Examination Guidelines for Computer-Related Inventions

Final Version

Patent and Trademark Office

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I. Introduction

These *Examination Guidelines for Computer-Related Inventions*[1] ("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-Abele [3] 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 be treated like any other process claims, pursuant to these Guidelines when relevant. [4]

The appendix includes a flow chart of t he 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.

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. [6] 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. [7] 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. [8]

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 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 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 pers onnel 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 [11], 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. [12]

Office personnel must rely on the applicant's disclosure to properly determine the meaning of terms used in the claims. [13] 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 applicant. [14] If an applicant does not define a term in the specification, that term will be given its "common meaning." [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. [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." [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"). [18]

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. [19] Office personnel may not dissect a claimed invention into discrete elements and then evaluate the 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:

> 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. [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). [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. [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 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 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 arts, 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 [27] 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. [28] 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. [29] 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.

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. [30] 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 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, [31] 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 material could be patented when claimed as an article of manufacture. [32] 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-functio nal 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. [33] However, a claim directed to a practical application of a natural phenomenon such as energy or magnetism is statutory. [34]

2. Statutory Subject Matter

(a) Statutory Product Claims [35]

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. [36]

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. [37] 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." [38] 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.

(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 th e 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:

	Applicant A	*Applicant B*
Disclosure	The disclosure describes specific software, *i.e.*, 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 "means" corresponding to the claimed means limitations.	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 "means" limitations recited in the claim (*i.e.*, 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.
Result	Claim defines specific computer, patentability stands independently from process claim.	Claim encompasses any computer embodiment of process claim; patentability stands or falls with process claim.
Explanation	Disclosure identifies the specific machine capable of performing the indicated functions.	Disclosure does not provide any information to distinguish the "implementation" 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.

(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), [39] or (2) be limited by the language in the claim to a practical application within the technological arts (discussed in (ii) below). [40] 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. [41] Thus, if a process 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, [42] 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. [43]

Examples of this type of claimed statutory process inc lude 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 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 harbors, 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. [44]

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. [45] 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. [46] 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.

- A method of controlling parallel processors to accomplish multi-tasking of several computing tasks to maximize computing efficiency. [47]

- 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-statuto ry 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[48] or a bubble hierarchy,[49] 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."[50]

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.

(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. [51] 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. [52] In other words, the acts are dictated by nothing other than the performance of a mathematical operation. [53]

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:

- a method of conducting seismic exploration which requires generating and manipulating signals from seismic energy waves *before* "summing" the values represented by the signals; [54] 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). [55]

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; [56] and

- selecting a set of arbitrary mea surement point values. [57]

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 operations recited in the claim and the invention as a whole. [58] 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; [59]

- final step of magnetically recording the result of a calculation; [60]

- 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; [61]

- 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; [62] and

- step of "transmitting electrical signals representing" the result of calculations. [63]

(e) Manipulation of Abstract Ideas Without a Claimed Practical Application

A process that consists solely of the manipulation of an abstract idea without any limitation to a practical application is non-statutory. [64] 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 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.

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

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.[65] 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.

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 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.[66] 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.[67] 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 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. [68]

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. [69] 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.

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. [70]

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 § 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 § 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 § 103. Factors and considerations dictated by law governing § 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, 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 § 103. Thus, a rejection of the claim as a whole under § 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. [71]

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 §§ 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.

[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).

[4] *See, e.g.*, *In re Toma*, 575 F.2d 872, 877-78, 197 USPQ 852, 857 (CCPA 1978); *In re Musgrave*, 431 F.2d 882, 893, 167 USPQ 280, 289-90 (CCPA 1970). *See also In re Schrader*, 22 F.3d 290, 297-98, 30 USPQ2d 1455, 1461-62 (Fed. Cir. 1994) (Newman, J., dissenting); *Paine, Webber, Jackson & Curtis, Inc. v. Merrill Lynch, Pierce, Fenner & Smith, Inc.*, 564 F. Supp. 1358, 1368-69, 218 USPQ 212, 220 (D. Del. 1983).

[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).

[6] *Brenner v. Manson*, 383 U.S. 519, 528-36, 148 USPQ 689, 693-96 (1966); *In re Ziegler*, 992 F.2d 1197, 1200-03, 26 USPQ2d 1600, 1603-06 (Fed. Cir. 1993).

[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.").

[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.

[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.

[13] *Markman v. Westview Instruments*, 52 F.3d 967, 980, 34 USPQ2d 1321, 1330 (Fed. Cir.) (in banc), *cert. granted*, 116 S. Ct. 40 (1995).

[14] *See, e.g., In re Paulsen*, 30 F.3d 1475, 1480, 31 USPQ2d 1671, 1674 (Fed. Cir. 1994) (inventor may define specific terms used to describe invention, but must do so "with reasonable clarity, deliberateness, and precision" and, if done, must "'set out his uncommon definition in some manner within the patent disclosure' so as to give one of ordinary skill in the art notice of the change" in meaning) (quoting *Intellicall, Inc. v. Phonometrics, Inc.*, 952 F.2d 1384, 1387-88, 21 USPQ2d 1383, 1386 (Fed. Cir. 1992)).

[15] *Id.* at 1480, 31 USPQ2d at 1674.

[16] *See, e.g., In re Zletz*, 893 F.2d 319, 321-22, 13 USPQ2d 1320, 1322 (Fed. Cir. 1989) ("During patent examination the pending claims must be interpreted as broadly as their terms reasonably allow. . . . The reason is simply that during patent prosecution when claims can be amended, ambiguities should be recognized, scope and breadth of language explored, and clarification imposed. . . . An essential purpose of patent examination is to fashion claims that are precise, clear,

correct, and unambiguous. Only in this way can uncertainties of claim scope be removed, as much as possible, during the administrative process.").

[17] Two *in banc* decisions of the Federal Circuit have made clear that the Office is to interpret means plus function language according to 35 U.S.C. § 112, sixth paragraph. In the first, *In re Donaldson*, 16 F.3d 1189, 1193, 29 USPQ2d 1845, 1848 (Fed. Cir. 1994), the court held:

> The plain and unambiguous meaning of paragraph six is that one construing means-plus-function language in a claim must look to the specification and interpret that language in light of the corresponding structure, material, or acts described therein, and 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.").

[20] *See supra* note 18 and accompanying text.

[21] *Diamond v. Chakrabarty*, 447 U.S. 303, 308-09, 206 USPQ 193, 197 (1980):

> 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).

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. [*Alappat*, 33 F.3d at 1542, 31 USPQ2d at 1556.]

[22] 35 U.S.C. § 101 (1994).

[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.").

[24] *E.g.*, *Alappat*, 33 F.3d at 1542, 31 USPQ2d at 1556; *In re Warmerdam*, 33 F.3d 1354, 1358, 31 USPQ2d 1754, 1757 (Fed. Cir. 1994).

[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).

[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 a s 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").

[30] *See, e.g.*, *Warmerdam*, 33 F.3d at 1361, 31 USPQ2d at 1760 (claim to a data structure *per se* held non-statutory).

[31] Computer Dictionary 210 (Microsoft Press, 2d ed. 1994):

> 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.

[32] *See supra* note 29.

[33] *O'Reilly v. Morse*, 56 U.S. (15 How.) at 112-14.

[34] *Id.* at 114-19.

[35] Products may be either machines, manufactures or compositions of matter.

A machine is:

> a concrete thing, consisting of parts or of certain devices and combinations of devices.

Burr v. Duryee, 68 U.S. (1 Wall.) 531, 570 (1863).

A manufacture is:

> the production of articles for use from raw or prepared materials by giving to these materials new forms, qualities, properties or combinations, whether by hand-labor or by machinery.

Diamond v. Chakrabarty, 447 U.S. at 308, 206 USPQ at 196-97 (quoting *American Fruit Growers, Inc. v. Brogdex Co.*, 283 U.S. 1, 11 (1931).

A composition of matter is:

> a composition[] of two or m ore substances [or] . . . a[] composite article[], whether . . . [it] be the result of chemical union, or of mechanical mixture, whether . . . [it] be [a] gas[], fluid[], powder[], or solid[].

Diamond v. Chakrabarty, 447 U.S. at 308, 206 USPQ at 197 (quoting *Shell Development Co. v. Watson*, 149 F. Supp. 279, 280, 113 USPQ 265, 266 (D.D.C. 1957), *aff'd per curiam*, 252 F.2d 861, 116 USPQ 428 (D.C. Cir. 1958).

[36] *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.

[37] *Cf. In re Iwahashi*, 888 F.2d 1370, 1374-75, 12 USPQ2d 1908, 1911-12 (Fed. Cir. 1989), *cited with approval in Alappat*, 33 F.3d at 1544 n.24, 31 USPQ2d at 1558 n.24.

[38] "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."

[39] *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.").

[40] *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).

[41] *Diamond v. Diehr*, 450 U.S. at 187, 209 USPQ at 8.

[42] *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).

[43] *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).

[44] *See supra* note 9.

[45] 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.

[46] *See supra* note 40.

[47] *See, e.g.*, *In re Bernhart*, 417 F.2d 1395, 1400, 163 USPQ 611, 616 (CCPA 1969).

[48] *Schrader*, 22 F.3d at 293-94, 30 USPQ2d at 1458-59.

[49] *Warmerdam*, 33 F.3d at 1360, 31 USPQ2d at 1759.

[50] *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, $a=32$ 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 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.

[51] *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.

[52] *Walter*, 618 F.2d at 769-70, 205 USPQ at 409.

[53] *See supra* note 45.

[54] *Taner*, 681 F.2d at 788, 214 USPQ at 679.

[55] *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 exit. Only after these steps have been completed is the algorithm performed, and the resultant modified data displayed in the required format.").

[56] *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.").

[57] *Sarkar*, 588 F.2d at 1331, 200 USPQ at 135.

[58] *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] *Parker v. Flook*, 437 U.S. 584, 585, 198 USPQ 193, 195 (1978).

[60] *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.").

[61] *Gelnovatch*, 595 F.2d at 41 n.7, 201 USPQ at 145 n.7.

[62] *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.").

[63] *In re De Castelet*, 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.").

[64] *E.g.*, *Warmerdam*, 33 F.3d at 1360, 31 USPQ2d at 1759. *See also Schrader*, 22 F.3d at 295, 30 USPQ2d at 1459.

[65] *See supra* note 18 and accompanying text.

[66] Computer Dictionary 353 (Microsoft Press, 2d ed. 1994) (definition of "self-documenting code").

[67] *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).

[68] *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, 975 (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).

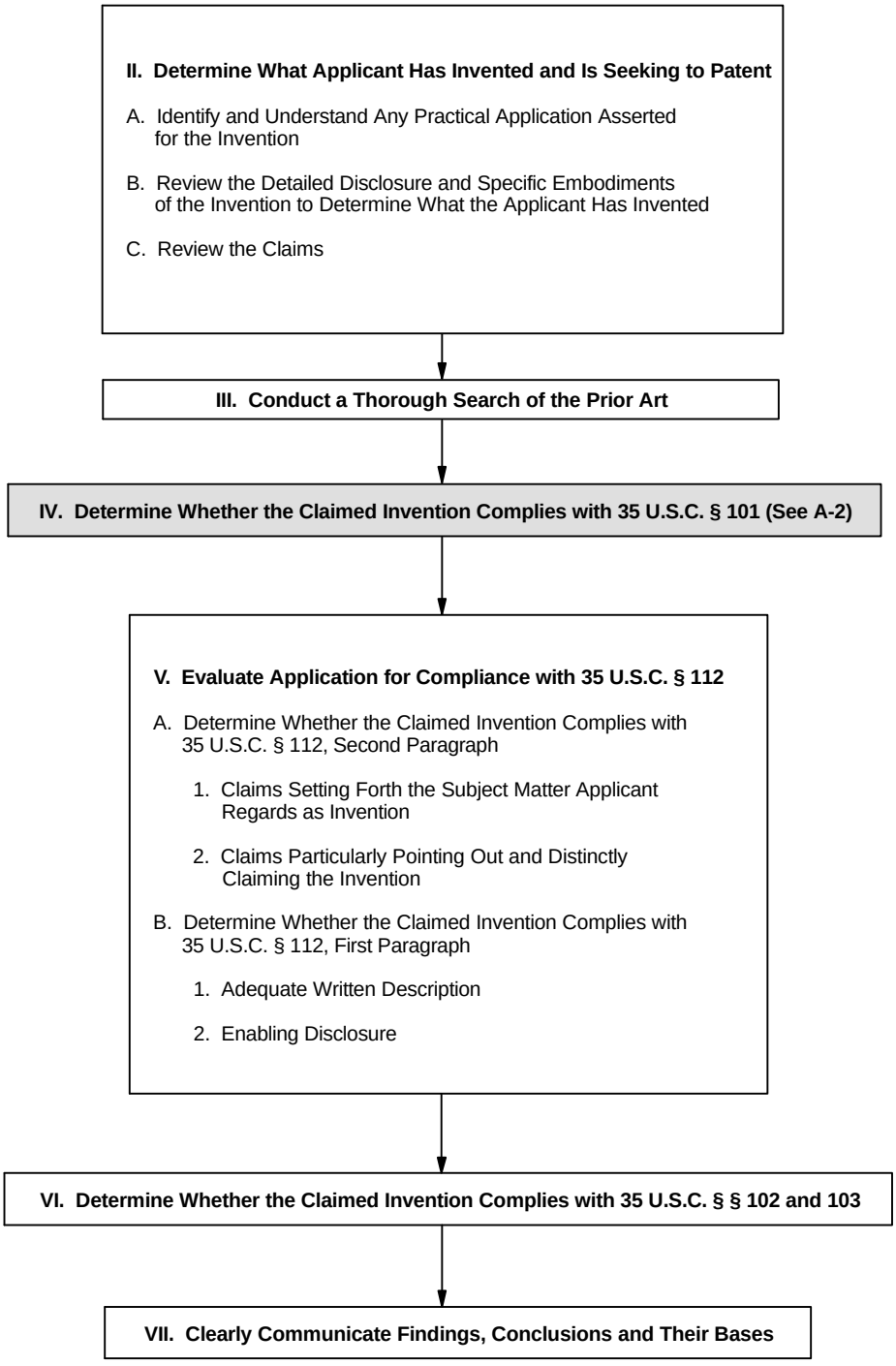
[69] *See In re Naquin*, 398 F.2d 863, 866, 158 USPQ 317, 319 (CCPA 1968) ("When an invention, in its different aspects, involves distinct arts, that specification is adequate which enables the adepts of each art, those who have the best chance of being enabled, to carry out the aspect proper to their 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").

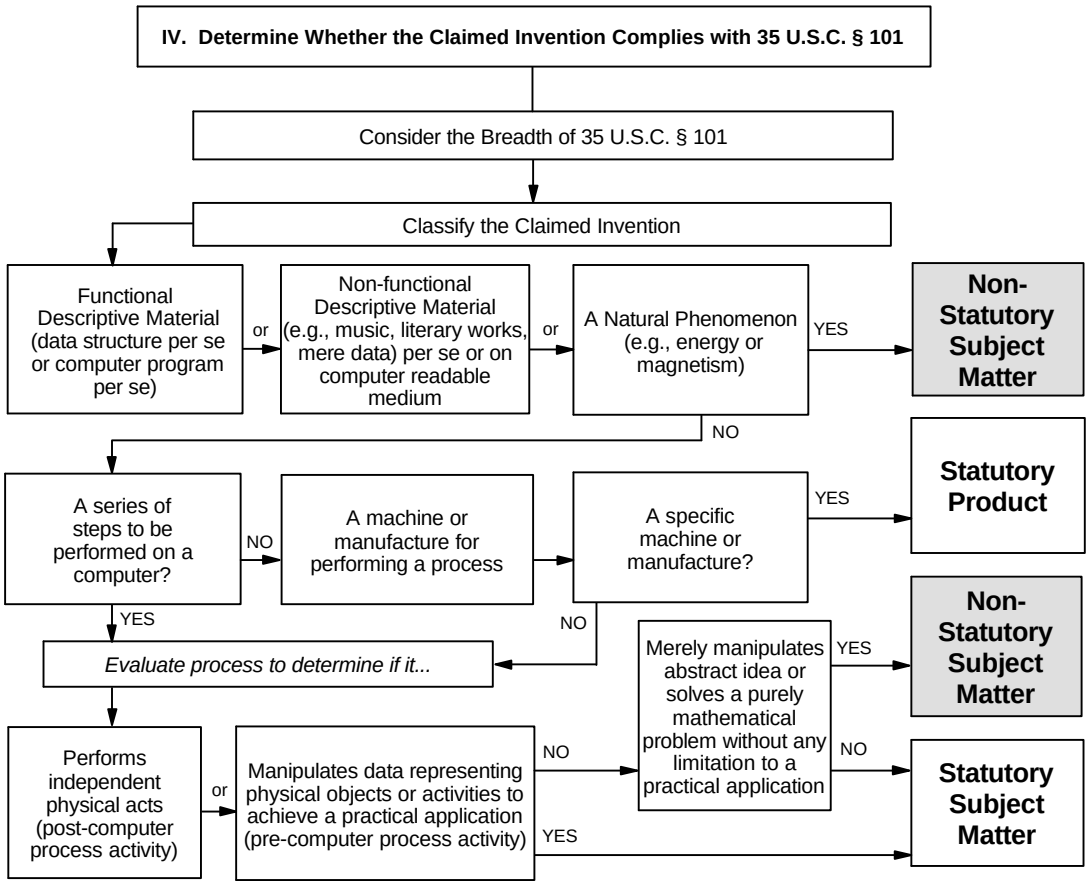
[70] *See In re Scarbrough*, 500 F.2d 560, 565, 182 USPQ 298, 301-02 (CCPA 1974) ("It is not enough that a person skilled in the art, by carrying on investigations along the line indicated in the instant application, and by a great amount of work eventually might find out how to make and use the instant 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, 405 (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).

[71] *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

Computer-Related Inventions




IV. Determine Whether the Claimed Invention Complies with 35 U.S.C. § 101
Consider the Breadth of 35 U.S.C. § 101
Classify the Claimed Invention
Functional Descriptive Material (data structure per se or computer program per se)
or
Non-functional Descriptive Material (e.g., music, literary works, mere data) per se or on computer readable medium
or
A Natural Phenomenon (e.g., energy or magnetism)
YES
Non-Statutory Subject Matter
NO
A series of steps to be performed on a computer?
NO
A machine or manufacture for performing a process
A specific machine or manufacture?
YES
Statutory Product
YES
NO
Evaluate process to determine if it...
Merely manipulates abstract idea or solves a purely mathematical problem without any limitation to a practical application
YES
Non-Statutory Subject Matter
Performs independent physical acts (post-computer process activity)
or
Manipulates data representing physical objects or activities to achieve a practical application (pre-computer process activity)
NO
NO
Statutory Subject Matter
YES