

The Shifting Sands of Section 101 and Section 112 Requirements for Computer Program-Related Inventions**

This article responds to the need of attorneys to develop a strategy in preparing and prosecuting patent protection for computer program-related inventions given the shifting legal environment surrounding this technology in the United States. The article is organized into two topics: (1) 35 U.S.C. section 101—statutory subject matter, and (2) 35 U.S.C. section 112—enablement, best mode, and means-plus-function claims. This article is not intended to be an exhaustive treatment of U.S. patent law surrounding these two topics. Rather, it provides practical tips and suggestions that will have immediate applicability to anyone interested in obtaining patent protection directed to computer program-related inventions in the United States.

The legal environment surrounding computer program-related inventions is currently uncertain. The reason is twofold. First, the United States Patent and Trademark Office (USPTO) is under sustained political pressure regarding computer program-related inventions. Second, with regard to the section 112 requirements, the courts and the USPTO are grappling with the issue of exactly how much disclosure is enough to satisfy the patent laws.

The software industry continues to grow every year. Currently, the United States is leading the world in the development of computer program-based inventions. For example, the personal computer software industry topped \$7 billion in

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1992.¹ Consequently, although patent claims directed towards computer program-related inventions are controversial in some circles, the patent community continues to file thousands of patent applications directed towards this technology every year. For example, the number of filings in the USPTO has steadily increased each of the last five years for technology relating to electrical computers and processing systems. In 1988 approximately 4,000 patent applications were filed in these classes, while in 1992 more than 7,500 patent applications were filed.² Attorneys cannot ignore the fact that inventors continue to file patent applications in the United States regardless of the increasing difficulty in obtaining approval of these applications.

I. 35 U.S.C. Section 101—Statutory Subject Matter

One of the more controversial and confusing areas of patent law today is statutory subject matter. The scope of statutory subject matter is encompassed within section 101, which states that the right to obtain a patent is given to one who “invents or discovers any new and useful process, machine, manufacture, or composition of matter or any new and useful improvement thereof.” A great deal has been written during the last ten years on the subject of statutory subject matter and how it should be applied to computer program-related inventions. Despite the controversy, the courts, the USPTO, and patent attorneys are no closer to a consensus on exactly what the scope of statutory subject matter should be for computer program-related inventions.

Not too long ago, a patent attorney did not need to worry whether a computer program-related invention was statutory subject matter in the United States. Beginning in the early 1980s the USPTO relaxed (in a de facto fashion) its critical interpretation of what constituted statutory subject matter with regard to computer program-related inventions. As late as 1987 statutory subject matter was a dead issue with respect to computer program-related inventions. The USPTO was issuing patents for all types of claims (structure, means-plus-function, method, user interface, computer program product, for example) directed towards computer program-related inventions. Even the use of mathematical expressions in the claims did not raise a statutory subject matter question in most cases.

This pattern changed, however, starting in 1987. Critics of computer program-related patents started voicing their concerns, and spreading what we considered to be misinformation in many cases. Both the critics of computer program-related patents and governmental channels brought political pressure on the USPTO. Consequently, the USPTO started rejecting claims based on statutory subject matter basis more frequently. In September 1989, the

1. SAN JOSE MERCURY NEWS, Jan. 20, 1993.

2. These figures were obtained from discussions with representatives of group 2300 of the USPTO.

USPTO, on its own initiative, published an article containing guidelines on the patentability of computer program-related inventions in its *Official Gazette*.³ The article analyzed all of the Supreme Court and Court of Customs and Patent Appeals (CCPA) decisions concerning statutory subject matter involving computer program-related or algorithm inventions. The article also set forth a two-part test for determining whether a claim is directed to a nonstatutory mathematical algorithm.⁴ The test first requires a determination whether the claim recites a mathematical algorithm. If it does, the test then holds that the claim recites statutory subject matter only if the mathematical algorithm applies to physical elements or process steps.

Two major schools of thought have emerged on the subject of computer program-related inventions. The first, which is the majority view as well as our own, is that computer program-related technology should not be treated any differently in terms of statutory subject matter than computer hardware-related technology. The second view, held by a minority, contends that computer program-related technology is inherently different from hardware technology, that it should not be deemed statutory subject matter, and that to do so will bring dire consequences to the software industry.

The USPTO is responding to this pressure essentially by forcing the issue from the Patent Office to Congress and the courts. Congress is unlikely to address this issue. From a practical point of view, one cannot see how Congress can modify the patent laws to deal specifically with computer program-related inventions.⁵ Thus, the problem will be left to the Federal Circuit and the Supreme Court. Unfortunately, a ruling by the Federal Circuit does not guarantee compliance from the USPTO.⁶

Engineers and computer scientists who develop hardware and software technology see no difference from a technical, business, or innovation point of view between hardware-related and computer program-related inventions. In many cases, the innovation that occurs in the computer program context is much greater than that which occurs in the hardware context. The amount of money, time, and effort the computer electronics industry is devoting to computer program development as compared with hardware development has risen dramatically over the last five years. Moreover, whether functionality is produced in hardware or software is often a mere design choice.

3. 1106 Off. Gaz. Pat. Office 5 (1989).

4. This analysis is known as the *Freeman-Walter-Abele* test for statutory subject matter.

5. See John C. Phillips, Note, *Sui Generis Intellectual Property Protection for Computer Software*, 60 GEO. WASH. L. REV. 997 (1992) (advocating a separate legislative program for the protection of computer software). A sui generis approach is no solution since it cannot keep up with the accelerating evolution of technology. An example of a failed sui generis protection scheme is the one covering chip masks. 35 U.S.C. § 901 (1988).

6. See, e.g., the USPTO response to *In re Iwahashi*, 888 F.2d 1370 (Fed. Cir. 1989); *Arrhythmia Research Technology, Inc. v. Corazonix Corp.*, 958 F.2d 1053 (Fed. Cir. 1992) (discussed below).

The patentability of computer program-related inventions is the result of a series of Supreme Court decisions.⁷ Another important Supreme Court decision that dealt with statutory subject matter (although in the biotechnology area) observed that Congress intended section 101 to include "anything under the sun that is made by man."⁸

The battleground concerning whether computer program-related inventions constitute patentable subject matter involves whether such inventions fall within the specified classes of statutory subject matter set forth in section 101. Prior to the *Diehr* decision, the USPTO broadly construed what was encompassed by computer program-related inventions and took the position that computer program-related inventions were not statutory subject matter.

In 1992 the Federal Circuit summarized the holdings in *Benson* and *Flook* as follows:

In *Gottschalk v. Benson* the Court held that a patent claim that "wholly pre-empts" a mathematical formula used in a general purpose digital computer is directed solely to a mathematical algorithm, and therefore does not define statutory subject matter under section 101.⁹

In *Parker v. Flook* the Court explained that the criterion for patentability of a claim that requires the use of mathematical procedures is not simply whether the claim "wholly pre-empts" a mathematical algorithm, but whether the claim is directed to a new and useful process, independent of whether the mathematical algorithm required for its performance is novel.¹⁰

The 1981 *Diehr* decision dramatically changed the direction taken by *Benson* and *Flook*. In *Diehr* the Supreme Court halted *Benson*'s expansion. In so doing, the Court stated:

[W]hen a claim containing a mathematical formula implements or applies that formula in a structure or process which, *when considered as a whole*, is performing a function which the patent laws were designed to protect (*e.g.*, transforming or reducing an article to a different state or thing), then the claim satisfies the requirements of § 101.¹¹

In November 1989 the Federal Circuit handed down its first two decisions relating to appeals from the USPTO on the issue of section 101 and computer-

7. *Gottschalk v. Benson*, 409 U.S. 663 (1972); *Parker v. Flook*, 437 U.S. 584 (1978). The Supreme Court, in its landmark 1981 decision of *Diamond v. Diehr*, 450 U.S. 175 (1981), effectively limited *Benson* and *Flook* to their facts.

8. *Diamond v. Chakrabarty*, 447 U.S. 303, 309 (1980).

9. Commentators still argue whether *Benson* was decided correctly or should be overruled. One commentator argues that although *Benson* did not articulate a rationale for its decision, there is a basis in patent law for rejecting patents directed towards computer program-related technology. Pamela Samuelson, *Benson Revisited: The Case Against Patent Protection for Algorithms and Other Computer Program-Related Inventions*, 39 EMORY L.J. 1025 (1990). In contrast, Donald S. Chisum, *The Patentability of Algorithms*, 47 U. PITT. L. REV. 959 (1986), argues that *Benson* should be overruled. We agree with this leading patent law commentator.

10. *Arrhythmia Research Technology, Inc. v. Carazonix Corp.*, 958 F.2d at 1056 (citations omitted; footnotes omitted).

11. *Diamond v. Diehr*, 450 U.S. 175, 192 (1981) (emphasis added).

related inventions. These decisions are *In re Iwahashi*¹² and *In re Grams*,¹³ and many commentators view them as being inconsistent.

The rejected claims at issue in *In re Grams* were directed to a method. The Federal Circuit held that a mere data gathering step was insufficient to render them statutory. In *In re Iwahashi* the claims at issue were means-plus-function, where structural relationships between the means clauses were found to exist and a ROM was recited. The court held claims to be statutory. The Federal Circuit in *In re Iwahashi* emphasized that means-plus-function claims should be interpreted in view of the specification.

The USPTO was hostile to the *In re Iwahashi* decision. In response, the USPTO in March 1990 published another guideline¹⁴ cautioning patent attorneys not to overly rely on the *In re Iwahashi* decision. The USPTO stated that it would not accept an interpretation of *In re Iwahashi* that would enable applicants to avoid nonstatutory method rejections merely by drafting claims in "means for" format. The guideline states that the current USPTO policy requires examiners to interpret "means for" limitations broadly. Moreover, the USPTO requires applicants to show that functionally defined means do not encompass all means for performing the recited functions.

That the USPTO in writing and in practice is deliberately ignoring a Federal Circuit decision is, to say the least, troublesome. The USPTO's rationale, according to informal discussion with Patent Office officials, is that later decisions by three-judge panels of the Federal Circuit cannot overrule prior case law. The USPTO, according to its official line, is merely following the earlier cases, which it states are inconsistent with the *In re Iwahashi* decision.

In March 1992 a three-judge panel of the Federal Circuit handed down another important decision relating to section 101. *Arrhythmia Research Technology, Inc. v. Corazonix Corp.*¹⁵ involved an appeal of a district court infringement case declaring method and apparatus claims invalid for being nonstatutory. The claims at issue were directed to the analysis of electrocardiographic signals in order to determine certain characteristics of the heart function. In the opinion written by Judge Newman the court held that the claims met the requirements of section 101.

The USPTO, although not officially so stating, takes the position that *Arrhythmia* does not affect the standard of statutory subject matter of claims reciting mathematical algorithm or computer program-related inventions.¹⁶ The USPTO asserts that since *Arrhythmia* involved the issue of infringement, the theories and analysis of the Federal Circuit do not apply in the statutory subject matter context.

12. 888 F.2d 1370 (Fed. Cir. 1989).

13. 888 F.2d 835 (Fed. Cir. 1989).

14. 1112 Off. Gaz. Pat. Office 16 (1990).

15. 958 F.2d 1053 (Fed. Cir. 1992).

16. See, e.g., Gerald Goldberg, *Presentation of Computer Related Inventions*, in 2 14TH ANNUAL COMPUTER LAW INSTITUTE 379, 379-410 (1992). Mr. Goldberg is Director of Group 2300 of the USPTO.

We disagree with this position. The standard for determining statutory subject matter of claims does not change from the patentability to the infringement context. Although the USPTO construes claims more broadly during prosecution than courts interpret them in an infringement case, the statutory subject matter analysis of *Arrhythmia* is valid and should be applied in the prosecution context of computer program-related inventions. As such, we recommend that the patent attorney quote from *Arrhythmia* during prosecution to build a record for appeal. Although the USPTO may find arguments based on *Arrhythmia* unpersuasive, the Board of Patent Appeals and Interferences and the Federal Circuit will probably be a better forum for such arguments. Outlined below are what we consider to be some of the more important parts of *Arrhythmia* in the statutory subject matter context.

After a thorough analysis of Supreme Court, CCPA, and prior Federal Circuit decisions, the *Arrhythmia* court concluded that:

The law crystallized about the principle that claims directed solely to an abstract mathematical formula or equation, including the mathematical expression of scientific truth or a law of nature, whether directly or indirectly stated, are nonstatutory under section 101; *whereas claims to a specific process or apparatus that is implemented in accordance with a mathematical algorithm will generally satisfy section 101.*

In applying this principle to an invention whose process steps or apparatus elements are described at least in part in terms of mathematical procedures, the mathematical procedures are considered in the context of the claimed invention *as a whole*.¹⁷

The *Arrhythmia* court went on to emphasize the discussion in *In re Abele*:¹⁸

[P]atentable subject matter [is not limited] to claims in which structural relationships or process steps are defined, limited or refined by the application of the algorithm.

Rather, *Walter* should be read as requiring no more than that the algorithm be “applied in any manner to physical elements or process steps,” provided that its application is circumscribed by more than a field of use limitation or non-essential post-solution activity.¹⁹

That the *Arrhythmia* court did not ignore the preamble of the claim is important. Indeed, the court states that the preamble is a claim limitation and should “not [be] ignored in determining whether the subject matter as a whole is statutory, for all of the claim steps are in implementation of this method.”²⁰ The preamble is the perfect place to emphasize for the examiner “what the claimed method steps do rather than *how* the steps are performed.”²¹

The court also stated that “[t]he view that ‘there is nothing necessarily physical about ‘signals’ ’ is incorrect.”²² This holding reaffirmed *In re Taner*,²³ in which

17. *Arrhythmia*, 958 F.2d at 1057 (emphasis added).

18. 684 F.2d 902 (C.C.P.A. 1982).

19. *Arrhythmia*, 958 F.2d at 1058.

20. *Id.* at 1059.

21. *Ex Parte Logan*, 20 U.S.P.Q.2d (BNA) 1465, 1468 (1991) (emphasis in original; footnote omitted).

22. *Arrhythmia*, 958 F.2d at 1059 (citing *In re Taner*, 681 F.2d 787, 790 (C.C.P.A. 1982)).

23. 681 F.2d 787 (C.C.P.A. 1982).

the CCPA held that a method of seismic exploration including the mathematically described steps of "summing" and "simulating from" was directed to statutory subject matter. Although not always possible, if the claims can be drafted so that signals are being manipulated or transformed, we recommend that the patent attorney couch the claimed invention in terms of signals. At the very least, we recommend using the term "signal," along with other correct terminology, in the specification where appropriate. In that way the patent attorney can, if necessary, amend the claims during prosecution to include the word "signal."

Under *Benson* it is important that any mathematical algorithm or formula not be preempted. The patent attorney must limit the use of the mathematical algorithm or formula to defined process steps and apparatus. The key question, "What did the applicant invent?,"²⁴ is the single most important one to ask during preparation and prosecution of the computer program-related application. If the examiner cannot answer this question after reviewing the claims, and the claims include a direct or indirect recitation of a mathematical algorithm, one can expect to receive a statutory subject matter rejection.

In meetings and interviews at the USPTO we have learned that examiners are instructed to give section 101 rejections if they have *any* doubt about statutory subject matter. In our experience the USPTO is making two types of section 101 rejections. The first deals with software per se, the second with the fact that the computer program-related invention covers a mathematical algorithm. Both rejections can be overcome in some cases, although claim amendment is often necessary. By drafting the claims with the question "What did the applicant invent?" in mind before the first office action, the probability of a statutory subject matter rejection can be decreased.

The *Arrhythmia* court also discussed the fact that the final output in the claimed invention was a number. The court stated that the fact "[t]hat the product is numerical is not a criterion of whether the claim is directed to statutory subject matter."²⁵ Once again, the court was recognizing that the claim as a whole must be examined; because the final output of the invention was a number does not mean it should be pigeonholed as nonstatutory subject matter.

In any computer program-related invention in which the process steps or apparatus elements are described at least in part in terms of mathematical algorithms, the USPTO must consider the claim "as a whole" as outlined in *Diehr*.²⁶ Therefore we recommend drafting the preamble and the body of the claims with functional language that enables an examiner to understand the claimed invention "as a whole." The patent attorney should make sure that the presentation of the claims allows the examiner to understand at a high level "what the invention is." Nevertheless, we remind the reader that the recitation of a "field of use

24. *In re Grams*, 888 F.2d 835, 839 (Fed. Cir. 1989).

25. *Arrhythmia*, 958 F.2d at 1060.

26. *Diamond v. Diehr*, 450 U.S. 175, 192 (1981).

limitation,²⁷ “insignificant post-solution activity,”²⁸ or mere “data gathering,”²⁹ cannot save a claim directed to nonstatutory subject matter.

The specification for computer-related inventions must also reflect this concept. The patent attorney must draft the specification with statutory subject matter in mind. Even if the entire invention is performed in software, the patent application should include a high level illustration of the computer hardware on which the computer program operates.

Moreover, the patent attorney must describe the invention at a high level. Arguing that the claims as a whole satisfy the requirements of section 101 is always easier if the specification describes the invention from a high level. Frequently, an application describes the invention at such a low, specific level that the patent attorney finds it difficult to claim the invention in anything other than mathematical steps. This flaw can be fatal. By explaining any transformations that might take place (whether they be the transformation of signals or other physical elements) or by explaining how the mathematical algorithm is applied in any manner to physical elements or process steps, the patent attorney can avoid claiming only the mathematical aspects of the invention.

Essential to a claim is that the computer program-related method be performed in a computer environment. We therefore recommend insertion of the words “computer-based” before the word “method” in a claim. We also recommend using “computer-based” before the words “system” and “apparatus.” Although all systems and apparatus meet the requirements of section 101, that may not be obvious, especially when the system or apparatus claims are in means-plus-function format.

If at all possible, the patent attorney should have system or apparatus claims in the computer program-related application. We also recommend that the attorney draft two sets of system or apparatus claims. The first set should use means-plus-function form under section 112, paragraph 6.³⁰ The second set should use specific architecture and hardware components. For example, in *In re Iwahashi* the court regarded a ROM to be “a specific piece of apparatus,”³¹ which required that the claim be considered statutory subject matter since it did not wholly preempt the use of the algorithm.

In order to claim a specific apparatus, the patent attorney should include in the specification any possible hardware components that could be substituted for the computer program-related modules—even if the patent attorney does not plan on claiming the specific hardware. Once again, any recitation of hardware in the

27. *Arrhythmia*, 958 F.2d at 1058.

28. *Ex Parte Akamatsu*, 22 U.S.P.Q.2d (BNA) 1915, 1919 (1992).

29. *Grams*, 888 F.2d at 840.

30. See *Ex parte Akamatsu*, 22 U.S.P.Q.2d (BNA) 1915 (1992) (means-plus-function claims that differ from method claims only in “means for” terms before steps must be treated as indistinguishable from method claims in determining whether method is statutory subject matter).

31. 888 F.2d 1370, 1375 (Fed. Cir. 1989).

specification, and especially in the claims, aids the patent attorney during prosecution. Once the USPTO rejects a claim under section 101, the patent attorney cannot add hardware elements not specifically discussed in the specification.

The net result of the current confusion in the area of section 101 is that the patent attorney should expect to see many more statutory subject matter rejections than heretofore. By following the recommendations discussed above, however, the patent attorney can avoid some section 101 rejections, and be in a better position during prosecution to argue that the claims recite statutory subject matter.

On a final note, we believe that the community supporting computer program-related patents must take concerted action to promote the Federal Circuit's understanding that the granting of such patents in the United States is critical for U.S. industrial competitiveness. We believe that the USPTO has taken its tough position to protect it from political pressure and to ease its workload. That stance is not a proper application of patent law, particularly when some of the most significant innovation presently occurring in the electronic industry comes from software development.

II. Disclosure Requirements under Section 112, Paragraph 1

The first paragraph of section 112 requires that:

[t]he 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.³²

The disclosure requirements for the specification—(1) written description and enablement, and (2) the best mode—present the patent attorney with some of the more difficult questions concerning computer program-related inventions.

A. WRITTEN DESCRIPTION AND ENABLEMENT REQUIREMENTS

The attorney must prepare a clear and concise patent application to fulfill the written description and enablement requirements of section 112. For an attorney to write the application seems only sensible. The difficulty lies in deciding how much information and what type of information is needed to satisfy the written description and enablement requirements under section 112. In this respect, computer program-related inventions pose a greater challenge than hardware-related inventions. Even more challenging is an application based on a foreign counterpart application.

1. *Amount of Information in the Specification*

In determining the amount of information to include in an application the patent attorney should opt for quality rather than quantity. Some will argue that the best

32. 35 U.S.C. § 112 (1988) (emphasis added).

policy is to err on the side of caution and provide more information than is needed. This approach sounds good in theory. In practice it is unrealistic because it substantially raises a patent application's preparation and prosecution costs, not only in the United States, but particularly abroad. Filing a case outside the United States entails additional translation costs, excess page costs in the European Patent Office, and significant fees (relevant to length) charged by the foreign patent office and perhaps a foreign associate.

As stated by the Federal Circuit in *In re Hayes Microcomputer Products Inc.*³³ in response to the appellant's argument that the core of a computer program-related claimed invention was described in only twenty-seven lines: "Certainly no length requirement exists for a disclosure to adequately describe an invention. While some inventions require more disclosure, the adequacy of the description of an invention depends on its content in relation to the particular invention, not its length."³⁴

2. Level of Detail in the Specification

a. Computer Program Listings

Generally, the patent application should include the computer program listing (that is object, source, and pseudo-code listings)³⁵ only when the structure, functionality, and operation of the computer program-related invention is impossible to describe through the drawings and specification so that a person of ordinary skill in the art could make or use the invention without undue experimentation or additional invention. The Federal Circuit has addressed the issue of providing information detailing computer programs for computer-based inventions at least three times.

In *White Consolidated Industries, Inc. v. Vega Servo-Control, Inc.*³⁶ the Federal Circuit held it necessary to disclose details of a computer program as of the filing date of an application, since one skilled in the art could not develop the program without undue experimentation. *White* involved a computer control system for machine tools that employed a computer program called "SPLIT." At the time of filing the patent application, SPLIT was a trade secret obtainable only by a license fee. The court reasoned that if *White* could maintain SPLIT as a trade secret, it could "theoretically extend its exclusionary rights beyond the 17 year life of the patent by controlling access to SPLIT, a result inconsistent with the objectives of the patent system."³⁷ That possibility therefore obliged *White* to

33. 982 F.2d 1527 (Fed. Cir. 1992).

34. *Id.* at 1534.

35. The industry uses a wide range of different terminology to define computer-related elements. To ensure a level of consistency, we recommend that the patent attorney refer to JERRY M. ROSENBERG, *DICTIONARY OF COMPUTERS, INFORMATION PROCESSING & TELECOMMUNICATIONS* (1991), because the USPTO uses its definitions during prosecution.

36. 713 F.2d 788 (Fed. Cir. 1983).

37. *Id.* at 791.

disclose details of SPLIT “unless suitable substitutes were known and available to those skilled in the art or unless a suitable substitute could be obtained without undue experimentation.”³⁸ The Federal Circuit excluded from consideration commercial uses and publications available after the filing date because “[a] sufficient disclosure must exist as of the application filing date.”³⁹

White is distinguished in *Northern Telecom, Inc. v. Datapoint Corp.*,⁴⁰ in which the Federal Circuit reversed a district court holding that a “patent specification did not contain an enabling disclosure of the software program used to carry out the claimed invention,”⁴¹ since the specification did not disclose such information. The Federal Circuit held that enablement is determined from the viewpoint of a skilled programmer and found “that it would be relatively straightforward for a skilled computer programmer to design a program to carry out the claimed invention.”⁴² Additionally, the court stated:

When the challenged subject matter is a computer program that implements a claimed device or method, enablement is determined from the viewpoint of a skilled programmer using the knowledge and skill with which such a person is charged. . . .

. . . .
The claimed invention of the . . . patent [in suit] is not in the details of the program writing, but in the apparatus and method whose patentability is based on the claimed combination of components or steps. . . . The possible design of superior software, or whether each programmer would work out the details in the identical way, is not relevant in determining whether the inventor has complied with the enablement requirement.⁴³

As summarized by the Federal Circuit in *Northern Telecom*, “[a]lthough there have been circumstances wherein production of the computer program was not routine, as in *White Consol. Indus. Inc. v. Vega Servo-Control, Inc.*, where the production of the program required one and one half to two person-years of work, such circumstances were not shown or suggested for the ’375 invention.”⁴⁴

Recently, Judge Lourie writing for the Federal Circuit in *Hayes*⁴⁵ affirmed a district court’s holding that the disclosure adequately described the invention of the challenged claims. At issue in *Hayes* was a “timing means.”⁴⁶ The appellant, Ven-Tel, asserted that the term referred to a software timer whose structure was not properly disclosed under the written-disclosure and best-mode requirements of section 112, but instead maintained as a trade secret. The Federal Circuit disagreed and stated that the written description of the invention contained in the specification must allow one skilled in the art to recognize that the applicant

38. *Id.*

39. *Id.* at 792.

40. 908 F.2d 931 (Fed. Cir.), *cert. denied*, 111 S. Ct. 296 (1990).

41. 908 F.2d at 941.

42. *Id.* at 941-42.

43. *Id.* at 941.

44. *Id.* at 942.

45. 982 F.2d 1527 (Fed. Cir. 1992).

46. *Id.* at 1533.

invented what was claimed. In this case, the specification stated that the modem's "decision making capability preferably resides in a microprocessor,"⁴⁷ and the applicant disclosed the preferred type of processor as a Z-8 type described in publications by Zilog, Inc. Since evidence showed that one skilled in the art would understand that the microprocessor's structure incorporated the timing means, the appeals court held that substantial evidence supported the jury finding of sufficient disclosure.

The Federal Circuit also disagreed with Ven-Tel's contention that section 112 required Hayes Microcomputer to disclose the actual software or "firmware" that defined how a microprocessor functioned:

The evidence of record supports the conclusion that all that was required for one of ordinary skill in the art to understand what the invention was and how to carry it out was the disclosure of a microprocessor having certain capabilities and the desired functions it was to perform. We disagree with Ven Tel's contention that to satisfy section 112, a statement as to the specific function of a microprocessor is inadequate, that the actual program must be disclosed. While this may be true in some instances, this is not such a case.⁴⁸

A patent attorney may submit along with the specification an appendix with program listings.⁴⁹ Such a listing appropriately includes the sequence of the instructions, routines, and other contents of a computer program. However, the description of the operation and general content of computer program listings must appear in the description portion of the specification.

Including computer program listings either in an appendix attached to the specification or in the specification itself is not recommended. The Patent Office does not require computer program listings.⁵⁰ From a practical point of view, the Patent Office microfiches these computer program listings and does not print them with the patent since they require too much paper. Also, patent attorneys who believe they cover themselves by providing computer program listings may rely too heavily on the listings as a basis for enablement. The Patent Office will reject such an application under section 112, paragraph 1, for not meeting the written description requirement, since computer program listings generally need accompanying written description and drawings.

b. Drawings

A properly drafted computer program-related application should describe the invention from the architectural, informational flow, and operational perspective,

47. *Id.* (emphasis omitted).

48. *Id.* at 1534.

49. See 37 C.F.R. § 1.96 (1992) and UNITED STATES PATENT OFFICE, MANUAL OF PATENT EXAMINATION PROCEDURE § 608.05 (1989) (hereinafter MPEP).

50. In discussions with Gerald Goldberg (Director of Group 2300) and Gary V. Harkcom and Michael R. Flemming (Supervisory Patent Examiners in Group 2300) they stated that the examiners in Group 2300 tend to view computer program listings as more of a hindrance than a help in the majority of computer program-related patent applications they examine.

and should explain the significant features and functions and the user interface, if present.

At least two, and up to four, levels of figures should be used to represent graphically these components of the invention. Conceptual representations at a high level are needed. They allow for the invention to be claimed at that level. They also provide a reader with an explanation at a conceptual level. This aspect is particularly important for a lay person, such as a judge or a member of a jury, who may have little to no idea of how to make or use the invention. Mid-level representations also are important, for they provide the description that spans the high-level conceptual representations and the low-level implementation or best-mode representations.

As stated by the CCPA in *Application of Ghiron*, “functional-type block diagrams may be acceptable and, in fact, preferable if they serve in conjunction with the rest of the specification to enable a person skilled in the art to make such a selection and practice the claimed invention with only a reasonable degree of routine experimentation.”⁵¹

3. Overcoming USPTO Section 112 Enablement Rejections

Overcoming a rejection for lack of enablement under section 112 usually requires a declaration or affidavit under rule 1.132.⁵² The steps for preparing an affidavit are as follows: (1) Qualify the affiant as at least someone with “ordinary skill in the art”;⁵³ (2) base all statements strictly on fact and do not make conclusory statements;⁵⁴ and (3) make sure information alleged to be adequately described and enabled is contained in the application and not solely in the affidavit.⁵⁵

B. BEST MODE

Establishing best mode requires a two-step inquiry: (1) did inventor know of a best mode of practicing the invention at the time of filing the application (subjective); and (2) did the inventor disclose the best mode in a manner that would enable a person of ordinary skill in the art to practice the best mode (objective).⁵⁶

To avoid best-mode difficulties the patent attorney must ensure that all information in the patent application is current as of the filing date—a requirement that poses two problems to the attorney. First, some aspects of the invention are typically more innovative than others and thus should be disclosed in greater

51. 442 F.2d 985, 991 (1971) (emphasis omitted).

52. 37 C.F.R. § 1.132 (1992).

53. 442 F.2d at 991.

54. *In re Buchner*, 929 F.2d 660 (Fed. Cir. 1991) (an expert’s opinion on an ultimate legal issue must be supported by something more than a conclusory statement in an affidavit).

55. *Id.*

56. *In re Hayes*, 982 F.2d 1527, 1536 (Fed. Cir. 1992); see also *In re Application of Sherwood*, 613 F.2d 809 (C.C.P.A. 1980), cert. denied, *Diamond v. Sherwood*, 450 U.S. 994 (1981).

detail. Second, programmers tend not to want to stop optimizing a program, and continue to work on it up to the patent application's filing. Thus, the patent attorney must work closely with the inventor until the actual filing and keep asking the inventor, "Are there any special procedures to implement your invention or a preferred apparatus or process to carry out your invention?"

In *Hayes* the best mode of implementing the invention was in firmware. The inventor did not consider the specific firmware program listing he used to implement his invention to be any better than any other techniques described in the specification. Rather, he believed the best mode of his invention was to store a program listing in firmware. Thus, he was not required to disclose the firmware's listings for a person of ordinary skill in the art to practice the invention.⁵⁷

Although in *Hayes* the "escape sequence" in firmware was a trade secret, the Federal Circuit held that substantial evidence supported the jury's finding of no best-mode violation, because "[b]oth hardware and software timers are disclosed in the specification, and . . . neither type is necessarily better than the other."⁵⁸ Furthermore, the Federal Circuit went on to say "[w]hile we agree that the '302 patent only discloses the general function of the firmware without teaching mathematical formulas, flow charts, or a firmware program listing, no more was needed here. . . . [A] person of ordinary skill in the microprocessor art could develop such a firmware listing."⁵⁹

A best-mode issue arises rarely in prosecution, but often in litigation. The CCPA addressed best mode in a prosecution environment in *In re Application of Sherwood*:

In general, writing a computer program may be a task requiring the most sublime of the inventive faculty or it may require only the droning use of a clerical skill. The difference between the two extremes lies in the creation of mathematical methodology to bridge the gap between the information one starts with . . . and the information that is desired. . . . If these bridge-gapping tools are disclosed, there would seem to be no cogent reason to require disclosure of the menial tools known to all who practice this art.⁶⁰

III. Means-Plus-Function under Section 112, Paragraph 6

Section 112's final paragraph authorizes means-plus-function limitations and provides a statutory claim construction rule:

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.⁶¹

57. *Hayes*, 982 F.2d at 1537.

58. *Id.* at 1538.

59. *Id.* at 1537.

60. 613 F.2d 809, 816-17 (C.C.P.A. 1980), *cert. denied*, *Diamond v. Sherwood*, 450 U.S. 994 (1981) (footnote omitted).

61. 35 U.S.C. § 112, para. 6 (1988).

Paragraph 6 is a controversial provision of section 112 as it relates to computer program-based inventions. It raises the questions: Should mean-plus-function claims be interpreted as method claims in the software arena? How should means-plus-function claims be analyzed under the doctrine of equivalents in an infringement action? This article addresses only the first question.

It is possible that the Federal Circuit will resolve questions surrounding statutory subject matter under section 101 and means-plus-function under section 112 in *In re Alappat*,⁶² which was scheduled to be heard en banc in April of 1993. It is questionable at this time whether the Federal Circuit will decide *Alappat* under substantive issues, because of significant procedural issues involved (see below).

A. BACKGROUND OF PROCEEDINGS

Alappat filed an application for a patent on January 29, 1988, Serial No. 07/149,792, for a "Raster Scan Wave Form Display Rasterizer With Pixel Intensity Gradation."⁶³ The examiner rejected claims 15-19 as unpatentable under section 101 because they were directed to nonstatutory subject matter under the mathematical algorithm exception.⁶⁴

On appeal before the Board of Appeals and Patent Interferences (Board), the Board reversed the examiner's decision. The Board held that claim 15, directed to a rasterizer in means-plus-function terms, was statutory even though it recited a mathematical algorithm because the claim as a whole was directed to an apparatus. In reaching the section 101 decision, the panel construed the means recited in a claim pursuant to section 112, paragraph 6 as corresponding to the hardware structure disclosed in the specification.⁶⁵

62. 980 F.2d 1439 (Fed. Cir. 1992).

63. *Ex Parte Alappat*, 23 U.S.P.Q.2d (BNA) 1340 (1992). A rasterizer is an electronic device that converts wave-form magnitude data into an array of intensity data for use in creating a smooth wave-form display. Overall, the claimed rasterizer controls the display connecting the digitized samples of the wave-form by giving a greater illumination intensity for pixels lying squarely on the wave-form trace and a lesser intensity for pixels lying along an edge of the trace. The physical effect is to create the visual appearance of a smooth, continuous wave-form. It accomplishes this by operation of a combination of conventional electronic hardware circuits.

An arithmetic logic unit (ALU) determines the vertical distance between the end-points of each vector created by successive data points of the input signal. A counter and ALU determine the "elevation" or location of a row of pixels with respect to the input vector. Barrel shifters, under control of priority encoder, normalize the vertical distance and elevation determined by the ALUs. The normalized vertical distance and elevation are used to address read-only memories (ROM) which contain lookup tables that provide illumination intensity data.

64. Claim 15 is listed below as follows:

15. A rasterizer for converting vectors in a data list representing sample magnitudes of an input waveform into anti-aliased pixel illumination intensity data to be displayed on a display means comprising:

- (a) means for determining the vertical distance between the endpoints of each of the vectors in the data list;
- (b) means for determining the elevation of a row of pixels that is spanned by the vector;
- (c) means for normalizing the vertical distance and elevation; and
- (d) means for outputting illumination intensity data as a predetermined function of the normalized vertical distance and elevation.

Id. at 1341.

65. *Id.* at 1340.

The panel relied on prior CCPA and Federal Circuit decisions involving the section 101 issue (including *Arrhythmia*) as authority for interpreting the claims as a whole in light of the corresponding structure described in the specification. The panel expressly distinguished the USPTO practice of viewing the claims as not limited to the specification.

After the examiner moved for reconsideration,⁶⁶ the Commissioner added five members to the original panel. On April 22, 1992, the expanded Board held that means-plus-function claims may be treated as indistinguishable from method claims for statutory subject matter determination, despite the requirements in section 112, paragraph 6 that such claims be examined in light of disclosed structures. Refusing to read into the claim structures recited in the specification, the Board concluded that a “means for” claim for a rasterizer should be treated as a method that recites a nonstatutory mathematical algorithm that reads on nonspecific apparatus. The three Board members who sat on the original panel wrote a dissent, arguing that *Arrhythmia* required that the statutory nature of a “means for” claim be determined with reference to the description in the patent specification.⁶⁷

The expanded Board declined to follow the *In re Iwahashi* court’s approach to resolving the section 101 issue, by referring to the specification to interpret means-plus-function elements pursuant to section 112, paragraph 6 calling it dictum, and limited the holding in *In re Iwahashi* to its facts (recital of a ROM in the claim).⁶⁸ The dissent recited *Arrhythmia* as reinforcing its reliance on *In re Iwahashi*.⁶⁹ The majority, however, dismissed *Arrhythmia* as differing both in claim language and context, stating that the rules of claim construction in infringement actions differed from the rules for claim interpretation during prosecution.⁷⁰

B. ISSUES

The case raises a number of issues for the Federal Circuit to consider when it hears the appeal en banc:

- (1) Does claim 15 recite patentable subject matter under 35 U.S.C. section 101 when the claim is written in means-plus-function format pursuant to section 112, paragraph 6 based on a hardware disclosure of digital circuitry in the specification?
- (2) When a three-member panel of the Board has rendered its decision, does the Commissioner have the authority to constitute a new panel for purposes of reconsideration of the first decision?

66. Pursuant to the MPEP, *supra* note 49, § 1214.04.

67. *Id.* at 1344-47.

68. *Id.* at 1345.

69. *Id.* at 1350 (dissent).

70. *Id.* at 1347.

- (3) If the Commissioner lacks such authority, does such a decision of the Board constitute a decision for purposes of 28 U.S.C. section 1295(a)(4)(A)? If not, does this court have jurisdiction to reach the merits of the appeal decision?
- (4) What is the relationship, if any, between the "reconsideration" action taken in this case and "rehearings" by the Board provided for in 35 U.S.C. section 7(b)?

C. THE RAMIFICATIONS

In *Ex parte Alappat* the Patent Office asserted a section 101 rejection under the mathematical algorithm basis against a hardware-based invention. Unfortunately, this decision is not an isolated one. Our personal experience is that we are receiving *Alappat*-type rejections against purely hardware inventions, and our colleagues at leading electronic and computer companies tell us that they also are receiving such section 101 rejections. The question to ponder is how far will the Patent Office extend these section 101 rejections before the Federal Circuit brings some rational analysis back into the situation?

IV. Conclusion

Computer program-related inventions have been, and will continue to be, the driving force for productivity enhancement in the electronics industry. At present, the USPTO's interpretation of the case law surrounding 35 U.S.C. sections 101 and 112 creates a hostile environment in which to prosecute computer program-related inventions. The Federal Circuit and the USPTO appear to have a different understanding of what constitutes statutory subject matter. Furthermore, the USPTO appears to be treating means-plus-function and method claims directed to computer program-related inventions as indistinguishable. Under the given conditions the patent attorney needs to describe and claim the invention in clear, concise terms to facilitate an understanding of the invention as a whole, and at the same time meet the written description, enablement, and best-mode requirements of the U.S. patent laws.

In conclusion, we expect that the Federal Circuit in the next few years will restore a rational analysis to the sections 101 and 112 issues concerning computer program-related inventions. Until then, the prudent course of action for the innovator of computer program-related technology is to file applications seeking broad and strong patent protection and to wait out the controversy at the USPTO. The resulting patent protection will be worth the cost, time, and effort.

