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Patent Protection for Computer-Related Inventions: The Past, the Present, and the Future

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Patent Protection for Computer-Related Inventions: The Past, the Present, and the Future

by

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and

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Introduction

The United States' patent laws require the U.S. Patent and Trademark Office (PTO) to provide patent protection for inventions that satisfy certain legal requirements. The importance of issuing valid patents, i.e., those that will withstand attack by third parties during litigation, was stressed in an earlier edition of this Journal.¹ It is equally important that the PTO not unjustifiably deny patent protection. Patent protection for intellectual property encourages investment in research and development, and the future economic welfare of the United States depends upon the development of its intellectual property.²

Particularly vital to the country's economic welfare is patent protection for the computer industry. While no longer first in many industries, the United States supplied 74 percent of the world's packaged software technology in 1992, valued at $47.6 billion.³ High-wage, high-tech jobs employed more than 5.5 million workers, and accounted for approximately $325 billion, or 5.6% of the Gross Domestic Product.⁴ Patent protection for computer software and computer-related inventions, and the corollary investment in research and development such protection encourages, will help ensure that the United States does not lose this market leadership position.⁵

The underlying purpose of the United States' patent laws is to promote the progress of the useful arts.⁶ Congress has determined that this purpose can best be fulfilled by providing protection to "any new and useful process, machine, manufacture, or composition of matter,

⁴. Id.
⁵. While computer software is protectible under the copyright laws, such protection has been limited by the courts. See, e.g., Lotus Dev. Corp. v. Borland Int'l, Inc., 49 F.3d 807 (1st Cir. 1995), aff'd mem., 116 S. Ct. 804 (1996); Apple Computer, Inc. v. Microsoft Corp., 35 F.3d 1435 (9th Cir. 1994), cert. denied, 115 S. Ct. 1176 (1995); Computer Assoc. Int'l, Inc. v. Altai, Inc., 982 F.2d 693 (2d Cir. 1992).
⁶. U.S. Const. art. I, § 8, cl. 8 ("The Congress shall have the Power . . . to promote the Progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries.").
or any new and useful improvement thereof . . . .7 The only categories of subject matter that are not eligible for patent protection are abstract ideas, laws of nature, and natural phenomena.8 Given Congress' intent to "include anything under the sun that is made by man" as protectible subject matter under the patent laws,9 an analysis of whether particular subject matter is eligible for patent protection appears to be straightforward. Nevertheless, over the past 25 to 30 years, there has been much confusion in this area of the law. The confusion has often led to the inconsistent availability of patent protection for computer software and computer-related inventions.

As noted, the problem stems from trying to define the line between patentable subject matter, i.e., statutory subject matter, and abstract ideas, laws of nature or natural phenomena, i.e., non-statutory subject matter. In order to address this problem, the PTO has issued "Examination Guidelines for Computer-Related Inventions" (referred

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8. In re Alappat, 33 F.3d 1526, 1543 (Fed. Cir. 1994) (en banc) (explaining that "the Supreme Court never intended to create an overly broad, fourth category of subject matter excluded from § 101").

In choosing such expansive terms as "manufacture" and "composition of matter," modified by the comprehensive "any," Congress plainly contemplated that the patent laws would be given wide scope. The relevant legislative history also supports a broad construction. The Patent Act of 1793, authored by Thomas Jefferson, defined statutory subject matter as "any new and useful art, machine, manufacture, or composition of matter, or any new or useful improvement [thereof]." Act of Feb. 21, 1793, § 1, 1 Stat. 319. The Act embodied Jefferson's philosophy that "ingenuity should receive a liberal encouragement." 5 Writings of Thomas Jefferson 75-76 (Washington ed. 1871). See Graham v. John Deere Co., 383 U.S. 1, 7-10 (1966). Subsequent patent statutes in 1836, 1870, and 1874 employed this same broad language. In 1952, when the patent laws were recodified, Congress replaced the word "art" with "process," but otherwise left Jefferson's language intact. The committee reports accompanying the 1952 Act inform us that Congress intended statutory subject matter to "include anything under the sun that is made by man." S. Rep. No. 1979, 82d Cong., 2d Sess. 5 (1952); H.R. Rep. No. 1923, 82d Cong., 2d Sess. 6 (1952).

The Federal Circuit has followed this perspective:

The plain and unambiguous meaning of § 101 is that any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may be patented if it meets the requirements for patentability set forth in Title 35, such as those found in §§ 102, 103, and 112. The use of the expansive term "any" in § 101 represents Congress's intent not to place any restrictions on the subject matter for which a patent may be obtained beyond those specifically recited in § 101 and the other parts of Title 35 . . . . Thus, it is improper to read into § 101 limitations as to the subject matter that may be patented where the legislative history does not indicate that Congress clearly intended such limitations.

Alappat, 33 F.3d at 1542.
to in this article as “Software Guidelines”). The Software Guidelines became effective on March 29, 1996, and PTO personnel have been trained in accordance with the Software Guidelines.

I

The Past: The U.S. Supreme Court Interrupts an Earlier Evolution of the Law

The history of patents for computer software and computer-related inventions has been complex. It has also been marked by “stops and starts.” One of the initial “starts” came as early as 1969, when the Court of Customs and Patent Appeals (CCPA) reversed the PTO's refusal to issue a patent on a programmed general purpose computer. The PTO argued that, in order for a process to be patentable, the process “must operate physically upon substances” so as to transform them into a different state or thing. In rejecting the argument, the CCPA stated that “once a program has been introduced, the general-purpose digital computer becomes a special-purpose digital computer . . . which, along with the process by which it operates, may be patented subject, of course, to the requirements of novelty, utility, and non-obviousness.”

Three months later, the CCPA applied this same logic when it once again reversed the PTO’s refusal to issue a patent on a programmed general purpose computer. The CCPA held that if the steps of the computer program are performed by a machine rather than a human, then a computer program claimed as a process is statutory subject matter. One year later, the CCPA reaffirmed the patentability of a computer program claimed as a process, holding that “[a]ll that is necessary . . . to make a sequence of operational steps a statutory ‘process’ within 35 U.S.C. § 101 is that it be in the

10. 61 Fed. Reg. 7478 (Feb. 28, 1996). The final version of the Software Guidelines are appended to this article. They can also be found on the PTO’s World Wide Web site. Software Guidelines, supra (visited Nov. 8, 1996) <http://www.uspto.gov>.
12. Id. at 1403.
13. Id. at 1403 n.29.
14. In re Bernhart, 417 F.2d 1395, 1400 (C.C.P.A. 1969) (“[I]f a machine is programmed in a certain new and unobvious way, it is physically different from the machine without that program; its memory elements are differently arranged . . . . [S]uch machines are statutory under 35 U.S.C. § 101 . . . .”).
15. Id. at 1401.
technological arts so as to be in consonance with the Constitutional purpose to promote the progress of 'useful arts.'”

Had the law been permitted to evolve from that point in history, the line between statutory and non-statutory subject matter might be clear today, and the current discourse on patent protection for computer software and computer-related inventions might be of historic interest only. Instead, the Supreme Court decided *Gottschalk v. Benson*, 7, *Parker v. Flook*, 18 and *Diamond v. Diehr*. 19 As a result, almost 30 years later, the lower courts and the PTO continue to struggle with essentially the same issues the CCPA struggled with in the late 1960s.

In *Benson*, the invention at suit was a “method of programming a general-purpose digital computer to convert signals from binary coded decimal form into pure binary form.” 20 The Court’s holding that the method was unpatentable 21 is not at issue. It remains consistent with the present understanding of the law. 22 The confusion stems from the Court’s dicta in the opinion. For example, the Court suggested a return to the requirement that a statutory process transform an article into a different state or thing. 23 During the execution of a computer process, however, there is always some form of physical transformation within the computer system. 24 As a result, such a test would not be determinative of whether the computer process was a statutory computer process or a non-statutory computer process.

The opinion also suggested dissecting the claim rather than analyzing it as a whole:

Uncertainty now exists as to whether the statute permits a valid patent to be granted on programs. Direct attempts to patent programs have been rejected on the ground of nonstatutory subject matter. Indirect attempts to obtain patents and avoid the rejection by drafting claims as a process, or a machine or components thereof

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17. 409 U.S. 63 (1972).
21. Id. at 71-72.
22. See Software Guidelines, *supra* note 10, at 7484-86 (section IV.B.2(c)).
23. *Benson*, 409 U.S. at 70 (“Transformation and reduction of an article ‘to a different state or thing’ is the clue to the patentability of a process claim that does not include particular machines.”). Compare *In re Prater*, 415 F.2d 1393, 1402-03 (C.C.P.A. 1969).
24. See Software Guidelines, *supra* note 10, at 7484 (section IV.B.2(b)(ii)).
programmed in a given manner, rather than as a program itself, have
confused the issue further and should not be permitted.25

While analyzing the individual recitations in a claim provides a
useful tool when properly done, such an analysis can lead to
improperly ignoring claim language.26 For a computer software claim,
the claim language that might be ignored could be the very language
that renders the claim statutory, e.g., the language that limits the claim
to a practical application in the technological arts.

While Benson merely suggested a move away from protecting
computer software inventions, the Court actually moved in that
direction in Flook.27 The invention at suit in Flook was a method of
updating an alarm limit for catalytic conversion processes.28 The
process consisted of three steps: (1) measuring the values of the
process variables, such as temperature; (2) calculating an updated
alarm limit value; and (3) adjusting the actual alarm limit value to the
updated value.29 The Court’s holding that the method was
unpatentable reflected a return to the “point of novelty” approach
suggested by the Benson Court.30 In support of its holding, the Court
gave only lip service to the requirement that a claim be analyzed as a
whole:

Our approach to respondent’s application is, however, not at all
inconsistent with the view that a patent claim must be considered as
a whole. Respondent’s process is unpatentable under § 101 not
because it contains a mathematical algorithm as one component, but
because once that algorithm is assumed to be within the prior art,
the application, considered as a whole, contains no patentable
invention.31

Thus, the novelty of a claimed invention could not be derived
from non-patentable subject matter, even though the claim covered an
otherwise patentable process. Interestingly, in spite of this analysis, the
35 U.S.C. § 101 rejection was the one affirmed, rather than one based
on lack of novelty under 35 U.S.C. § 102.32

26. See infra note 32 and accompanying text.
27. See, e.g., Flook, 437 U.S. at 596 ("[W]e must proceed cautiously when we are asked to
extend patent rights into areas wholly unforeseen by Congress.").
29. Id.
30. Id. at 591-92.
31. Id. at 594.
32. 35 U.S.C. § 102 requires the invention to be novel, i.e., not found within the prior art.
The Court’s 1981 decision in Diehr limited the impact of the Benson and Flook decisions when it held that the incorporation of non-patentable subject matter in an otherwise patentable process does not make the process non-patentable. In Diehr, the invention at suit was a process for curing synthetic rubber in a mold. The process included the use of a mathematical formula and a programmed digital computer. The contribution to the art resided in constantly measuring the temperature inside the mold and using these measurements to repeatedly recalculate the cure time. At the appropriate time, the computer signaled a device to open the mold. The examiner had rejected the claims under 35 U.S.C. § 101, and the PTO’s Board of Patent Appeals (Board) had affirmed the examiner’s rejection. When the CCPA reversed the PTO, the government sought a writ of certiorari. In affirming the CCPA, the Court held:

It is inappropriate to dissect the claims into old and new elements and then to ignore the presence of the old elements in the analysis . . . . The “novelty” of any element or steps in a process, or even of the process itself, is of no relevance in determining whether the subject matter of a claim falls within the § 101 categories of possibly patentable subject matter.

Once again, the Court said much more than was necessary to reach its result. For example, the Court suggested that limiting a mathematical formula to a particular technological use might not make the formula patentable: specifically, a “mathematical formula in the abstract is nonstatutory subject matter regardless of whether the patent is intended to cover all uses of the formula or only limited uses.”

After Diehr, the focus of attention for computer software and computer-related inventions turned to mathematical algorithms. A claim to a mathematical algorithm for converting one set of numbers into a different set of numbers did not amount to statutory subject matter. On the other hand, a claim that recited a mathematical algorithm in which structural and functional interrelationships were

33. Diamond v. Diehr, 450 U.S. 175, 185 (1981) (“Excluded from such patent protection are laws of nature, physical phenomena and abstract ideas . . . . Our recent holdings in Gottschalk v. Benson . . . . and Parker v. Flook, . . . stand for no more than these long established principles.”) (citations omitted).
34. Id. at 177.
35. Id. at 178.
36. Id. at 179.
37. Id. at 188-89.
38. Id. at 192 n.14.
implemented, or in which steps were refined or limited, did amount to statutory subject matter. The hard question was how to determine whether a specific claim fell on one side of the line or the other.

II
The Turning Point: The Federal Circuit Decides In re Alappat And In re Lowry

The next significant step forward in the evolution of patents for computer software and computer-related inventions did not come until 1994, when the United States Court of Appeals for the Federal Circuit decided In re Alappat\(^{39}\) and In re Lowry.\(^{40}\) In Alappat, the invention at suit was "a means for creating a smooth waveform display in a digital oscilloscope."\(^{41}\) The PTO had rejected the claims under 35 U.S.C. § 101. Applying 35 U.S.C. § 112 Paragraph 6,\(^{42}\) the Federal Circuit held that the claims could not be read to cover all means for implementing the underlying process.\(^{43}\) Reversing the PTO, the Federal Circuit stated that the claims were limited by their "means" language and "unquestionably recite[] a machine, or apparatus, made up of a combination of known electronic circuitry elements."\(^{44}\)

In its decision, the Alappat court reaffirmed the breadth of subject matter that could be protected under the patent laws as well as the narrow scope of subject matter that could not: "[T]here are three categories of subject matter for which one may not obtain patent protection, namely 'laws of nature, natural phenomena, and abstract ideas.'"\(^{45}\) The court also clarified the basis for prohibiting the patenting of mathematical subject matter:

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39. 33 F.3d 1526 (Fed. Cir. 1994) (en banc). For an earlier discussion of Alappat, see Barrett, supra note 1, at 646-55.
40. 32 F.3d 1579 (Fed. Cir. 1994).
41. 33 F.3d at 1537.
42. 35 U.S.C. § 112 Paragraph 6 reads:
   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.
Prior to the decision in In re Donaldson, 16 F.3d 1189 (Fed. Cir. 1994), the PTO did not apply the language of § 112 Paragraph 6 but rather read "means" language to cover all means for performing the recited function. The Federal Circuit in Donaldson held that this was error. Id. at 1193-94.
43. Alappat, 33 F.3d at 1540-41.
44. Id. at 1541.
45. Id. at 1542 (quoting Diamond v. Diehr, 450 U.S. 175, 185 (1981)).
A close analysis of *Diehr*, *Flook*, and *Benson* reveals that the Supreme Court never intended to create an overly broad, fourth category of subject matter excluded from § 101. Rather, at the core of the Court's analysis in each of these cases lies an attempt by the Court to explain the rather straightforward concept that certain types of mathematical subject matter, standing alone, represent nothing more than *abstract ideas* until reduced to *some type of practical application*. Thus, that subject matter is not, in and of itself, entitled to patent protection.\(^4\)

The "practical application" requirement was further stressed in the court's analysis:

Laws of nature and natural phenomena are in essence manifestations of . . . nature [*i.e.*, not "new"], free to all men and reserved exclusively to none, . . . whereas abstract ideas constitute disembodied concepts or truths which are not "useful" from a practical standpoint standing alone, *i.e.*, they are not "useful" until *reduced to some practical application* . . . .\(^47\)

The *Alappat* court also stressed the need to analyze the "claim as a whole," reaffirming the *Diehr* Court. If a claim as a whole was to statutory subject matter, then the fact that it contained unpattentable mathematical subject matter did not make it nonstatutory.\(^46\) As a final note, echoing the CCPA's *Prater* and *Bernhart* holdings, the Federal Circuit agreed in *Alappat* that, even if the claim covered a general purpose computer, it would still be to statutory subject matter because "a general purpose computer . . . becomes a special purpose computer once it is programmed to perform particular functions pursuant to instructions from program software."\(^49\)

Less than one month later, the Federal Circuit decided *Lowry*. In many ways, it is the more significant of the two cases. For example, in *Lowry*, the Federal Circuit finally answered a question left open by previous cases, *i.e.*, whether computer software stored on computer-readable media (an article of manufacture) was statutory subject matter.

In *Lowry*, the invention at suit was a data structure stored in computer memory.\(^50\) The examiner had rejected the claims under both 35 U.S.C. §§ 101 and 103. The Board reversed the examiner's § 101

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46. *Alappat*, 33 F.3d at 1543 (second emphasis added).
47. *Id.* at 1542 n.18 (emphasis added) (internal quotations and citations omitted).
48. *Id.* at 1543 & n.20.
49. *Id.* at 1545.
50. *In re Lowry*, 32 F.3d 1579, 1580 (Fed. Cir. 1994).
rejection and affirmed the examiner's § 103 rejection. In reversing the examiner's § 101 rejection, the Board held that the claims covered an article of manufacture. In affirming the examiner's § 103 rejection, the Board treated the data structure as "printed matter" and thus gave the nature of the data structure no patentable weight. The prior art disclosed other data structures stored in computer memories.

The Federal Circuit rejected the PTO's reasoning that a data structure was analogous to printed matter and, therefore, not entitled to patentable weight. The court held that a data structure could be patented as an article of manufacture, such as a floppy disk. In doing so, the court stated that the printed matter doctrine could not be applied to matter which must be read by a machine rather than a human.

Although Lowry was a § 103 case, the Federal Circuit relied heavily on Bernhart, suggesting that the court recognized the impact on § 101:

There is one further rationale used by both the board and the examiner, namely, that the provision of new signals to be stored by the computer does not make it a new machine, i.e., it is structurally the same, no matter how new, useful and unobvious the result . . . . To this question we say that if a machine is programmed in a certain new and unobvious way, it is physically different from the machine without that program; its memory elements are differently arranged. The fact that these physical changes are invisible to the eye should not tempt us to conclude that the machine has not been changed.

III

The Present: The PTO Reassesses the Patentability of Computer-Related Inventions in Light of Alappat and Lowry

After Lowry became final, the PTO began drafting its Software Guidelines in compliance with both the letter and spirit of the law. The primary focus of the Software Guidelines is to assist PTO personnel in determining the line between statutory and non-statutory
subject matter under 35 U.S.C. § 101. The secondary focus is to help PTO’s customers understand the approach PTO personnel are expected to follow.

A. Development of the “Practical Application” Test

Prior to issuance of the Software Guidelines, the courts and the PTO attempted to analyze claims to computer-related inventions by applying a “physical transformation” test. Because there is always some form of physical transformation within a computer when it runs software, i.e., signals are transformed and the computer’s components are changed during execution of a computer program, the application of such a test fails to distinguish statutory inventions from non-statutory inventions. Thus, the “physical transformation” test is only helpful when the transformation occurs outside the computer. When that is the case, the subject matter is clearly statutory and falls into one of the Software Guidelines’ “safe harbors.”

When there is no physical transformation outside the computer, the Software Guidelines instruct PTO personnel to apply the “practical application in the technological arts” test. This test arises from the statutory requirement that the invention be “useful.” Abstract ideas, laws of nature and natural phenomena do not satisfy this requirement unless they are practically applied to provide some “real world” result. The use of an abstract idea, a law of nature, or a natural phenomenon to achieve a practical application satisfies the requirement that the invention be useful. It also ensures that use of a mathematical algorithm will not be “wholly pre-empted.”


60. Software Guidelines, supra note 10, at 7483 (Section IV.B.2(b)(i)).

61. See id. at 7483 (Section IV.B.2(b)(ii)). This test finds its basis in the case law. See, e.g., Alappat, 33 F.3d at 1543 (quoting Diehr, 450 U.S. at 192). See also Alappat, 33 F.3d at 1569 (Newman, J., concurring)(“unpatentability of the principle does not defeat patentability of its practical applications”) (citing O’Reilly v. Morse, 56 U.S. (15 How.) 62, 114-19 (1854)); Arrhythmia, 958 F.2d at 1056 (Fed. Cir. 1992); In re Musgrave, 431 F.2d 882, 893 (C.C.P.A. 1970) (“All that is necessary, in our view, to make a sequence of operational steps a statutory ‘process’ within 35 U.S.C. § 101 is that it be in the technological arts so as to be in consonance with the Constitutional purpose to promote the progress of ‘useful arts.’”) (citing U.S. Const. art I, § 8).


63. Cf. Gottschalk v. Benson, 409 U.S. 63, 72 (1972); Parker v. Flook, 437 U.S. 584, 591 (1978). The concern over preemption was expressed as early as 1852. See Le Roy v. Tatham, 55 U.S. 156, 175 (1852) (“A principle, in the abstract, is a fundamental truth; an original cause; a motive; these cannot be patented, as no one can claim in either of them an exclusive right.”);
B. Non-Statutory Subject Matter

Given the broad scope of 35 U.S.C. § 101, it is much easier to define what is non-statutory subject matter. While that is not the general approach taken in the Software Guidelines, it is the one taken in this article. The ultimate outcome is the same.

1. Descriptive Material

Certain "descriptive material" cannot be protected, regardless of the form in which it is claimed. Examples of descriptive material that cannot be protected in any form are music, literary works, and pure data. Because such "descriptive material" cannot cause a computer to function, even when encoded on a computer-readable medium, the Software Guidelines refer to such descriptive material as "non-functional descriptive material." An example of a claim to non-functional descriptive material is:

A computer system apparatus for monitoring and controlling an automated manufacturing plant using a telemetered processed data signal comprising:
(a) a first data portion embodying the compressed and encrypted operating parameters of the automated manufacturing plant;
(b) a second data portion embodying the compressed and encrypted physical outputs of the plant;
(c) a third data portion embodying a first encryption key for the encrypted operating parameters embodied on the first data portion; and
(d) a fourth data portion embodying a second encryption key for the encrypted physical outputs embodied on the second data portion.

64. Software Guidelines, supra note 10, at 7482 (Section IV.B.1(b)).
65. The "compression/encryption" examples used in this paper are from the materials used to train PTO personnel. The supporting specification for all of the examples reads as follows:
The invention relates to a data compression and encryption system for monitoring and controlling an automated manufacturing process. The system translates the outputs of various sensors from an automated plant's manufacturing process into digital data signals through a series of equations for calculating codewords, then compresses the calculated codewords, subsequently encrypts the compressed signal, and transmits the compressed and encrypted signal to a remote supervisory location. At the remote supervisory location, the signal is decrypted and decompressed. The remote supervisory location then compares the decrypted and decompressed digital data signals to the preset ranges for the respective operating parameters of the automated plant's manufacturing process, generates a digital correction signal on the basis of the comparison, compresses and encrypts the correction signal, transmits the correction
The claimed invention recites non-functional descriptive material, *i.e.*, mere data. For example, the operating parameters for the automated manufacturing plant embodied on the "first data portion" of the "computer system apparatus" is not protectable.

signal back to the plant location, and applies the correction signal to the disclosed process controllers, such as valves and motors, to maintain the automated plant's operation within its design parameters.

The automated plant's manufacturing process is controlled with a general purpose computer system. In the plant's general purpose computer system, various memory sections are included to store the plant's operating parameters and the sensor's outputs. The plant's various sensors and sensing systems are disclosed.

The remote supervisory location's process is implemented on a general purpose computer system. The remote supervisory location's general purpose computer system must have the identical compression and encryption capabilities of the automated plant's general purpose computer system.

The general purpose computer systems of the automated manufacturing plant and the remote supervisory location are programmed by a data signal transmitted from a remote main office location. The data signal includes a carrier wave and the source code segments for both the compression and encryption computer programs.

In the preferred embodiment for data compression, the general purpose computer system at each site is programmed with a computer program to process a digital signal into codewords wherein the codewords are then compressed/decompressed in accordance with Bluffman code (a hypothetical compression algorithm well known to those of ordinary skill in the art). The general purpose computer system has both an encoder and a decoder on which are stored identical Bluffman code books. The use of compressed signals allows for reduced transmission time between the sites.

In the preferred embodiment for data encryption, the general purpose computer system at each site is programmed with a separate computer program to encrypt/decrypt a digital signal in accordance with the Data Encryption Standard (DES) algorithm. The DES algorithm uses an encryption key stored in a read-only memory to produce a digital signal whose content is protected and secured for transmission. In another embodiment for data encryption, the general purpose computer system has an application specific integrated circuit (ASIC). The various components of the ASIC are incorporated by reference from U.S. Patent No.*

The disclosure contains both self-documenting source code for the preferred embodiments of the computer programs and high-level written descriptions of the computer programs with flow charts. There is correspondence between the written descriptions, the flow charts, and the specific software. The disclosure states that alternate computer programs based on the high-level written descriptions and flow charts are within the skill of a routineer in the art. The training materials are available on diskette from the PTO's Patent Academy and on the PTO's World Wide Web site. PTO Training Materials (visited Nov. 8, 1996) <http://www.uspto.gov>.

66. The claim would also be rejected under 35 U.S.C. §112, Paragraph 2 for failure to distinctly point out and claim the invention, and under 35 U.S.C. §103 as obvious. Under §112, Paragraph 2, it is unclear: (1) whether the preamble defines an arrangement of data, a machine, or an article of manufacture, (2) the body of the claim defines an arrangement of data, a machine, or an article of manufacture, and (3) how the phrase "data portion" in the body of the claim relates to the preamble. Under §103, the embodiment of mere data on a "computer system apparatus" would have been obvious to a person of ordinary skill in the art at the time of invention.
Other "descriptive material" cannot be protected when claimed in the absence of a computer-readable medium, but can be protected when claimed as embodied on a computer-readable medium.

Examples of descriptive material that can be protected when embodied on a computer-readable medium are data structures and computer programs. Because such "descriptive material" can cause a computer to function, unlike music, a literary work, or pure data, the Software Guidelines refer to such "descriptive material" as "functional descriptive material."

An example of an unpatentable claim to functional descriptive material (a computer program per se) is:

A computer program for monitoring and controlling an automated manufacturing plant using a telemetered processed data signal comprising:

(a) means for compressing a data signal into variable length codewords in accordance with Bluffman code; and

(b) means for encrypting the compressed data signal in accordance with the Data Encryption Standard algorithm.

In contrast, the same subject matter can be protected when claimed as a process:

A method for monitoring and controlling an automated manufacturing plant using a telemetered processed data signal comprising:

(a) means for compressing a data signal into variable length codewords in accordance with Bluffman code; and

(b) means for encrypting the compressed data signal in accordance with the Data Encryption Standard algorithm.

It can also be protected when claimed as embodied on a computer-readable medium.

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68. In re Lowry, 32 F.3d 1579, 1583 (Fed. Cir. 1994).
69. See Software Guidelines, supra note 10, at 7481 (Section IV.B.1(a)).
70. This claim would also be rejected under 35 U.S.C. § 112, Paragraph 2 for failure to distinctly point out and claim the invention. In particular, the preamble phrase "computer program" defines a set of instructions for execution on a computer, i.e., a computer program per se. The body of the claim, however, recites means plus function language which defines at least a set of instructions embodied on a computer-readable medium to perform the recited functions. Because it is reasonable to presume that applicant is seeking to claim a computer program per se, the claim would be rejected under 35 U.S.C. § 101.
2. **Natural Phenomena**

Natural phenomena, such as energy or magnetism, cannot be patented unless limited to a practical application in the technological arts.\(^7\)

3. **Laws of Nature and Abstract Ideas Expressed Through Mathematical Algorithms: Numbers to Numbers**

Mathematical algorithms are more difficult to analyze. If it is clear, however, that the claimed subject matter does nothing more than convert one set of numbers into another set of numbers without any limitation to a practical application, then the claimed subject matter cannot be protected.\(^7\) An example of a claimed invention that falls into this category is:

A method for monitoring and controlling an automated manufacturing plant using a telemetered processed data signal comprising the steps of:

(a) receiving a data signal;
(b) processing the data signal into codewords; and
(c) outputting the processed data signal.

When we examine the claim, we find that: (1) means "a" merely provides the data signal that will be used in the means "b" processing operation; and (2) means "c" merely conveys the direct result of the operation of means "a" and "b." Therefore, neither means "a" nor "c" places the claim within one of the "safe harbors." From the disclosure, we find that means "b" corresponds to the calculation of variable length codewords from a series of equations. This correspondence is determined from the express recitation in the disclosure that "the system then processes the digital data signals through a series of equations for calculating codewords." Therefore, means "b" recites a mathematical operation. Taken as a whole, the claimed invention merely converts one set of numbers into another set of numbers.\(^3\)

In this example the mathematical algorithm represented a law of nature, in which case the concern is preemption of the law of nature. Often, however, the concern is that the mathematical algorithm

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\(^7\) See Software Guidelines, supra note 10, at 7482 (Section IV.B.1(c)). See also, e.g., O'Reilly v. Morse, 56 U.S. (15 How.) 62, 112 (1854) (denying a claim to "electro-magnetism, however developed for marking or printing intelligible characters, signs, or letters, at any distance").

\(^7\) See Software Guidelines, supra note 10, at 7484-85 (Sections IV.B.2(c) & (d)).

\(^7\) Also, the preamble language is a statement of intended use that does not limit the claim to the practical application of monitoring and controlling an automated manufacturing plant.
merely manipulates an abstract idea.\textsuperscript{74} In such a case, even though there is no preemption problem, the manipulation of an abstract idea cannot be protected unless it is limited to a practical application in the technological arts.\textsuperscript{75} Thus, even though a mathematical algorithm may not preempt all uses of the algorithm, it may not be patentable if it merely represents the manipulation of an abstract idea.

C. **Statutory Subject Matter**

Almost without exception, inventors seek to protect their inventions under the patent laws in order to reap the economic benefits. Such benefits are possible only if the invention has a practical application. Thus, when properly claimed, most inventions should fall under the statutory categories found in 35 U.S.C. § 101.

1. **The “Safe Harbors”**

Under the Software Guidelines, a distinction is made between claims that require activity outside the computer, either before or after the claimed computer operations, and claims that are limited to

\textsuperscript{74} See, e.g., \textit{In re Meyer}, 688 F.2d 789, 794-95 (C.C.P.A. 1982):

Scientific principles, such as the relationship between mass and energy, and laws of nature, such as the acceleration of gravity, namely, \( a = 32 \, \text{ft./sec.}^2 \), can be represented in mathematical format. However, some mathematical algorithms and formulae do not represent scientific principles or laws of nature; they represent ideas or mental processes and are simply logical vehicles for communicating possible solutions to complex problems. The presence of a mathematical algorithm or formula in a claim is merely an indication that a scientific principle, law of nature, idea or mental process \textit{may} be the subject matter claimed and, thus, justify a rejection of that claim under 35 U.S.C. § 101; but the presence of a mathematical algorithm or formula is only a signpost for further analysis.

\textit{Cf. In re Alappat}, 33 F.3d 1526, 1543 n.19 (Fed. Cir. 1994) (en banc), in which the Federal Circuit recognized the confusion:

The Supreme Court has not been clear . . . as to whether such subject matter is excluded from the scope of § 101 because it represents laws of nature, natural phenomena, or abstract ideas. \textit{See Diamond v. Diehr}, 450 U.S. 175, 186 (1981) (viewing mathematical algorithm as a law of nature); \textit{Gottschalk v. Benson}, 409 U.S. 63, 71-72 (1972) (treating mathematical algorithm as an “idea”). The Supreme Court also has not been clear as to exactly what kind of mathematical subject matter may not be patented. The Supreme Court has used, among others, the terms “mathematical algorithm,” “mathematical formula,” and “mathematical equation” to describe types of mathematical subject matter not entitled to patent protection standing alone. The Supreme Court has not set forth, however, any consistent or clear explanation of what it intended by such terms or how these terms are related, if at all.

\textit{See also} Software Guidelines, supra note 10, at 7485-86 (Section IV.B.2(e)).

\textsuperscript{75} \textit{E.g., In re Warmerdam}, 33 F.3d 1354, 1361 (Fed. Cir. 1994) (holding non-statutory a claim to a data structure per se); \textit{In re Schrader}, 22 F.3d 290, 293-94 (Fed. Cir. 1994) (holding manipulation of a bid without limitation to a practical application non-statutory).
activity within the computer. Claims that require activity outside the computer fall into what the Software Guidelines call statutory "safe harbors" of either pre-computer process activity or post-computer process activity. Claims limited to activity within the computer are likewise entitled to protection, but only when limited by claim language to a practical application. An example of a claimed invention that falls into the safe harbor of pre-computer process activity is:

A method for monitoring and controlling an automated manufacturing plant using a telemetered processed data signal comprising the steps of:

(a) generating a data signal from output sensors of the automated manufacturing plant;
(b) compressing the data signal into variable length codewords in accordance with Bluffman code; and
(c) encrypting the compressed data signal in accordance with the Data Encryption Standard algorithm.

The physical transformation occurs when the output of the sensors is converted into an electrical data signal.

An example of a claimed invention that falls into the safe harbor of post-computer process activity is:

A method for monitoring and controlling an automated manufacturing plant using a telemetered processed data signal comprising the steps of:

(a) decrypting a compressed and encrypted data signal in accordance with the Data Encryption Standard algorithm;
(b) de-compressing the decrypted data signal in accordance with Bluffman code; and
(c) controlling the physical processes of the automated manufacturing plant in accordance with the information conveyed by the decrypted and decompressed data signal.

The physical transformation occurs when the physical processes of the plant are controlled.

2. Statutory Products

The form of the claim will not determine whether the invention is statutory or non-statutory. To permit such a result would be to elevate claim form over claim substance. Under the Software Guidelines, when a claim is so broad that it covers any computer-implemented means for performing the underlying process, the determination of whether the claim is a statutory or non-statutory product claim
depends on the basis of the underlying process. For example, the following claim is a non-statutory product claim, even though claimed as an article of manufacture:

A computer program embodied on a computer-readable medium for monitoring and controlling an automated manufacturing plant using a telemetered processed data signal comprising:

(a) means for receiving a data signal;
(b) means for processing the data signal into codewords; and
(c) means for outputting the processed data signal.

When we analyze the claim, we find that for means “a” and “c,” the specification discloses use of a general purpose computer system. It does not disclose specific hardware or specific software for performing either the means “a” or means “c” function. For means “b,” though, the specification discloses specific software in a preferred embodiment. It also discloses use of a general purpose computer system with encoders and decoders, and the creation of alternate computer programs based on the disclosed high-level written descriptions and disclosed flow charts. Under the broadest reasonable interpretation, therefore, the claimed invention encompasses any and every computer-implemented means for performing the underlying process. The determination of whether the claim is a statutory article of manufacture claim is determined on the basis of the underlying process. As noted, the underlying process merely converts one set of numbers into another set of numbers without limitation to a practical application.

In contrast, the following claimed invention is statutory because it is limited to the practical application of encryption:

A computer program embodied on a computer-readable medium for monitoring and controlling an automated manufacturing plant using a telemetered processed data signal comprising:

(a) means for receiving a data signal;
(b) means for encrypting the data signal in accordance with the Data Encryption Standard algorithm; and
(c) means for outputting the encrypted data signal.

A claim to a product that does not encompass any and every computer-implementation of a process is treated as a claim to a

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76. See Software Guidelines, supra note 10, at 7482-83 (Section IV.B.2(a)(i)).
77. See supra Section III.B.3.
78. See supra note 65. As noted in the specification, encryption protects and secures the content of the data signal.
specific machine or manufacture. The claim may define the physical structure of the machine or manufacture in terms of its hardware or hardware and specific software. In most cases, a claim to a specific machine or manufacture will have a practical application in the technological arts. An example of a claim defined in terms of its hardware and specific software is:

A computer program embodied on computer-readable medium for monitoring and controlling an automated manufacturing plant using a telemetered processed data signal comprising:

(a) a compression source code segment comprising . . . [recites self-documenting source code]; and

(b) an encryption source code segment comprising . . . [recites self-documenting source code].

IV
The Future: Software Protection Will Continue to Evolve

When the Software Guidelines were published for comment, most of the PTO’s customers applauded them as a big step in the right direction. Given the state of the law, a line had to be drawn. Thus, mathematical algorithms cannot be protected without some claim limitation to a practical application. Further, data structures and computer programs cannot be protected as articles of manufacture unless embodied in a computer-readable medium. In the future, the PTO is expected to interpret “computer-readable medium” broadly, perhaps to include a carrier wave for a data signal. Thus, under a broader definition, the following exemplary claim may well be patentable:

A computer data signal embodied in a carrier wave comprising:

(a) a compression source code segment comprising . . . [recites self-documenting source code]; and

(b) an encryption source code segment comprising . . . [recited self-documenting source code].

Presuming that the signal is manufactured, as opposed to naturally occurring, there appears to be little basis for rejecting such a claim—it is specific software embodied in a computer-readable medium. It also has a practical application in the technological arts—it

79. “Specific software” is defined as a set of instructions implemented in a specific program code segment. See Computer Dictionary 78 (2d ed. 1994) for a definition of “code segment.” See also Software Guidelines, supra note 10, at 7483 (Section IV.B.2(a)(ii)).
can be used to monitor and control the physical processes in an automated manufacturing plant.

There are, of course, critics of patent protection for computer software. Their arguments against such protection focus on the computer industry's current practice of building new computer programs on the foundations of existing computer programs and the fact that the computer industry has progressed to its current global leadership position without patent protection. There are two rejoinders to such arguments: (1) the amount of time and dollars an investor will spend in research and development is directly proportional to the amount of return the investor can expect to get from the investment; and (2) such a determination cannot be made independent of an assessment of what rights under the law are available to protect that investment.

The computer industry's current practice of building on the foundations of existing technologies should not be the basis for assessing the computer industry's future practice. Critics seem to believe that the computer industry's future lies in small, continuous strides made on the groundwork already laid. Why not a future that holds all that, plus much more? Patent protection offers the computer industry an opportunity to re-assess its research and development strategies in light of such protection. With the implementation of those new strategies, "quantum leaps" over the groundwork already laid might be on the computer industry's horizon.

V

Conclusion

With its Software Guidelines, the PTO has made every effort to embrace the letter and spirit of the law. Sometime in the future, the courts will undoubtedly expand the scope of statutory subject matter. The PTO will make every effort to be sensitive to such change and respond promptly by revisiting its Software Guidelines and modifying them as appropriate.

81. Id.
Appendix
Examination Guidelines for Computer-Related Inventions,*

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* As an appendix to Ms. Linck's article and as a reference tool for its readers, COMM/ENT is printing these Examination Guidelines for Computer-Related Inventions as they appear at 61 Fed. Reg. 7478 (1996). COMM/ENT has made no changes to the text of the Guidelines, nor has COMM/ENT verified or altered citations made in the Guidelines. For this reason, this appendix does not conform to COMM/ENT's usual adherence to the Bluebook or the Texas Law Review Manual on Style. Minor changes have been made to format and typeface to assist the reader.
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I

Introduction

These Examination Guidelines for Computer-Related Inventions1 ("Guidelines") are to assist Office personnel in the examination of applications drawn to computer-related inventions.2 The Guidelines are based on the Office's current understanding of the law and are believed to be fully consistent with binding precedent of the Supreme Court, the Federal Circuit and the Federal Circuit's predecessor courts.

These Guidelines do not constitute substantive rulemaking and hence do not have the force and effect of law. These Guidelines have been designed to assist Office personnel in analyzing claimed subject matter for compliance with substantive law. Rejections will be based upon the substantive law and it is these rejections which are appealable. Consequently, any failure by Office personnel to follow the Guidelines is neither appealable nor petitionable.

The Guidelines alter the procedures Office personnel will follow when examining applications drawn to computer-related inventions and are equally applicable to claimed inventions implemented in either hardware or software. The Guidelines also clarify the Office's position on certain patentability standards related to this field of technology. Office personnel are to rely on these Guidelines in the event of any inconsistent treatment of issues between these Guidelines and any earlier provided guidance from the Office.

The Freeman-Walter-Abele3 test may additionally be relied upon in analyzing claims directed solely to a process for solving a mathematical algorithm.

Office personnel have had difficulty in properly treating claims directed to methods of doing business. Claims should not be categorized as methods of doing business. Instead, such claims should

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1. These Guidelines are final and replace the Proposed Examination Guidelines for Computer-Implemented Inventions, 60 Fed. Reg. 28,778 (June 2, 1995) and the supporting legal analysis issued on October 3, 1995.

2. "Computer-related inventions" include inventions implemented in a computer and inventions employing computer-readable media.

3. In re Abele, 684 F.2d 902, 905-07, 214 USPQ 682, 685-87 (CCPA 1982); In re Walter, 618 F.2d 758, 767, 205 USPQ 397, 406-07 (CCPA 1980); In re Freeman, 573 F.2d 1237, 1245, 197 USPQ 464, 471 (CCPA 1978).
be treated like any other process claims, pursuant to these Guidelines when relevant.4

The appendix includes a flow chart of the process Office personnel will follow in conducting examinations for computer-related inventions.

II
Determine What Applicant Has Invented and Is Seeking to Patent

It is essential that patent applicants obtain a prompt yet complete examination of their applications. Under the principles of compact prosecution, each claim should be reviewed for compliance with every statutory requirement for patentability in the initial review of the application, even if one or more claims are found to be deficient with respect to some statutory requirement. Thus, Office personnel should state all reasons and bases for rejecting claims in the first Office action. Deficiencies should be explained clearly, particularly when they serve as a basis for a rejection. Whenever practicable, Office personnel should indicate how rejections may be overcome and how problems may be resolved. A failure to follow this approach can lead to unnecessary delays in the prosecution of the application.

Prior to focusing on specific statutory requirements, Office personnel must begin examination by determining what, precisely, the applicant has invented and is seeking to patent,5 and how the claims relate to and define that invention. Consequently, Office personnel will no longer begin examination by determining if a claim recites a "mathematical algorithm." Rather, they will review the complete specification, including the detailed description of the invention, any specific embodiments that have been disclosed, the claims and any specific utilities that have been asserted for the invention.


5. As the courts have repeatedly reminded the Office: "The goal is to answer the question "What did applicants invent?"" *Abele*, 684 F.2d at 907, 214 USPQ at 687. *Accord, e.g., Arrhythmia Research Tech. v. Corazonix Corp.*, 958 F.2d 1053, 1059, 22 USPQ2d 1033, 1038 (Fed. Cir. 1992).
A. Identify and Understand Any Practical Application Asserted for the Invention

The subject matter sought to be patented must be a "useful" process, machine, manufacture or composition of matter, i.e., it must have a practical application. The purpose of this requirement is to limit patent protection to inventions that possess a certain level of "real world" value, as opposed to subject matter that represents nothing more than an idea or concept, or is simply a starting point for future investigation or research. Accordingly, a complete disclosure should contain some indication of the practical application for the claimed invention, i.e., why the applicant believes the claimed invention is useful.

The utility of an invention must be within the "technological" arts. A computer-related invention is within the technological arts. A practical application of a computer-related invention is statutory subject matter. This requirement can be discerned from the variously phrased prohibitions against the patenting of abstract ideas, laws of nature or natural phenomena. An invention that has a practical application in the technological arts satisfies the utility requirement.

The applicant is in the best position to explain why an invention is believed useful. Office personnel should therefore focus their efforts on pointing out statements made in the specification that identify all practical applications for the invention. Office personnel should rely on such statements throughout the examination when assessing the invention for compliance with all statutory criteria. An applicant may assert more than one practical application, but only one is necessary to satisfy the utility requirement. Office personnel should review the


7. See, e.g., Musgrave, 431 F.2d at 893, 167 USPQ at 289-90, cited with approval in Schrader, 22 F.3d at 297, 30 USPQ2d at 1461 (Newman, J., dissenting). The definition of "technology" is the "application of science and engineering to the development of machines and procedures in order to enhance or improve human conditions, or at least to improve human efficiency in some respect." Computer Dictionary 384 (Microsoft Press, 2d ed. 1994).

8. E.g., In re Alappat, 33 F.3d 1526, 1543, 31 USPQ2d 1545, 1556-57 (Fed. Cir. 1994) (in banc) (quoting Diamond v. Diehr, 450 U.S. 175, 192, 209 USPQ 1, 10 (1981)). See also id. at 1569, 31 USPQ2d at 1578-79 (Newman, J., concurring) ("unpatentability of the principle does not defeat patentability of its practical applications") (citing O'Reilly v. Morse, 56 U.S. (15 How.) 62, 114-19 (1854)); Arrhythmia, 958 F.2d at 1056, 22 USPQ2d at 1036; Musgrave, 431 F.2d at 893, 167 USPQ at 289-90 ("All that is necessary, in our view, to make a sequence of operational steps a statutory 'process' within 35 U.S.C. 101 is that it be in the technological arts so as to be in consonance with the Constitutional purpose to promote the progress of 'useful arts.' Const. Art. 1, sec. 8.").
entire disclosure to determine the features necessary to accomplish at least one asserted practical application.

B. Review the Detailed Disclosure and Specific Embodiments of the Invention to Determine What the Applicant Has Invented

The written description will provide the clearest explanation of the applicant's invention, by exemplifying the invention, explaining how it relates to the prior art and explaining the relative significance of various features of the invention. Accordingly, Office personnel should begin their evaluation of a computer-related invention as follows:

- determine what the programmed computer does when it performs the processes dictated by the software (i.e., the functionality of the programmed computer);\(^9\)
- determine how the computer is to be configured to provide that functionality (i.e., what elements constitute the programmed computer and how those elements are configured and interrelated to provide the specified functionality); and
- if applicable, determine the relationship of the programmed computer to other subject matter outside the computer that constitutes the invention (e.g., machines, devices, materials, or process steps other than those that are part of or performed by the programmed computer).\(^10\)

Patent applicants can assist the Office by preparing applications that clearly set forth these aspects of a computer-related invention.

C. Review the Claims

The claims define the property rights provided by a patent, and thus require careful scrutiny. The goal of claim analysis is to identify the boundaries of the protection sought by the applicant and to

\(^9\) Arrhythmia, 958 F.2d at 1057, 22 USPQ2d at 1036: It is of course true that a modern digital computer manipulates data, usually in binary form, by performing mathematical operations, such as addition, subtraction, multiplication, division, or bit shifting, on the data. But this is only how the computer does what it does. Of importance is the significance of the data and their manipulation in the real world, i.e., what the computer is doing.

\(^10\) Many computer-related inventions do not consist solely of a computer. Thus, Office personnel should identify those claimed elements of the computer-related invention that are not part of the programmed computer, and determine how those elements relate to the programmed computer. Office personnel should look for specific information that explains the role of the programmed computer in the overall process or machine and how the programmed computer is to be integrated with the other elements of the apparatus or used in the process.
understand how the claims relate to and define what the applicant has indicated is the invention. Office personnel must thoroughly analyze the language of a claim before determining if the claim complies with each statutory requirement for patentability.

Office personnel should begin claim analysis by identifying and evaluating each claim limitation. For processes, the claim limitations will define steps or acts to be performed. For products, the claim limitations will define discrete physical structures. The discrete physical structures may be comprised of hardware or a combination of hardware and software.

Office personnel are to correlate each claim limitation to all portions of the disclosure that describe the claim limitation. This is to be done in all cases, i.e., whether or not the claimed invention is defined using means or step plus function language. The correlation step will ensure that Office personnel correctly interpret each claim limitation.

The subject matter of a properly construed claim is defined by the terms that limit its scope. It is this subject matter that must be examined. As a general matter, the grammar and intended meaning of terms used in a claim will dictate whether the language limits the claim scope. Language that suggests or makes optional but does not require steps to be performed or does not limit a claim to a particular structure does not limit the scope of a claim or claim limitation.

Office personnel must rely on the applicant's disclosure to properly determine the meaning of terms used in the claims. An applicant is entitled to be his or her own lexicographer, and in many instances will provide an explicit definition for certain terms used in the claims. Where an explicit definition is provided by the applicant for a term, that definition will control interpretation of the term as it is used in the claim. Office personnel should determine if the original disclosure provides a definition consistent with any assertions made by

11. Products may be either machines, manufactures or compositions of matter. Product claims are claims that are directed to either machines, manufactures or compositions of matter.

12. Examples of language that may raise a question as to the limiting effect of the language in a claim:
   (a) statements of intended use or field of use,
   (b) “adapted to” or “adapted for” clauses,
   (c) “wherein” clauses, or
   (d) “whereby” clauses.
This list of examples is not intended to be exhaustive.

applicant.\textsuperscript{14} If an applicant does not define a term in the specification, that term will be given its “common meaning.”\textsuperscript{15}

If the applicant asserts that a term has a meaning that conflicts with the term’s art-accepted meaning, Office personnel should encourage the applicant to amend the claim to better reflect what applicant intends to claim as the invention. If the application becomes a patent, it becomes prior art against subsequent applications. Therefore, it is important for later search purposes to have the patentee employ commonly accepted terminology, particularly for searching text-searchable databases.

Office personnel must always remember to use the perspective of one of ordinary skill in the art. Claims and disclosures are not to be evaluated in a vacuum. If elements of an invention are well known in the art, the applicant does not have to provide a disclosure that describes those elements. In such a case the elements will be construed as encompassing any and every art-recognized hardware or combination of hardware and software technique for implementing the defined requisite functionalities.

Office personnel are to give claims their broadest reasonable interpretation in light of the supporting disclosure.\textsuperscript{16} Where means plus function language is used to define the characteristics of a machine or manufacture invention, claim limitations must be interpreted to read on only the structures or materials disclosed in the specification and “equivalents thereof.”\textsuperscript{17} Disclosure may be express,
implicit or inherent. Thus, at the outset, Office personnel must attempt to correlate claimed means to elements set forth in the written description. The written description includes the specification and the drawings. Office personnel are to give the claimed means plus function limitations their broadest reasonable interpretation consistent with all corresponding structures or materials described in the specification and their equivalents. Further guidance in interpreting the scope of equivalents is provided in the Examination Guidelines For Claims Reciting A Means or Step Plus Function Limitation In Accordance With 35 U.S.C. 112, 6th Paragraph ("Means Plus Function Guidelines").

While it is appropriate to use the specification to determine what applicant intends a term to mean, a positive limitation from the specification cannot be read into a claim that does not impose that limitation. A broad interpretation of a claim by Office personnel will reduce the possibility that the claim, when issued, will be interpreted more broadly than is justified or intended. An applicant can always amend a claim during prosecution to better reflect the intended scope of the claim.

Finally, when evaluating the scope of a claim, every limitation in the claim must be considered. Office personnel may not dissect a claimed invention into discrete elements and then evaluate the equivalents thereof, to the extent that the specification provides such disclosure.

Paragraph six does not state or even suggest that the PTO is exempt from this mandate, and there is no legislative history indicating that Congress intended that the PTO should be. Thus, this court must accept the plain and precise language of paragraph six. Consistent with Donaldson, in the second decision, Alappat, 33 F.3d at 1540, 31 USPQ2d at 1554, the Federal Circuit held:

Given Alappat's disclosure, it was error for the Board majority to interpret each of the means clauses in claim 15 so broadly as to "read on any and every means for performing the function" recited, as it said it was doing, and then to conclude that claim 15 is nothing more than a process claim wherein each means clause represents a step in that process. Contrary to suggestions by the Commissioner, this court's precedents do not support the Board's view that the particular apparatus claims at issue in this case may be viewed as nothing more than process claims.

18. 1162 O.G. 59 (May 17, 1994).

19. See, e.g., Diamond v. Diehr, 450 U.S. at 188-89, 209 USPQ at 9 ("In determining the eligibility of respondents' claimed process for patent protection under §101, their claims must be considered as a whole. It is inappropriate to dissect the claims into old and new elements and then to ignore the presence of the old elements in the analysis. This is particularly true in a process claim because a new combination of steps in a process may be patentable even though all the constituents of the combination were well known and in common use before the combination was made.").
elements in isolation. Instead, the claim as a whole must be considered.

III

Conduct a Thorough Search of the Prior Art

Prior to classifying the claimed invention under § 101, Office personnel are expected to conduct a thorough search of the prior art. Generally, a thorough search involves reviewing both U.S. and foreign patents and non-patent literature. In many cases, the result of such a search will contribute to Office personnel’s understanding of the invention. Both claimed and unclaimed aspects of the invention described in the specification should be searched if there is a reasonable expectation that the unclaimed aspects may be later claimed. A search must take into account any structure or material described in the specification and its equivalents which correspond to the claimed means plus function limitation, in accordance with 35 U.S.C. § 112, sixth paragraph and the Means Plus Function Guidelines.20

IV

Determine Whether the Claimed Invention Complies with 35 U.S.C. § 101

A. Consider the Breadth of 35 U.S.C. § 101 Under Controlling Law

As the Supreme Court has held, Congress chose the expansive language of § 101 so as to include “anything under the sun that is made by man.”21 Accordingly, § 101 of title 35, United States Code, provides:

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20. See supra note 18 and accompanying text.
In choosing such expansive terms as “manufacture” and “composition of matter,” modified by the comprehensive “any,” Congress plainly contemplated that the patent laws would be given wide scope. The relevant legislative history also supports a broad construction. The Patent Act of 1793, authored by Thomas Jefferson, defined statutory subject matter as “any new and useful art, machine, manufacture, or composition of matter, or any new or useful improvement [thereof].” Act of Feb. 21, 1793, § 1, 1 Stat. 319. The Act embodied Jefferson's philosophy that “ingenuity should receive a liberal encouragement.” 5 Writings of Thomas Jefferson 75-76 (Washington ed. 1871). See Graham v. John Deere Co., 383 U.S. 1, 7-10 (1966). Subsequent patent statutes in 1836, 1870, and 1874 employed this same broad language. In 1952, when the patent laws were recodified, Congress replaced the word “art” with “process,” but otherwise left Jefferson's language intact. The Committee Reports accompanying the 1952 Act inform us that Congress
Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.\textsuperscript{22}

As cast, § 101 defines four categories of inventions that Congress deemed to be the appropriate subject matter of a patent; namely, processes, machines, manufactures and compositions of matter. The latter three categories define “things” while the first category defines “actions” (i.e., inventions that consist of a series of steps or acts to be performed).\textsuperscript{23}

Federal courts have held that § 101 does have certain limits. First, the phrase “anything under the sun that is made by man” is limited by the text of § 101, meaning that one may only patent something that is a machine, manufacture, composition of matter or a process.\textsuperscript{24} Second, § 101 requires that the subject matter sought to be patented be a “useful” invention. Accordingly, a complete definition of the scope of § 101, reflecting Congressional intent, is that any new and useful process, machine, manufacture or composition of matter under the sun that is made by man is the proper subject matter of a patent. Subject matter not within one of the four statutory invention categories or which is not “useful” in a patent sense is, accordingly, not eligible to be patented.

The subject matter courts have found to be outside the four statutory categories of invention is limited to abstract ideas, laws of nature and natural phenomena. While this is easily stated, determining whether an applicant is seeking to patent an abstract idea, a law of

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intended statutory subject matter to “include anything under the sun that is made by man.” S. Rep. No. 1979, 82d Cong., 2d Sess. 5 (1952); H.R. Rep. No. 1923, 82d Cong., 2d Sess. 6 (1952).
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This perspective has been embraced by the Federal Circuit:

The plain and unambiguous meaning of § 101 is that any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may be patented if it meets the requirements for patentability set forth in Title 35, such as those found in §§ 102, 103, and 112. The use of the expansive term “any” in § 101 represents Congress’s intent not to place any restrictions on the subject matter for which a patent may be obtained beyond those specifically recited in § 101 and the other parts of Title 35 . . . . Thus, it is improper to read into § 101 limitations as to the subject matter that may be patented where the legislative history does not indicate that Congress clearly intended such limitations. [\textit{Alappat}, 33 F.3d at 1542, 31 USPQ2d at 1556.]

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23. See 35 U.S.C. § 100(b) (“The term ‘process’ means process, art, or method, and includes a new use of a known process, machine, manufacture, composition of matter, or material.”).
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24. E.g., \textit{Alappat}, 33 F.3d at 1542, 31 USPQ2d at 1556; \textit{In re Warmerdam}, 33 F.3d 1354, 1358, 31 USPQ2d 1754, 1757 (Fed. Cir. 1994).
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nature or a natural phenomenon has proven to be challenging. These
three exclusions recognize that subject matter that is not a practical
application or use of an idea, a law of nature or a natural phenomenon
is not patentable.25

Courts have expressed a concern over “preemption” of ideas,
laws of nature or natural phenomena.26 The concern over preemption
serves to bolster and justify the prohibition against the patenting of
such subject matter. In fact, such concerns are only relevant to
claiming a scientific truth or principle. Thus, a claim to an “abstract
idea” is non-statutory because it does not represent a practical
application of the idea, not because it would preempt the idea.

B. Classify the Claimed Invention as to Its Proper Statutory Category

To properly determine whether a claimed invention complies with
the statutory invention requirements of § 101, Office personnel should
classify each claim into one or more statutory or non-statutory
categories. If the claim falls into a non-statutory category, that should
not preclude complete examination of the application for satisfaction
of all other conditions of patentability. This classification is only an
initial finding at this point in the examination process that will be
again assessed after the examination for compliance with §§ 102, 103
and 112 is completed and before issuance of any Office action on the
merits.

If the invention as set forth in the written description is statutory,
but the claims define subject matter that is not, the deficiency can be
corrected by an appropriate amendment of the claims. In such a case,
Office personnel should reject the claims drawn to non-statutory
subject matter under § 101, but identify the features of the invention

25. See, e.g., Rubber-Tip Pencil Co. v. Howard, 87 U.S. 498, 507 (1874) (“idea of itself is not
patentable, but a new device by which it may be made practically useful is”); Mackay Radio &
Telegraph Co. v. Radio Corp. of America, 306 U.S. 86, 94 (1939) (“While a scientific truth, or the
mathematical expression of it, is not patentable invention, a novel and useful structure created
with the aid of knowledge of scientific truth may be.”); Warmerdam, 33 F.3d at 1360, 31 USPQ2d
at 1759 (“steps of locating a medial axis, and ‘creating’ a bubble hierarchy . . . describe
nothing more than the manipulation of basic mathematical constructs, the paradigmatic ‘abstract
idea’.”).

26. The concern over preemption was expressed as early as 1852. See Le Roy v. Tatham, 55
U.S. 156, 175 (1852) (“A principle, in the abstract, is a fundamental truth; an original cause; a
motive; these cannot be patented, as no one can claim in either of them an exclusive right.”); Funk Brothers Seed Co. v. Kalo Inoculant Co., 333 U.S. 127, 132, 76 USPQ 280, 282 (1948)
(combination of six species of bacteria held to be non-statutory subject matter).
that would render the claimed subject matter statutory if recited in the claim.

1. **Non-Statutory Subject Matter**

   Claims to computer-related inventions that are clearly non-statutory fall into the same general categories as non-statutory claims in other parts, namely natural phenomena such as magnetism, and abstract ideas or laws of nature which constitute "descriptive material." Descriptive material can be characterized as either "functional descriptive material" or "non-functional descriptive material." In this context, "functional descriptive material" consists of data structures and computer programs which impart functionality when encoded on a computer-readable medium. "Non-functional descriptive material" includes but is not limited to music, literary works and a compilation or mere arrangement of data.

   Both types of "descriptive material" are non-statutory when claimed as descriptive material per se. When functional descriptive material is recorded on some computer-readable medium it becomes structurally and functionally interrelated to the medium and will be statutory in most cases. When non-functional descriptive material is recorded on some computer-readable medium, it is not structurally and functionally interrelated to the medium but is merely carried by the medium. Merely claiming non-functional descriptive material stored in a computer-readable medium does not make it statutory. Such a result would exalt form over substance. Thus, non-statutory music does not become statutory by merely recording it on a compact disk. Protection for this type of work is provided under the copyright law.

27. The definition of "data structure" is "a physical or logical relationship among data elements, designed to support specific data manipulation functions." The New IEEE Standard Dictionary of Electrical and Electronics Terms 308 (5th ed. 1993).

28. Compare *In re Lowry*, 32 F.3d 1579, 1583-84, 32 USPQ2d 1031, 1035 (Fed. Cir. 1994) (claim to data structure that increases computer efficiency held statutory) and *Warmerdam*, 33 F.3d at 1360-61, 31 USPQ2d at 1759 (claim to computer having specific memory held statutory product-by-process claim) with *Warmerdam*, 33 F.3d at 1361, 31 USPQ2d at 1760 (claim to a data structure *per se* held non-statutory).

29. *In re Sarkar*, 588 F.2d 1330, 1333, 200 USPQ 132, 137 (CCPA 1978): [E]ach invention must be evaluated as claimed; yet semantogenic considerations preclude a determination based solely on words appearing in the claims. In the final analysis under § 101, the claimed invention, as a whole, must be evaluated for what it is.

Quoted with approval in *Abele*, 684 F.2d at 907, 214 USPQ at 687. See also *In re Johnson*, 589 F.2d 1070, 1077, 200 USPQ 199, 206 (CCPA 1978) ("form of the claim is often an exercise in drafting").
Claims to processes that do nothing more than solve mathematical problems or manipulate abstract ideas or concepts are more complex to analyze and are addressed below. See sections IV.B.2(d) and IV.B.2(e).

(a) Functional Descriptive Material: “Data Structures” Representing Descriptive Material per se or Computer Programs Representing Computer Listings per se

Data structures not claimed as embodied in computer-readable media are descriptive material per se and are not statutory because they are neither physical “things” nor statutory processes. Such claimed data structures do not define any structural and functional interrelationships between the data structure and other claimed aspects of the invention which permit the data structure’s functionality to be realized. In contrast, a claimed computer-readable medium encoded with a data structure defines structural and functional interrelationships between the data structure and the medium which permit the data structure’s functionality to be realized, and is thus statutory.

Similarly, computer programs claimed as computer listings per se, *i.e.*, the descriptions or expressions of the programs, are not physical “things,” nor are they statutory processes, as they are not “acts” being performed. Such claimed computer programs do not define any structural and functional interrelationships between the computer program and other claimed aspects of the invention which permit the computer program’s functionality to be realized. In contrast, a claimed computer-readable medium encoded with a computer program defines structural and functional interrelationships between the computer program and the medium which permit the computer program’s functionality to be realized, and is thus statutory. Accordingly, it is important to distinguish claims that define descriptive material per se from claims that define statutory inventions.

Computer programs are often recited as part of a claim. Office personnel should determine whether the computer program is being claimed as part of an otherwise statutory manufacture or machine. In such a case, the claim remains statutory irrespective of the fact that a computer program is included in the claim. The same result occurs when a computer program is used in a computerized process where

30. See, e.g., Warmerdam, 33 F.3d at 1361, 31 USPQ2d at 1760 (claim to a data structure *per se* held non-statutory).
the computer executes the instructions set forth in the computer program. Only when the claimed invention taken as a whole is directed to a mere program listing, i.e., to only its description or expression, is it descriptive material per se and hence non-statutory.

Since a computer program is merely a set of instructions capable of being executed by a computer, the computer program itself is not a process and Office personnel should treat a claim for a computer program, without the computer-readable medium needed to realize the computer program's functionality, as non-statutory functional descriptive material. When a computer program is claimed in a process where the computer is executing the computer program's instructions, Office personnel should treat the claim as a process claim. See Sections IV.B.2(b)-(e).

When a computer program is recited in conjunction with a physical structure, such as a computer memory, Office personnel should treat the claim as a product claim. See Section IV.B.2(a).

(b) Non-Functional Descriptive Material

Descriptive material that cannot exhibit any functional interrelationship with the way in which computing processes are performed does not constitute a statutory process, machine, manufacture or composition of matter and should be rejected under § 101. Thus, Office personnel should consider the claimed invention as a whole to determine whether the necessary functional interrelationship is provided.

Where certain types of descriptive material, such as music, literature, art, photographs and mere arrangements or compilations of facts or data, are merely stored so as to be read or outputted by a computer without creating any functional interrelationship, either as part of the stored data or as part of the computing processes performed by the computer, then such descriptive material alone does not impart functionality either to the data as so structured, or to the computer. Such "descriptive material" is not a process, machine, manufacture or composition of matter.

The policy that precludes the patenting of non-functional descriptive material would be easily frustrated if the same descriptive

Data consists of facts, which become information when they are seen in context and convey meaning to people. Computers process data without any understanding of what that data represents.
material could be patented when claimed as an article of manufacture. For example, music is commonly sold to consumers in the format of a compact disc. In such cases, the known compact disc acts as nothing more than a carrier for non-functional descriptive material. The purely non-functional descriptive material cannot alone provide the practical application for the manufacture.

Office personnel should be prudent in applying the foregoing guidance. Non-functional descriptive material may be claimed in combination with other functional descriptive material on a computer-readable medium to provide the necessary functional and structural interrelationship to satisfy the requirements of §101. The presence of the claimed non-functional descriptive material is not necessarily determinative of non-statutory subject matter. For example, a computer that recognizes a particular grouping of musical notes read from memory and upon recognizing that particular sequence, causes another defined series of notes to be played, defines a functional interrelationship among that data and the computing processes performed when utilizing that data, and as such is statutory because it implements a statutory process.

(c) Natural Phenomena Such as Electricity and Magnetism

Claims that recite nothing but the physical characteristics of a form of energy, such as a frequency, voltage, or the strength of a magnetic field, define energy or magnetism, per se, and as such are non-statutory natural phenomena. However, a claim directed to a practical application of a natural phenomenon such as energy or magnetism is statutory.

2. Statutory Subject Matter

(a) Statutory Product Claims

If a claim defines a useful machine or manufacture by identifying the physical structure of the machine or manufacture in terms of its hardware or hardware and software combination, it defines a statutory product.

32. See supra note 29.
34. Id. at 114-19.
35. See, e.g., Lowry, 32 F.3d at 1583, 32 USPQ2d at 1034-35; Warmerdam, 33 F.3d at 1361-62, 31 USPQ2d at 1760.
A machine or manufacture claim may be one of two types: (1) a claim that encompasses any and every machine for performing the underlying process or any and every manufacture that can cause a computer to perform the underlying process, or (2) a claim that defines a specific machine or manufacture. When a claim is of the first type, Office personnel are to evaluate the underlying process the computer will perform in order to determine the patentability of the product.

(i) Claims that Encompass Any Machine or Manufacture Embodiment of a Process

Office personnel must treat each claim as a whole. The mere fact that a hardware element is recited in a claim does not necessarily limit the claim to a specific machine or manufacture. If a product claim encompasses any and every computer implementation of a process, when read in light of the specification, it should be examined on the basis of the underlying process. Such a claim can be recognized as it will:

- define the physical characteristics of a computer or computer component exclusively as functions or steps to be performed on or by a computer, and
- encompass any and every product in the stated class (e.g., computer, computer-readable memory) configured in any manner to perform that process.

Office personnel are reminded that finding a product claim to encompass any and every product embodiment of a process invention simply means that the Office will presume that the product claim encompasses any and every hardware or hardware platform and associated software implementation that performs the specified set of claimed functions. Because this is interpretive and nothing more, it does not provide any information as to the patentability of the applicant’s underlying process or the product claim.

When Office personnel have reviewed the claim as a whole and found that it is not limited to a specific machine or manufacture, they shall identify how each claim limitation has been treated and set forth their reasons in support of their conclusion that the claim encompasses any and every machine or manufacture embodiment of a process. This

will shift the burden to applicant to demonstrate why the claimed invention should be limited to a specific machine or manufacture.

If a claim is found to encompass any and every product embodiment of the underlying process, and if the underlying process is statutory, the product claim should be classified as a statutory product. By the same token, if the underlying process invention is found to be non-statutory, Office personnel should classify the “product” claim as a “non-statutory product.” If the product claim is classified as being a non-statutory product on the basis of the underlying process, Office personnel should emphasize that they have considered all claim limitations and are basing their finding on the analysis of the underlying process.

(ii) Product Claims—Claims Directed to Specific Machines and Manufactures

If a product claim does not encompass any and every computer-implementation of a process, then it must be treated as a specific machine or manufacture. Claims that define a computer-related invention as a specific machine or specific article of manufacture must define the physical structure of the machine or manufacture in terms of its hardware or hardware and “specific software.” The applicant may define the physical structure of a programmed computer or its hardware or software components in any manner that can be clearly understood by a person skilled in the relevant art. Generally a claim drawn to a particular programmed computer should identify the elements of the computer and indicate how those elements are configured in either hardware or a combination of hardware and specific software.

To adequately define a specific computer memory, the claim must identify a general or specific memory and the specific software which provides the functionality stored in the memory.

A claim limited to a specific machine or manufacture, which has a practical application in the technological arts, is statutory. In most cases, a claim to a specific machine or manufacture will have a practical application in the technological arts.

37. “Specific software” is defined as a set of instructions implemented in a specific program code segment. See Computer Dictionary 78 (Microsoft Press, 2d ed. 1994) for definition of “code segment.”
(iii) Hypothetical Machine Claims Which Illustrate Claims of the Types Described in Sections IV.B.2(a)(i) and (ii)

Two applicants present a claim to the following process:
A process for determining and displaying the structure of a chemical compound comprising:
(a) Solving the wavefunction parameters for the compound to determine the structure of a compound; and
(b) Displaying the structure of the compound determined in step (a).

Each applicant also presents a claim to the following apparatus:
A computer system for determining the three dimensional structure of a chemical compound comprising:
(a) Means for determining the three dimensional structure of a compound; and
(b) Means for creating and displaying an image representing a three-dimensional perspective of the compound.

In addition, each applicant provides the noted disclosures to support the claims:
<table>
<thead>
<tr>
<th>Disclosure</th>
<th>Applicant A</th>
<th>Applicant B</th>
</tr>
</thead>
<tbody>
<tr>
<td>The disclosure describes specific software, <em>i.e.</em>, specific program code segments, that are to be employed to configure a general purpose microprocessor to create specific logic circuits. These circuits are indicated to be the &quot;means&quot; corresponding to the claimed means limitations.</td>
<td>The disclosure states that it would be a matter of routine skill to select an appropriate conventional computer system and implement the claimed process on that computer system. The disclosure does not have specific disclosure that corresponds to the two &quot;means&quot; limitations recited in the claim (<em>i.e.</em>, no specific software or logic circuit). The disclosure does have an explanation of how to solve the wavefunction equations of a chemical compound, and indicates that the solutions of those wavefunction equations can be employed to determine the physical structure of the corresponding compound.</td>
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<tr>
<th>Result</th>
<th>Applicant A</th>
<th>Applicant B</th>
</tr>
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<tbody>
<tr>
<td>Claim defines specific computer, patentability stands independently from process claim.</td>
<td>Claim encompasses any computer embodiment of process claim; patentability stands or falls with process claim.</td>
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<tr>
<th>Explanation</th>
<th>Applicant A</th>
<th>Applicant B</th>
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</thead>
<tbody>
<tr>
<td>Disclosure identifies the specific machine capable of performing the indicated functions.</td>
<td>Disclosure does not provide any information to distinguish the &quot;implementation&quot; of the process on a computer from the factors that will govern the patentability determination of the process per se. As such, the patentability of this apparatus claim will stand or fall with that of the process claim.</td>
<td></td>
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</table>
(b) Statutory Process Claims

A claim that requires one or more acts to be performed defines a process. However, not all processes are statutory under § 101. To be statutory, a claimed computer-related process must either: (1) Result in a physical transformation outside the computer for which a practical application in the technological arts is either disclosed in the specification or would have been known to a skilled artisan (discussed in (i) below), or (2) Be limited by the language in the claim to be a practical application within the technological arts (discussed in (ii) below). The claimed practical application must be a further limitation upon the claimed subject matter if the process is confined to the internal operations of the computer. If a physical transformation occurs outside the computer, it is not necessary to claim the practical application. A disclosure that permits a skilled artisan to practice the claimed invention, i.e., to put it to a practical use, is sufficient. On the other hand, it is necessary to claim the practical application if there is no physical transformation or if the process merely manipulates concepts or converts one set of numbers into another.

A claimed process is clearly statutory if it results in a physical transformation outside the computer, i.e., falls into one or both of the following specific categories ("safe harbors").

(i) Safe Harbors

• Independent Physical Acts (Post-Computer Process Activity)

A process is statutory if it requires physical acts to be performed outside the computer independent of and following the steps to be performed by a programmed computer, where those acts involve the manipulation of tangible physical objects and result in the object having a different physical attribute or structure. Thus, if a process

38. See Diamond v. Diehr, 450 U.S. at 183-84, 209 USPQ at 6 (quoting Cochrane v. Deener, 94 U.S. 780, 787-88 (1877) ("A [statutory] process is a mode of treatment of certain materials to produce a given result. It is an act, or a series of acts, performed upon the subject-matter to be transformed and reduced to a different state or thing . . . . The process requires that certain things should be done with certain substances, and in a certain order; but the tools to be used in doing this may be of secondary consequence.").

39. See Alappat, 33 F.3d at 1543, 31 USPQ2d at 1556-57 (quoting Diamond v. Diehr, 450 U.S. at 192, 209 USPQ at 10). See also id. at 1569, 31 USPQ2d at 1578-79 (Newman, J., concurring) ("unpatentability of the principle does not defeat patentability of its practical applications") (citing O'Reilly v. Morse, 56 U.S. (15 How.) at 114-19).

claim includes one or more post-computer process steps that result in a physical transformation outside the computer (beyond merely conveying the direct result of the computer operation, see Section IV.B.2(d)(iii)), the claim is clearly statutory.

Examples of this type of statutory process include the following:

- A method of curing rubber in a mold which relies upon updating process parameters, using a computer processor to determine a time period for curing the rubber, using the computer processor to determine when the time period has been reached in the curing process and then opening the mold at that stage.

- A method of controlling a mechanical robot which relies upon storing data in a computer that represents various types of mechanical movements of the robot, using a computer processor to calculate positioning of the robot in relation to given tasks to be performed by the robot, and controlling the robot's movement and position based on the calculated position.

- Manipulation of Data Representing Physical Objects or Activities (Pre-Computer Process Activity)

Another statutory process is one that requires the measurements of physical objects or activities to be transformed outside of the computer into computer data,\(^{41}\) where the data comprises signals corresponding to physical objects or activities external to the computer system, and where the process causes a physical transformation of the signals which are intangible representations of the physical objects or activities.\(^{42}\)

Examples of this type of claimed statutory process include the following:

- A method of using a computer processor to analyze electrical signals and data representative of human cardiac activity by converting the signals to time segments, applying the time segments in reverse order to a high pass filter means, using the computer processor to determine the amplitude of the high pass

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41. See In re Gelnovatch, 595 F.2d 32, 41 n.7, 201 USPQ 136, 145 n.7 (CCPA 1979) (data-gathering step did not measure physical phenomenon).

42. Schrader, 22 F.3d at 294, 30 USPQ2d at 1459 citing with approval Arrhythmia, 958 F.2d at 1058-59, 22 USPQ2d at 1037-38; Abele, 684 F.2d at 909, 214 USPQ at 688; In re Taner, 681 F.2d 787, 790, 214 USPQ 678, 681 (CCPA 1982).
filter's output, and using the computer processor to compare
the value to a predetermined value. In this example the data is
an intangible representation of physical activity, i.e., human
cardiac activity. The transformation occurs when heart activity
is measured and an electrical signal is produced. This process
has real world value in predicting vulnerability to ventricular
tachycardia immediately after a heart attack.

- A method of using a computer processor to receive data
representing Computerized Axial Tomography ("CAT") scan
images of a patient, performing a calculation to determine the
difference between a local value at a data point and an average
value of the data in a region surrounding the point, and
displaying the difference as a gray scale for each point in the
image, and displaying the resulting image. In this example the
data is an intangible representation of a physical object, i.e.,
portions of the anatomy of a patient. The transformation occurs
when the condition of the human body is measured with X-rays
and the X-rays are converted into electrical digital signals that
represent the condition of the human body. The real world
value of the invention lies in creating a new CAT scan image of
body tissue without the presence of bones.

- A method of using a computer processor to conduct seismic
exploration, by imparting spherical seismic energy waves into
the earth from a seismic source, generating a plurality of
reflected signals in response to the seismic energy waves at a set
of receiver positions in an array, and summing the reflection
signals to produce a signal simulating the reflection response of
the earth to the seismic energy. In this example, the electrical
signals processed by the computer represent reflected seismic
energy. The transformation occurs by converting the spherical
seismic energy waves into electrical signals which provide a
geophysical representation of formations below the earth's
surface. Geophysical exploration of formations below the
surface of the earth has real world value.

If a claim does not clearly fall into one or both of the safe havens,
the claim may still be statutory if it is limited by the language in the
claim to a practical application in the technological arts.
(ii) Computer-Related Processes Limited to a Practical Application in the Technological Arts

There is always some form of physical transformation within a computer because a computer acts on signals and transforms them during its operation and changes the state of its components during the execution of a process. Even though such a physical transformation occurs within a computer, such activity is not determinative of whether the process is statutory because such transformation alone does not distinguish a statutory computer process from a non-statutory computer process. What is determinative is not how the computer performs the process, but what the computer does to achieve a practical application.43

A process that merely manipulates an abstract idea or performs a purely mathematical algorithm is non-statutory despite the fact that it might inherently have some usefulness.44 For such subject matter to be statutory, the claimed process must be limited to a practical application of the abstract idea or mathematical algorithm in the technological arts.45 For example, a computer process that simply calculates a mathematical algorithm that models noise is non-statutory. However, a claimed process for digitally filtering noise employing the mathematical algorithm is statutory.

Examples of this type of claimed statutory process include the following:

- A computerized method of optimally controlling transfer, storage and retrieval of data between cache and hard disk storage devices such that the most frequently used data is readily available.

43. See supra note 9.
44. In Sarkar, 588 F.2d at 1335, 200 USPQ at 139, the court explained why this approach must be followed:

No mathematical equation can be used, as a practical matter, without establishing and substituting values for the variables expressed therein. Substitution of values dictated by the formula has thus been viewed as a form of mathematical step. If the steps of gathering and substituting values were alone sufficient, every mathematical equation, formula, or algorithm having any practical use would be per se subject to patenting as a "process" under §101. Consideration of whether the substitution of specific values is enough to convert the disembodied ideas present in the formula into an embodiment of those ideas, or into an application of the formula, is foreclosed by the current state of the law.
45. See supra note 40.
A method of controlling parallel processors to accomplish multi-tasking of several computing tasks to maximize computing efficiency.  

A method of making a word processor by storing an executable word processing application program in a general purpose digital computer's memory, and executing the stored program to impart word processing functionality to the general purpose digital computer by changing the state of the computer's arithmetic logic unit when program instructions of the word processing program are executed.  

A digital filtering process for removing noise from a digital signal comprising the steps of calculating a mathematical algorithm to produce a correction signal and subtracting the correction signal from the digital signal to remove the noise.  

(c) Non-Statutory Process Claims  

If the "acts" of a claimed process manipulate only numbers, abstract concepts or ideas, or signals representing any of the foregoing, the acts are not being applied to appropriate subject matter. Thus, a process consisting solely of mathematical operations, i.e., converting one set of numbers into another set of numbers, does not manipulate appropriate subject matter and thus cannot constitute a statutory process.  

In practical terms, claims define non-statutory processes if they:  

* consist solely of mathematical operations without some claimed practical application (i.e., executing a "mathematical algorithm"); or  
* simply manipulate abstract ideas, e.g., a bid\textsuperscript{47} or a bubble hierarchy,\textsuperscript{48} without some claimed practical application.  

A claimed process that consists solely of mathematical operations is non-statutory whether or not it is performed on a computer. Courts have recognized a distinction between types of mathematical algorithms, namely, some define a "law of nature" in mathematical terms and others merely describe an "abstract idea."\textsuperscript{49}  

\textsuperscript{46} See, e.g., In re Bernhart, 417 F.2d 1395, 1400, 163 USPQ 611, 616 (CCPA 1969).  
\textsuperscript{47} Schrader, 22 F.3d at 293-94, 30 USPQ2d at 1458-59.  
\textsuperscript{48} Warmerdam, 33 F.3d at 1360, 31 USPQ2d at 1759.  
\textsuperscript{49} See, e.g., In re Meyer, 688 F.2d 789, 794-95, 215 USPQ 193, 197 (CCPA 1982) ("Scientific principles, such as the relationship between mass and energy, and laws of nature, such as the acceleration of gravity, namely, $a=32 \text{ ft.}/\text{sec.}^2$, can be represented in mathematical
Certain mathematical algorithms have been held to be non-statutory because they represent a mathematical definition of a law of nature or a natural phenomenon. For example, a mathematical algorithm representing the formula \( E=mc^2 \) is a "law of nature"—it defines a "fundamental scientific truth" (i.e., the relationship between energy and mass). To comprehend how the law of nature relates to any object, one invariably has to perform certain steps (e.g., multiplying a number representing the mass of an object by the square of a number representing the speed of light). In such a case, a claimed process which consists solely of the steps that one must follow to solve the mathematical representation of \( E=mc^2 \) is indistinguishable from the law of nature and would "preempt" the law of nature. A patent cannot be granted on such a process.

Other mathematical algorithms have been held to be non-statutory because they merely describe an abstract idea. An "abstract idea" may simply be any sequence of mathematical operations that are combined to solve a mathematical problem. The concern addressed by holding such subject matter non-statutory is that the mathematical operations merely describe an idea and do not define a process that represents a practical application of the idea.

Accordingly, when a claim reciting a mathematical algorithm is found to define non-statutory subject matter the basis of the § 101 rejection must be that, when taken as a whole, the claim recites a law of nature, a natural phenomenon, or an abstract idea.

format. However, some mathematical algorithms and formulae do not represent scientific principles or laws of nature; they represent ideas or mental processes and are simply logical vehicles for communicating possible solutions to complex problems. The presence of a mathematical algorithm or formula in a claim is merely an indication that a scientific principle, law of nature, idea or mental process may be the subject matter claimed and, thus, justify a rejection of that claim under 35 USC § 101; but the presence of a mathematical algorithm or formula is only a signpost for further analysis.”). Cf. Alappat, 33 F.3d at 1543 n.19, 31 USPQ2d at 1556 n.19 in which the Federal Circuit recognized the confusion:

The Supreme Court has not been clear . . . as to whether such subject matter is excluded from the scope of § 101 because it represents laws of nature, natural phenomena, or abstract ideas. See Diehr, 450 U.S. at 186 (viewed mathematical algorithm as a law of nature); Benson, 409 U.S. at 71-72 (treated mathematical algorithm as an "idea"). The Supreme Court also has not been clear as to exactly what kind of mathematical subject matter may not be patented. The Supreme Court has used, among others, the terms "mathematical algorithm," "mathematical formula," and "mathematical equation" to describe types of mathematical subject matter not entitled to patent protection standing alone. The Supreme Court has not set forth, however, any consistent or clear explanation of what it intended by such terms or how these terms are related, if at all.
(d) Certain Claim Language Related to Mathematical Operation Steps of a Process

(i) Intended Use or Field of Use Statements

Claim language that simply specifies an intended use or field of use for the invention generally will not limit the scope of a claim, particularly when only presented in the claim preamble. Thus, Office personnel should be careful to properly interpret such language. When such language is treated as non-limiting, Office personnel should expressly identify in the Office action the claim language that constitutes the intended use or field of use statements and provide the basis for their findings. This will shift the burden to applicant to demonstrate why the language is to be treated as a claim limitation.

(ii) Necessary Antecedent Step to Performance of a Mathematical Operation or Independent Limitation on a Claimed Process

In some situations, certain acts of “collecting” or “selecting” data for use in a process consisting of one or more mathematical operations will not further limit a claim beyond the specified mathematical operation step(s). Such acts merely determine values for the variables used in the mathematical formulae used in making the calculations. If a claim requires acts to be performed to create data that will then be used in a process representing a practical application of one or more mathematical operations, those acts must be treated as further limiting the claim beyond the mathematical operation(s) per se. Such acts are data gathering steps not dictated by the algorithm but by other limitations which require certain antecedent steps and as such constitute an independent limitation on the claim.

Examples of acts that independently limit a claimed process involving mathematical operations include:

50. Walter, 618 F.2d at 769, 205 USPQ at 409 (Because none of the claimed steps were explicitly or implicitly limited to their application in seismic prospecting activities, the court held that “[a]lthough the claim preambles relate the claimed invention to the art of seismic prospecting, the claims themselves are not drawn to methods of or apparatus for seismic prospecting; they are drawn to improved mathematical methods for interpreting the results of seismic prospecting.”). Cf. Alappat, 33 F.3d at 1544, 31 USPQ2d at 1558.

51. Walter, 618 F.2d at 769-70, 205 USPQ at 409.

52. See supra note 45 [sic—note 40 (eds.)].
A method of conducting seismic exploration which requires generating and manipulating signals from seismic energy waves before "summing" the values represented by the signals; and
A method of displaying X-ray attenuation data as a signed gray scale signal in a "field" using a particular algorithm, where the antecedent steps require generating the data using a particular machine (e.g., a computer tomography scanner).

Examples of steps that do not independently limit one or more mathematical operation steps include:

- "Perturbing" the values of a set of process inputs, where the subject matter "perturbed" was a number and the act of "perturbing" consists of substituting the numerical values of variables; and
- Selecting a set of arbitrary measurement point values.

Such steps do not impose independent limitations on the scope of the claim beyond those required by the mathematical operation limitation.

(iii) Post-Mathematical Operation Step Using Solution or Merely Conveying Result of Operation

In some instances, certain kinds of post-solution "acts" will not further limit a process claim beyond the performance of the preceding mathematical operation step even if the acts are recited in the body of a claim. If, however, the claimed acts represent some "significant use" of the solution, those acts will invariably impose an independent limitation on the claim. A "significant use" is any activity which is more than merely outputting the direct result of the mathematical operation. Office personnel are reminded to rely on the applicant's characterization of the significance of the acts being assessed to resolve questions related to their relationship to the mathematical

53. Taner, 681 F.2d at 788, 214 USPQ at 679.
54. Abele, 684 F.2d at 908, 214 USPQ at 687 ("The specification indicates that such attenuation data is available only when an X-ray beam is produced by a CAT scanner, passed through an object, and detected upon its exist [sic]. Only after these steps have been completed is the algorithm performed, and the resultant modified data displayed in the required format.").
55. Gelnovatch, 595 F.2d at 41 n.7, 201 USPQ at 145 n.7 ("Appellants' claimed step of perturbing the values of a set of process inputs (step 3), in addition to being a mathematical operation, appears to be a data-gathering step of the type we have held insufficient to change a nonstatutory method of calculation into a statutory process. . . . In this instance, the perturbed process inputs are not even measured values of physical phenomena, but are instead derived by numerically changing the values in the previous set of process inputs.").
56. Sarkar, 588 F.2d at 1331, 200 USPQ at 135.
operations recited in the claim and the invention as a whole. Thus, if a claim requires that the direct result of a mathematical operation be evaluated and transformed into something else, Office personnel cannot treat the subsequent steps as being indistinguishable from the performance of the mathematical operation and thus not further limiting on the claim. For example, acts that require the conversion of a series of numbers representing values of a wavefunction equation for a chemical compound into values representing an image that conveys information about the three-dimensional structure of the compound and the displaying of the three-dimensional structure cannot be treated as being part of the mathematical operations.

Office personnel should be especially careful when reviewing claim language that requires the performance of “post-solution” steps to ensure that claim limitations are not ignored.

Examples of steps found not to independently limit a process involving one or more mathematical operation steps include:

- Step of “updating alarm limits” found to constitute changing the number value of a variable to represent the result of the calculation;
- Final step of magnetically recording the result of a calculation;
- Final step of “equating” the process outputs to the values of the last set of process inputs found to constitute storing the result of calculations;
- Final step of displaying result of a calculation “as a shade of gray rather than as simply a number” found to not constitute distinct step where the data were numerical values that did not represent anything;

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57. See Sarkar, 588 F.2d at 1332 n.6, 200 USPQ at 136 n.6 (“post-solution” construction that was being modeled by the mathematical process not considered in deciding § 101 question because applicant indicated that such construction was not a material element of the invention).
59. Walter, 618 F.2d at 770, 205 USPQ at 409 (“If § 101 could be satisfied by the mere recordation of the results of a nonstatutory process on some record medium, even the most unskilled patent draftsman could provide for such a step.”).
60. Gelnovatch, 595 F.2d at 41 n.7, 201 USPQ at 145 n.7.
61. Abele, 684 F.2d at 909, 214 USPQ at 688 (“This claim presents no more than the calculation of a number and display of the result, albeit in a particular format. The specification provides no greater meaning to ‘data in a field’ than a matrix of numbers regardless of by what method generated. Thus, the algorithm is neither explicitly nor implicitly applied to any certain process. Moreover, that the result is displayed as a shade of gray rather than as simply a number provides no greater or better information, considering the broad range of applications encompassed by the claim.”).
A process that consists solely of the manipulation of an abstract idea without any limitation to a practical application is non-statutory. Office personnel have the burden to establish a prima facie case that the claimed invention taken as a whole is directed to the manipulation of abstract ideas without a practical application.

In order to determine whether the claim is limited to a practical application of an abstract idea, Office personnel must analyze the claim as a whole, in light of the specification, to understand what subject matter is being manipulated and how it is being manipulated. During this procedure, Office personnel must evaluate any statements of intended use or field of use, any data gathering step and any post-manipulation activity. See section IV.B.2(d) above for how to treat various types of claim language. Only when the claim is devoid of any limitation to a practical application in the technological arts should it be rejected under §101. Further, when such a rejection is made, Office personnel must expressly state how the language of the claims has been interpreted to support the rejection.

V
Evaluate Application for Compliance with 35 U.S.C. § 112

Office personnel should begin their evaluation of an application's compliance with §112 by considering the requirements of §112, second paragraph. The second paragraph contains two separate and distinct requirements: (1) that the claim(s) set forth the subject matter applicants regard as the invention, and (2) that the claim(s) particularly point out and distinctly claim the invention. An application will be deficient under §112, second paragraph when (1) evidence including admissions, other than in the application as filed, shows applicant has stated that he or she regards the invention to be

62. In re De Castelete, 562 F.2d 1236, 1244, 195 USPQ 439, 446 (CCPA 1977) ("That the computer is instructed to transmit electrical signals, representing the results of its calculations, does not constitute the type of 'post solution activity' found in Flook, [437 U.S. 584, 198 USPQ 193 (1978)], and does not transform the claim into one for a process merely using an algorithm. The final transmitting step constitutes nothing more than reading out the result of the calculations.").

63. E.g., Warmerdam, 33 F.3d at 1360, 31 USPQ2d at 1759. See also Schrader, 22 F.3d at 295, 30 USPQ2d at 1459.
different from what is claimed, or when (2) the scope of the claims is unclear.

After evaluation of the application for compliance with §112, second paragraph, Office personnel should then evaluate the application for compliance with the requirements of §112, first paragraph. The first paragraph contains three separate and distinct requirements: (1) Adequate written description, (2) enablement, and (3) best mode. An application will be deficient under §112, first paragraph when the written description is not adequate to identify what the applicant has invented, or when the disclosure does not enable one skilled in the art to make and use the invention as claimed without undue experimentation. Deficiencies related to disclosure of the best mode for carrying out the claimed invention are not usually encountered during examination of an application because evidence to support such a deficiency is seldom in the record.

If deficiencies are discovered with respect to §112, Office personnel must be careful to apply the appropriate paragraph of §112.


1. Claims Setting Forth the Subject Matter Applicant Regards as Invention

Applicant’s specification must conclude with claim(s) that set forth the subject matter which the applicant regards as the invention. The invention set forth in the claims is presumed to be that which applicant regards as the invention, unless applicant considers the invention to be something different from what has been claimed as shown by evidence, including admissions, outside the application as filed. An applicant may change what he or she regards as the invention during the prosecution of the application.

2. Claims Particularly Pointing Out and Distinctly Claiming the Invention

Office personnel shall determine whether the claims set out and circumscribe the invention with a reasonable degree of precision and particularity. In this regard, the definiteness of the language must be analyzed, not in a vacuum, but always in light of the teachings of the disclosure as it would be interpreted by one of ordinary skill in the art. Applicant’s claims, interpreted in light of the disclosure, must reasonably apprise a person of ordinary skill in the art of the invention. However, the applicant need not explicitly recite in the
claims every feature of the invention. For example, if an applicant indicates that the invention is a particular computer, the claims do not have to recite every element or feature of the computer. In fact, it is preferable for claims to be drafted in a form that emphasizes what the applicant has invented (i.e., what is new rather than old).

A means plus function limitation is distinctly claimed if the description makes it clear that the means corresponds to well-defined structure of a computer or computer component implemented in either hardware or software and its associated hardware platform. Such means may be defined as:

- A programmed computer with a particular functionality implemented in hardware or hardware and software;
- A logic circuit or other component of a programmed computer that performs a series of specifically identified operations dictated by a computer program; or
- A computer memory encoded with executable instructions representing a computer program that can cause a computer to function in a particular fashion.

The scope of a “means” limitation is defined as the corresponding structure or material (e.g., a specific logic circuit) set forth in the written description and equivalents. Thus, a claim using means plus function limitations without corresponding disclosure of specific structures or materials that are not well-known fails to particularly point out and distinctly claim the invention. For example, if the applicant discloses only the functions to be performed and provides no express, implied or inherent disclosure of hardware or a combination of hardware and software that performs the functions, the application has not disclosed any “structure” which corresponds to the claimed means. Office personnel should reject such claims under § 112, second paragraph. The rejection shifts the burden to the applicant to describe at least one specific structure or material that corresponds to the claimed means in question, and to identify the precise location or locations in the specification where a description of at least one embodiment of that claimed means can be found. In contrast, if the corresponding structure is disclosed to be a memory or logic circuit that has been configured in some manner to perform that function (e.g., using a defined computer program), the application has disclosed “structure” which corresponds to the claimed means.

64. See supra note 18 and accompanying text.
When a claim or part of a claim is defined in computer program code, whether in source or object code format, a person of skill in the art must be able to ascertain the metes and bounds of the claimed invention. In certain circumstances, as where a self-documenting programming code is employed, use of programming language in a claim would be permissible because such program source code presents "sufficiently high-level language and descriptive identifiers" to make it universally understood to others in the art without the programmer having to insert any comments. Applicants should be encouraged to functionally define the steps the computer will perform rather than simply reciting source or object code instructions.

B. Determine Whether the Claimed Invention Complies with
35 U.S.C. § 112, First Paragraph Requirements

1. Adequate Written Description

The satisfaction of the enablement requirement does not satisfy the written description requirement. For the written description requirement, an applicant's specification must reasonably convey to those skilled in the art that the applicant was in possession of the claimed invention as of the date of invention. The claimed invention subject matter need not be described literally, i.e., using the same terms, in order for the disclosure to satisfy the description requirement.

2. Enabling Disclosure

An applicant's specification must enable a person skilled in the art to make and use the claimed invention without undue experimentation. The fact that experimentation is complex, however, will not make it undue if a person of skill in the art typically engages in such complex experimentation. For a computer-related invention, the disclosure must enable a skilled artisan to configure the computer to possess the requisite functionality, and, where applicable, interrelate the computer with other elements to yield the claimed invention, without the exercise of undue experimentation. The specification

66. See In re Barker, 559 F.2d 588, 591, 194 USPQ 470, 472 (CCPA 1977), cert. denied, Barker v. Parker, 434 U.S. 1064 (1978) (a specification may be sufficient to enable one skilled in the art to make and use the invention, but still fail to comply with the written description requirement). See also In re DiLeone, 436 F.2d 1404, 1405, 168 USPQ 592, 593 (CCPA 1971).
should disclose how to configure a computer to possess the requisite functionality or how to integrate the programmed computer with other elements of the invention, unless a skilled artisan would know how to do so without such disclosure.\textsuperscript{67}

For many computer-related inventions, it is not unusual for the claimed invention to involve more than one field of technology. For such inventions, the disclosure must satisfy the enablement standard for each aspect of the invention.\textsuperscript{68} As such, the disclosure must teach a person skilled in each art how to make and use the relevant aspect of the invention without undue experimentation. For example, to enable a claim to a programmed computer that determines and displays the three-dimensional structure of a chemical compound, the disclosure must:

- enable a person skilled in the art of molecular modeling to understand and practice the underlying molecular modeling processes; and
- enable a person skilled in the art of computer programming to create a program that directs a computer to create and display the image representing the three-dimensional structure of the compound.

\textsuperscript{67} See, e.g., Northern Telecom v. Datapoint Corp., 908 F.2d 931, 941-43, 15 USPQ2d 1321, 1328-30 (Fed. Cir.), cert. denied, Datapoint Corp. v. Northern Telecom, 498 U.S. 920 (1990) (judgment of invalidity reversed for clear error where expert testimony on both sides showed that a programmer of reasonable skill could write a satisfactory program with ordinary effort based on the disclosure); DeGeorge v. Bernier, 768 F.2d 1318, 1324, 226 USPQ 758, 762-63 (Fed. Cir. 1985) (superseded by statute with respect to issues not relevant here) (invention was adequately disclosed for purposes of enablement even though all of the circuitry of a word processor was not disclosed, since the undisclosed circuitry was deemed inconsequential because it did not pertain to the claimed circuit); In re Phillips, 608 F.2d 879, 882-83, 203 USPQ 971 (CCPA 1979) (computerized method of generating printed architectural specifications dependent on use of glossary of predefined standard phrases and error-checking feature enabled by overall disclosure generally defining errors); In re Donohue, 550 F.2d 1269, 1271, 193 USPQ 136, 137 (CCPA 1977) ("Employment of block diagrams and descriptions of their functions is not fatal under 35 U.S.C. § 112, first paragraph, providing the represented structure is conventional and can be determined without undue experimentation."); In re Knowlton, 481 F.2d 1357, 1366-68, 178 USPQ 486, 493-94 (CCPA 1973) (examiner's contention that a software invention needed a detailed description of all the circuitry in the complete hardware system reversed).

\textsuperscript{68} See In re Naquin, 398 F.2d 863, 866, 158 USPQ 317, 319 (CCPA 1968) ("When an invention, in its different aspects, involves distinct arts, that specification is adequate which enables the adepts of each art, those who have the best chance of being enabled, to carry out the aspect proper to their specialty."); Ex parte Zechnall, 194 USPQ 461, 461 (Bd. App. 1973) ("appellants' disclosure must be held sufficient if it would enable a person skilled in the electronic computer art, in cooperation with a person skilled in the fuel injection art, to make and use appellants' invention").
In other words, the disclosure corresponding to each aspect of the invention must be enabling to a person skilled in each respective art.

In many instances, an applicant will describe a programmed computer by outlining the significant elements of the programmed computer using a functional block diagram. Office personnel should review the specification to ensure that along with the functional block diagram the disclosure provides information that adequately describes each "element" in hardware or hardware and its associated software and how such elements are interrelated.\(^{69}\)

VI
Determine Whether the Claimed Invention Complies with 35 U.S.C. §§ 102 and 103

As is the case for inventions in any field of technology, assessment of a claimed computer-related invention for compliance with sections 102 and 103 begins with a comparison of the claimed subject matter to what is known in the prior art. If no differences are found between the claimed invention and the prior art, the claimed invention lacks novelty and is to be rejected by Office personnel under section 102. Once distinctions are identified between the claimed invention and the prior art, those distinctions must be assessed and resolved in light of the knowledge possessed by a person of ordinary skill in the art. Against this backdrop, one must determine whether the invention would have been obvious at the time the invention was made. If not, the claimed invention satisfies section 103. Factors and considerations dictated by law governing section 103 apply without modification to computer-related inventions.

If the difference between the prior art and the claimed invention is limited to descriptive material stored on or employed by a machine, Office personnel must determine whether the descriptive material is functional descriptive material or non-functional descriptive material,

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\(^{69}\) See In re Scarbrough, 500 F.2d 560, 565, 182 USPQ 298, 301-02 (CCPA 1974) ("It is not enough that a person skilled in the art, by carrying on investigations along the line indicated in the instant application, and by a great amount of work eventually might find out how to make and use the instant invention. The statute requires the application itself to inform, not to direct others to find out for themselves (citation omitted."); Knowlton, 481 F.2d at 1367, 178 USPQ at 493 (disclosure must constitute more than a "sketchy explanation of flow diagrams or a bare group of program listings together with a reference to a proprietary computer on which they might be run"). See also In re Gunn, 537 F.2d 1123, 1127-28, 190 USPQ 402 (CCPA 1976); In re Brandstadter, 484 F.2d 1395, 1406-07, 17 USPQ 286, 294 (CCPA 1973); and In re Ghiron, 442 F.2d 985, 991, 169 USPQ 723, 727-28 (CCPA 1971).
as described supra in Section IV. Functional descriptive material is a limitation in the claim and must be considered and addressed in assessing patentability under section 103. Thus, a rejection of the claim as a whole under section 103 is inappropriate unless the functional descriptive material would have been suggested by the prior art.

Non-functional descriptive material cannot render non-obvious an invention that would have otherwise been obvious.\(^7\)

Common situations involving non-functional descriptive material are:

- A computer-readable storage medium that differs from the prior art solely with respect to non-functional descriptive material, such as music or a literary work, encoded on the medium,
- A computer that differs from the prior art solely with respect to non-functional descriptive material that cannot alter how the machine functions (i.e., the descriptive material does not reconfigure the computer), or
- A process that differs from the prior art only with respect to non-functional descriptive material that cannot alter how the process steps are to be performed to achieve the utility of the invention.

Thus, if the prior art suggests storing a song on a disk, merely choosing a particular song to store on the disk would be presumed to be well within the level of ordinary skill in the art at the time the invention was made. The difference between the prior art and the claimed invention is simply a rearrangement of non-functional descriptive material.

**VII**

**Clearly Communicate Findings, Conclusions and Their Bases**

Once Office personnel have concluded the above analyses of the claimed invention under all the statutory provisions, including sections 101, 112, 102 and 103, they should review all the proposed rejections and their bases to confirm their correctness. Only then should any rejection be imposed in an Office action. The Office action should clearly communicate the findings, conclusions and reasons which support them.

\(^7\) Cf. In re Gulack, 703 F.2d 1381, 1385, 217 USPQ 401, 404 (Fed. Cir. 1983) (when descriptive material is not functionally related to the substrate, the descriptive material will not distinguish the invention from the prior art in terms of patentability).
Appendix to
Examination Guidelines for Computer Related Inventions,

Computer-Related Inventions

II. Determine What Applicant Has Invented and is Seeking to Patent
   A. Identify and Understand Any Practical Application Asserted
      for the Invention.
   B. Review the Detailed Disclosure and Specific Embodiments
      of the Invention to Determine What the Applicant Has Invented.
   C. Review the Claims.

III. Conduct a Thorough Search of the Prior Art.

IV. Determine Whether the Claimed Invention Complies with 35 U.S.C. § 101 (See Next Chart).

V. Evaluate Application for Compliance with 35 U.S.C. § 112
   A. Determine Whether the Claimed Invention Complies with
      1. Claims Setting Forth the Subject Matter Applicant
         Regards as Invention.
      2. Claims Particularly Pointing Out and Distinctly
         Claiming the Invention.
   B. Determine Whether the Claimed Invention Complies with
      1. Adequate Written Description.
      2. Enabling Disclosure.

VI. Determine Whether the Claimed Invention Complies with 35 U.S.C. §§ 102 and 103.

VII. Clearly Communicate Findings, Conclusions and Their Bases.
Determine Whether the Claimed Invention Complies with 36 U.S.C. § 101

Consider the Breadth of 35 U.S.C. § 101

Classify the Claimed

Functional Descriptive Material (data structure per se or computer program per se)

Non-functional Descriptive Material (e.g., music, literary works, computer readable medium)

A Natural Phenomenon (e.g., energy, or magnetism)

A series of steps to be performed on a computer?

A machine or manufacture for performing a process

A specific machine or manufacture?

Evaluate process to determine if it...

Performs independent physical acts (post-computer process activity)

Manipulates data representing physical objects or activities to achieve a practical application (pre-computer process activity)

Merely manipulates abstract idea or solves a purely mathematical problem without any limitation to a practical application

Non-Statutory Subject Matter

Statutory Product

Non-Statutory Subject Matter

Statutory Subject Matter

Non-Statutory Subject Matter

Statutory Subject Matter