoke the doctrine of equivalents to cover the accused device, the patentee relied on the substitutability factor and argued that those skilled in the art would have regarded tap-coupling and loop-coupling as interchangeable.³⁴ Therefore, loop-coupling should fall within the equivalency range. The Federal Circuit rejected the argument, holding that, although interchangeability was a factor in considering whether the doctrine of equivalents applied, the accused devices must still perform substantially the same function in substantially the same way to obtain the same result.³⁵

In 1995, the Federal Court had clearer decision on interchangeability in

²⁸ *Id.* at 933-34.

²⁹ *Id.*

³⁰ *Id.* at 935.

³¹ *Perkin-Elmer Corp. v. Westinghouse Electric Corp.*, 822 F.2d 1528 (Fed. Cir. 1987).

³² *Id.* at 1529-31.

³³ *Id.* at 1531.

³⁴ *Id.* at 1532.

³⁵ *Id.* at 1535.

*Hilton Davis Chem. Co. v. Warner-Jenkinson Co., Inc.*³⁶ This is a Federal Circuit *en banc* decision. In this case, the inventors added the phrase “at a pH from approximately 6.0 to 9.0” for the operation condition of the claimed process during patent prosecution. The accused process operated at a pH of 5.0. The patentee, Hilton Davis, sued Warner-Jenkinson for patent infringement and relied solely on the doctrine of equivalents. The Federal Circuit indicated that the Supreme Court defined the doctrine of equivalents in terms of the substantiality of the differences between the claimed and accused subject.³⁷ In many cases, the courts relied on the “triple identity” test to measure the substantiality of the differences.³⁸ The “triple identity” test often suffices to assess equivalency because similarity of function, way, and result leaves little room for doubt that only insubstantial differences distinguish the accused product or process from the claims.³⁹ But evaluation of function, way, and result does not necessarily end the inquiry.⁴⁰ As technology becomes more complex, the “triple identity” test may not always suffice to show the substantiality of the difference.⁴¹ The Supreme Court introduced factors other than function, way, and result in *Graver Tank* because equivalence is not the prisoner of a formula.⁴² Therefore, the Federal Circuit cited *Graver Tank* and restated that an important factor to be considered apart from function, way, and result “is whether persons reasonably skilled in the art would have known of the interchangeability of an ingredient not contained in the patent with one that was.” Because “equivalence, in the patent law, is not the prisoner of a formula,” the available relevant evidence may vary by case. Therefore, the court stressed that “the known interchangeability of the accused and claimed elements is potent evidence that one of ordinary skill in the relevant art would have considered the change insubstantial.”⁴³

After *Hilton Davis Chem.*, most of the Federal Circuit decisions followed the ruling. In *Lifescan, Inc. v. Home Diagnostics, Inc.*,⁴⁴ the patent claim requires taking dry and wet reflectances from the same strip. The accused

³⁶ *Hilton Davis Chem. Co. v. Warner-Jenkinson Co.*, 62 F.3d 1512 (Fed. Cir. 1995) (en banc), *rev'd & remanded* for further proceedings consistent with the Supreme Court's opinion, 520 U.S. 17 (1997), *remanded*, 114 F.3d 1161 (Fed. Cir. 1997).

³⁷ *Id.* at 1517.

³⁸ *Id.*

³⁹ *Id.* at 1518.

⁴⁰ *Id.*

⁴¹ *Id.*

⁴² *Id.* at 1518-19.

⁴³ *Id.* at 1519.

⁴⁴ *Lifescan, Inc. v. Home Diagnostics, Inc.*, 76 F.3d 358 (Fed. Cir. 1996).

method did not take a dry reflectance reading from the same test strip that was used in the test, but measured it in advance at the factory.⁴⁵ The accused infringer argued that a prior art reference limits the available equivalency range. The court ruled that the prior art might be viewed as showing that the accused infringer has simply replaced the initial step of the claimed process with a known interchangeable alternative, thus reinforcing the patentee's position that the processes are equivalent. The court cited *Hilton Davis Chem.* and stated that “interchangeability known to persons reasonably skilled in the art is evidence of equivalency. The remaining steps of the patented process and the accused process are the same. Thus the factual question is raised of the significance of the prior art as evidence that the accused infringer is practicing the prior art or as evidence of equivalency.”⁴⁶

C. The All-Elements Rule and Interchangeability in Warner-Jenkinson

In *Warner-Jenkinson Co., Inc. v. Hilton Davis Chem. Co.*,⁴⁷ the Supreme Court confirmed applying the doctrine of equivalents under the all-elements rule. This is an appeal case from the *Hilton Davis Chem.* decision by the Federal Circuit. The Supreme Court declined the petitioner's invitation to speak the death of the doctrine of equivalents⁴⁸ and noted that if the doctrine is broadly applied, it conflicts with the definitional and public-notice functions of the statutory claim requirement.⁴⁹ To reconcile the doctrine with these functions, the Supreme Court conceded that the court has no right to enlarge a patent beyond the scope of its claims as allowed by the United States Patent and Trademark Office (“USPTO”).⁵⁰ The scope is not enlarged if courts do not go beyond the substitution of equivalents.⁵¹ Therefore, it confirmed that each element contained in a patent claim is deemed material to defining the patented-invention scope, and thus, the doctrine must be applied to individual elements of the claim, and not to the invention as a whole.⁵² Ensuring that the doctrine application, even to an individual element, is not allowed such broad to effectively eliminate that element entirely is important.⁵³ The doctrine of equivalents should apply under the all-elements rule.

⁴⁵ *Id.* at 361.

⁴⁶ *Id.* at 362.

⁴⁷ *Warner-Jenkinson Co., Inc. v. Hilton Davis Chem. Co.*, 520 U.S. 17 (1997).

⁴⁸ *Id.* at 21.

⁴⁹ *Id.* at 29.

⁵⁰ *Id.*

⁵¹ *Id.*

⁵² *Id.*

⁵³ *Id.*

The Supreme Court stressed that claims serve both a definitional and a notice function by placing the burden on the patent-holder to establish the reason for an amendment during patent prosecution. If no explanation can be established, the court presumes that the USPTO had a substantial reason related to patentability for including the limiting element in the amendment. In those circumstances, prosecution history estoppel bars the application of the doctrine of equivalents to that element.⁵⁴

In this decision, the Supreme Court also indicated the insufficiency of “triple identity” test and “insubstantial differences” test. Although the “triple identity” test may be suitable for analyzing mechanical devices, it often provides a poor framework for analyzing other products or processes. However, the insubstantial differences test offers little additional guidance as to what might render any given difference “insubstantial.”⁵⁵ Various linguistic frameworks may be more suitable to different cases, depending on their particular facts. However, the particular linguistic framework used is less important than whether the test is probative of the essential inquiry: Does the accused product or process contain elements identical or equivalent to each claimed element of the patented invention?⁵⁶ Irrespective of which test is applied, an analysis of the role played by each element in the context of the specific patent claim informs the inquiry as to whether a substitute element matches the function, the way, and the result of the claimed element, or whether the substitute element plays a role that is substantially different from the claimed element.⁵⁷ With these limiting principles as a backdrop, the Supreme Court saw no purpose in further micromanaging the Federal Circuit’s particular word choice for analyzing equivalence.

For the interchangeability issue, the Supreme Court addressed that the proper time for evaluating equivalency—and thus, knowledge of interchangeability between elements—is at the time of infringement, and not at the time of patent issuance.⁵⁸ The Supreme Court also noted that the “known interchangeability of substitutes for an element of a patent is one of the express objective factors noted by *Graver Tank* as bearing upon whether the accused device is substantially the same as the patented invention.”⁵⁹ This indicates that knowledge combined with state of the art is a factor that bears upon substantial similarity, but is not the ultimate test of substantial

⁵⁴ *Id.* at 33.

⁵⁵ *Id.* at 39-40.

⁵⁶ *Id.* at 40.

⁵⁷ *Id.*

⁵⁸ *Id.* at 37.

⁵⁹ *Id.* at 36.

similarity or equivalency. The Court stated that “a skilled practitioner’s knowledge of the interchangeability between claimed and accused elements is not relevant for its own sake, but rather for what it tells the fact-finder about the similarities or differences between those elements.”⁶⁰

D. The Unforeseeable Equivalent in Festo

In *Festo Corp. v. Shoketsu Kinzoku Kogyo Kabushiki Co.*,⁶¹ the Supreme Court again stressed the importance of the public-notice function in the patent system, indicating that patent laws require inventors to describe their work in “full, clear, concise, and exact terms,” and the public should be encouraged to pursue innovations, creations, and new ideas beyond the inventor’s exclusive rights.⁶² However, the nature of language makes it impossible to capture the essence of a thing in a patent application. The invention is often novel, and words do not exist to describe it. Things are not made for the sake of words, but words for things.⁶³ Thus, patent-claim language may not capture every nuance of the invention or describe the range of its novelty with complete precision. If patents were always interpreted literally, their value would greatly diminish. Non-important and insubstantial substitutes for certain elements could defeat the patent and destroy its value to inventors by simple copying.⁶⁴ Therefore, the scope of a patent is not limited to its literal terms, but instead embraces all equivalents to the claims described.⁶⁵ The patent scope should cover unforeseeable technology under the doctrine of equivalents.⁶⁶

However, the doctrine of equivalents renders the patent scope uncertain, and it may be difficult to determine whether it is equivalent. This uncertainty may deter competitors from engaging in legitimate manufacturing outside the patent-limit scope, or cause the competitors to mistakenly invest in competing products, or lead to wasteful litigation between competitors. However, the Court has acknowledged uncertainty as the price of ensuring appropriate innovation incentives, and has affirmed the doctrine over dissents urging a more certain rule.⁶⁷

E. Further Development of the Interchangeability Factor

⁶⁰ *Id.* at 37.

⁶¹ *Festo Corp. v. Shoketsu Kinzoku Kogyo Kabushiki Co.*, 535 U.S. 722 (2002).

⁶² *Id.* at 731.

⁶³ *Id.*

⁶⁴ *Id.*

⁶⁵ *Id.* at 732.

⁶⁶ *Id.* at 740-41.

⁶⁷ *Id.* at 732-33.

After the *Warner-Jenkinson* decision, the interchangeability factor had further development in Federal Circuit decisions. Most of these decisions continued recognizing the importance of “interchangeability” in determining equivalency as in the following:

In *Multiform Desiccants, Inc. v. Medzam, Ltd.*,⁶⁸ the claimed invention required the packet comprising a degradable envelope.⁶⁹ However, the accused product’s envelope was non-soluble and did not degrade in the liquid. Although the patentee argued that the accused packet functioned in a manner that was “consistent” with the patented invention, for the accused porous envelope to release its contents on contact with liquid, the district court found a porous envelope that bursts with inner pressure to be substantially different from a degradable envelope that dissolves.⁷⁰ The Federal Circuit ruled that “interchangeability is a significant factor in determination of equivalency.” Because the district court found that person skilled in the art would not know the envelope in the accused product as interchangeable with a degradable envelope, the Federal Circuit affirmed the district court's finding of non-infringement under the doctrine of equivalents.⁷¹ The interchangeability factor in the decision was used to reject the application of doctrine of equivalents.

In *Interactive Pictures Corp. v. Infinite Pictures, Inc.*,⁷² the Federal Circuit confirmed the importance of the interchangeability test, and further indicated that incompatibilities in computer data files do not necessarily rise to the level of substantial differences. Even the slightest difference in file formats often creates an incompatibility, because computers are exact machines. However, the law of patent infringement is not so limiting. A patent claim may be infringed if an element of the infringing device is only substantially the same as a limitation of the patent claim ... Rather than focusing on physical or electronic compatibility, the known interchangeability approach looks to the knowledge of a skilled artisan to see whether that artisan would contemplate the interchange as a design choice.”⁷³ Thus, the expert testimony that the claimed digital fisheye image and the equirectangular panorama file in the accused device are “interchangeable alternatives” is substantial evidence supporting equivalency.⁷⁴

⁶⁸ *Multiform Desiccants, Inc. v. Medzam, Ltd.*, 133 F.3d 1473 (Fed. Cir. 1998).

⁶⁹ *Id.* at 1476.

⁷⁰ *Id.* at 1480.

⁷¹ *Id.* at 1480-81.

⁷² *Interactive Pictures Corp. v. Infinite Pictures, Inc.*, 274 F.3d 1371 (2001).

⁷³ *Id.* at 1382.

⁷⁴ *Id.*

In *Toro Co. v. Deere & Co.*,⁷⁵ the Federal Circuit ruled that the interchangeability factor should consider the similarity of technology between the patent and the accused subject, not only the function and result. In this case, the patent required a control means connecting said pressurized fluid-generating means to the input ports of each said nozzle to produce periodic fluid injections from the output port of each said nozzle.⁷⁶ The district court concluded that this clause was written in means-plus-function format pursuant to 35 U.S.C. § 112 ¶ 6 and determined that the corresponding structure included a mechanical cam system. This is the structure that ultimately produces and controls the dispersion of pressurized liquid from the nozzle output ports.⁷⁷ The accused device used an electrically operated solenoid system, and therefore, did not contain the same structure as disclosed in the patent.

The key question then is whether a reasonable trier of fact could find § 112, ¶ 6 equivalency between the mechanically operated cam system and the electrically operated solenoid system.⁷⁸ The patentee contended that any differences between the cam system and the solenoid system were insubstantial.⁷⁹ The Federal Circuit stated, “Although the two devices appear to perform an identical function, they do so in substantially dissimilar ways.”⁸⁰ The patentee failed to articulate the technical similarities between the cam and solenoid systems or why the differences between the two systems were insubstantial, particularly in the way the claimed function performed. The patentee highlighted certain statements (e.g., from its expert witnesses) that cams and solenoids could be used interchangeably, but this applied to the function or result of these systems.⁸¹ In contrast, the accused infringer stressed the basic technical difference between a cam system and a solenoid system: the cam system is mechanical, and the solenoid system is electrical. This difference means that the two systems accomplish the claimed function in fundamentally different ways. The cam system uses a metal “cam follower” that travels up the cam slope, lifting a valve stem to open the liquid valve. The solenoid system uses electricity to create a magnetic force that pulls open the liquid valve.⁸² Therefore, the Federal Circuit stated that “although the two devices appear to perform an identical

⁷⁵ *Toro Co. v. Deere & Co.*, 355 F.3d 1313 (Fed. Cir. 2004)

⁷⁶ *Id.* at 1322-23.

⁷⁷ *Id.* at 1323.

⁷⁸ *Id.*

⁷⁹ *Id.*

⁸⁰ *Id.* at 1324.

⁸¹ *Id.*

⁸² *Id.*

function, they do so in substantially dissimilar ways.”⁸³

In summary, the interchangeability factor has played an important role in certain Federal Circuit decisions. The court has occasionally relied on interchangeability to support equivalence under the doctrine of equivalents. However, in certain decisions, interchangeability was not dispositive. In these decisions, although certain evidence supported interchangeability between the patented invention and the accused device, the court resorted to the function/way/result test or the insubstantial-differences test for determining equivalency.

III. Reconsidering the Interchangeability Factor

A. Non-explicit Interchangeability Content

Although the judicial decisions continuously recognized the importance of interchangeability factor and applied this factor, the content of interchangeability factor is insufficiently explicit to follow. In *Graver Tank*, when the Supreme Court ruled that “an important factor is whether a person reasonably skilled in the art would have known of the interchangeability of an ingredient not contained in the patent with one that was,” it did not explain interchangeability content clearly.⁸⁴ In this case, it mainly relied on the disclosures of prior art that manganese silicate is a useful ingredient in welding compositions and specialists understood the high possibility of substituting manganese for magnesium in the patented-flux composition. The Court presented no discussion on technology similarity, but it focused on the similar function or result for determining interchangeability. Therefore, in *Toro*, the patentee alleged interchangeability based on function and result similarity. However, the Federal Circuit rejected the argument by indicating substantially dissimilar ways between the accused device and the claimed invention. The court took the position that the interchangeability test still required discussion of technology similarity between the accused technology and the patented invention, and not simply the similarity of function and result.

However, the Federal Circuit attempted to develop an interchangeability approach on specific topics in certain decisions. In *Pennwalt* and *Overhead*, the court discussed the tradeoff between hardware and software. In *Interactive Pictures*, the court indicated that interchangeability is not compatibility, but a design choice.

These decisions are not explicit enough for determining equivalence. For example, none of the leading cases discussed the possibility or difficulty of

⁸³ *Id.*

⁸⁴ CHISUM, *supra* note 5, at § 18.04[5].

interchangeability. The evidence for determining interchangeable relied mostly on expert testimony, with no clear guidelines for these experts to determine interchangeability. For example, it was unclear whether these experts should consider interchangeability a function, way or result. To what extent should interchangeability be able to support equivalency? What is the level of interchangeability possibility and difficulty?

Because of interchangeability ambiguousness, the Federal Circuit resorted to the function/way/result test or the insubstantial-differences test, even when there was discussion or a potential interchangeability conclusion in the case.

B. Interchangeability Uncertainty

The interchangeability conclusion might float for the same accused technology. To date, the Supreme Court has ruled that the proper time for evaluating equivalency and knowledge of interchangeability between elements is at the time of infringement, and not when the patent was issued.⁸⁵ Based on the timing of determining equivalency, if an accused device is not considered interchangeable with the patented invention, the same device might have a different conclusion on any other day after the first accused device goes public. Because the first accused device has been a part of the state of the art in the public domain, a person skilled in the art could use it for a potential second accused device without difficulty. Then, the second accused device would be interchangeable from the patented invention for a person skilled to the art after the first accused device goes public. Therefore, although the accused devices are the same, the interchangeability conclusions could be different because of time difference, which could occur within a few days after the first decision. Thus, interchangeability is not a fixed criterion, but a floating one that leads to different infringement consequences under the doctrine of equivalents for the same accused devices.

In contrast, if the court applies the “triple identity” test or the “insubstantial differences” test, the equivalency conclusion will not differ for the same devices. In the triple-identity test, the conclusion of the function/way/result comparison will not change for the same device, regardless of the time difference. In the insubstantial-differences test, the conclusion of insubstantiality for the accused device also will not change because of the time change.

Therefore, compared with the “triple identity” test and the “insubstantial differences” test, the interchangeability approach has high uncertainty.

⁸⁵ *Warner-Jenkinson*, 520 U.S. at 37.

C. Insufficient Public Notice Function

In *Warner-Jenkinson*, the Supreme Court noted that the doctrine of equivalents, when applied broadly, conflicts with the definitional and public-notice functions of the statutory claims requirement.⁸⁶ To reconcile the doctrine with these functions, the Supreme Court conceded that the court has no right to enlarge a patent beyond the scope of its claims as allowed by the USPTO.⁸⁷ Therefore, it confirmed that each element contained in a patent claim is deemed material to defining the scope of the patented invention, and thus, the doctrine must be applied to individual elements of the claim, and not to the invention as a whole.⁸⁸ In *Festo*, the Supreme Court further stressed that the patent laws require inventors to describe their work in “full, clear, concise, and exact terms,” and that the public should be encouraged to pursue innovations, creations, and new ideas beyond the inventor’s exclusive rights.⁸⁹

As mentioned, the interchangeability criterion is floating and could lead to diverse infringement consequences because of time difference. This criterion places the public in a highly dangerous position to inappropriately evaluate potential infringement risk under such a criterion because the conclusion changes over time.

In contrast, if the court applies the triple-identity test or the insubstantial-differences test, the equivalency conclusion will not differ. The public could rely on the conclusion derived from the “triple identity” test or the “insubstantial differences” test, and could pursue innovations beyond the inventor's exclusive right.

D. Reconsidering the Interchangeability Factor

Interchangeability is not a complete test for determining equivalents, but only one possible supplemental factor to support the equivalency conclusion. However, interchangeability has high uncertainty in determining equivalency. Using the interchangeability approach, the equivalency decision differs from the first accused matter to the others, even if all of the accused matters are the same. The public-notice function in the interchangeability approach is also insufficient because the public cannot rely on it to determine equivalency.

Just as the statement in *Festo*, the public should be encouraged to pursue innovations, creations, and new ideas beyond the inventor's exclusive rights.

⁸⁶ *Id.* at 29.

⁸⁷ *Id.*

⁸⁸ *Id.*

⁸⁹ *Festo*, 535 U.S. at 731.

However, by applying the interchangeability factor, the public will hesitate to invest and research in the field of patent related technology because they won't be able to evaluate the potential risk of infringement appropriately.

Because of the uncertainty and insufficient public notice function in interchangeability factor, determining equivalency by interchangeability is insufficiently appropriate to treat it as an important factor. Applying the interchangeability factor should be seriously considered.

IV. Conclusion

Following the Supreme Court ruling that interchangeability is an important factor to determine equivalency in *Graver Tank*, interchangeability played a notable role in later patent litigations. In *Warner-Jenkinson*, the Supreme Court further ruled that the proper time for evaluating interchangeability knowledge between elements is at the time of infringement, and not at the time the patent was issued. The patentee or accused infringer frequently introduces interchangeability to argue equivalency.

The Federal Circuit has often cited interchangeability as a factor that may influence a decision on equivalency. In *Hilton Davis*, the Federal Circuit sitting en banc stressed that known interchangeability of the accused and claimed elements is potent evidence that a person of ordinary skill in the relevant art has considered the change insubstantial. However, interchangeability is not dispositive. In certain decisions by the Federal Circuit, although certain evidence has supported interchangeability between the patented invention and the accused device, the courts have resorted to the "triple identity" test or the "insubstantial differences" test for determining equivalency. However, interchangeability content is inexplicit and interchangeability has high uncertainty. The public won't be unable to rely on this factor to determine equivalency appropriately and will hesitate to invest and research. Therefore, interchangeability should not be treated as such an important factor under the doctrine of equivalents as the Supreme Court conceived it.

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