United States Court of Appeals for the Federal Circuit

2006-1371
(Serial No. 09/211,928)

IN RE PETRUS A.C.M. NUIJTEN

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Appealed from: United States Patent and Trademark Office
Board of Patent Appeals and Interferences

United States Court of Appeals for the Federal Circuit

2006-1371
(Serial No. 09/211,928)

IN RE PETRUS A.C.M. NUIJTEN

DECIDED: September 20, 2007

Before GAJARSA, LINN, and MOORE, Circuit Judges.

Opinion for the court filed by Circuit Judge GAJARSA. Opinion concurring-in-part and dissenting-in-part filed by Circuit Judge LINN.

GAJARSA, Circuit Judge.

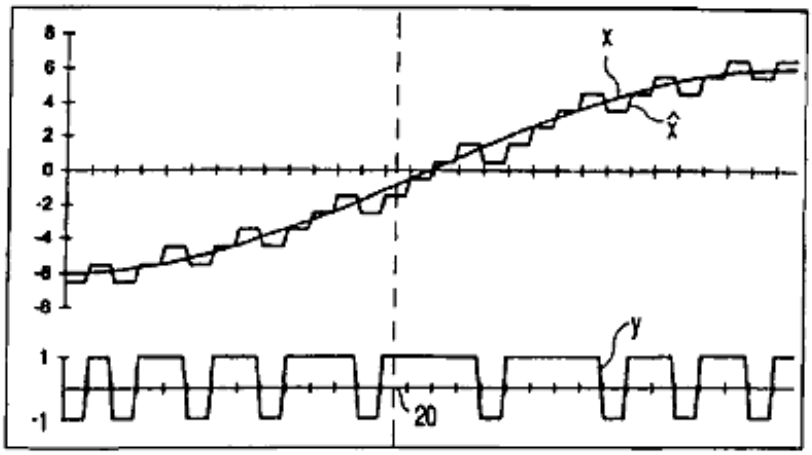
The issue before the court is whether or not a signal is patentable subject matter. Petrus A.C.M. Nuijten appeals the decision of the Board of Patent Appeals and Interferences ("Board") of the United States Patent and Trademark Office ("PTO"), which rejected claims 14, 22, 23, and 24 in his patent application Serial No. 09/211,928 as unpatentable subject matter outside the scope of 35 U.S.C. § 101. The claims seek to patent any "signal" that has been encoded in a particular manner. Because we agree with the Board that the "signal" claims in Nuijten's application are not directed to statutory subject matter, we affirm.

I. BACKGROUND

A. Nuijten's Invention and Patent Application

Nuijten's patent application discloses a technique for reducing distortion induced by the introduction of "watermarks" into signals. In the context of signal processing, watermarking is a technique by which an original signal (such as a digital audio file) is manipulated so as to embed within it additional data. The additional data is preferably imperceptible to someone who views or listens to the signal—for instance, a listener who plays back a watermarked digital audio file would, if the watermark is sufficiently unobtrusive, not be able to distinguish between the watermarked and unwatermarked versions. However, an analysis of the file by software capable of detecting the watermark will reveal the mark's contents. This ability to encode additional data into a signal is useful to publishers of sound and video recordings, who can use watermarks to embed in the media they distribute information intended to protect that media against unauthorized copying. For these publishers and others, watermarking represents a trade-off: the desired additional data is encoded directly into the signal, but like any change to a signal, the watermark introduces some level of distortion. Thus, a key goal of watermarking techniques is to minimize the distortion so that the resulting diminution in signal quality is as minimal as possible.

Nuijten's technique improves existing watermark technology by further modifying the watermarked signal in a way that partially compensates for distortion introduced by the watermark. A helpful illustration is found in the diagrams of Nuijten's application:

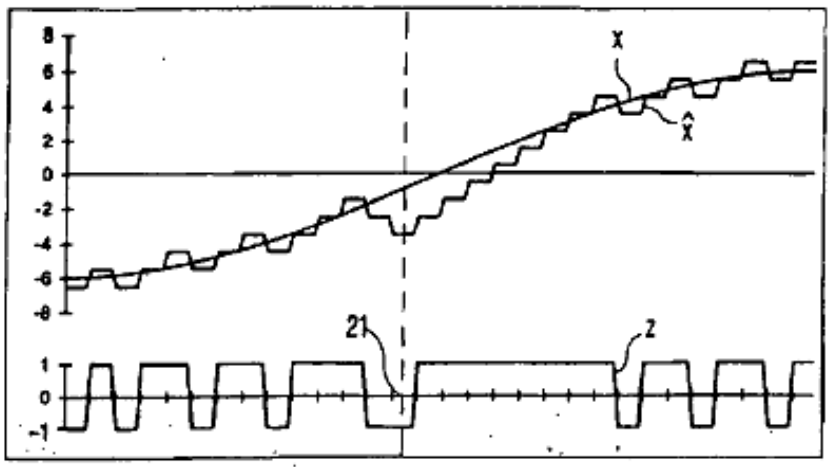


This diagram, Figure 2 of the application, demonstrates a relatively simple form of digital audio encoding called "delta modulation."[1] The smooth line in the upper graph (labeled 'x') represents a very small slice of the sound wave to be encoded. The lower graph represents a digital encoding of that signal. It takes on only two values. They are labeled here as '1' and '-1,' rather than the usual labeling of these binary values as one and zero. The sound wave is reconstructed from the digital signal one step at a time, left to right. If the digital signal has value '1,' the reconstructed sound wave's value is increased slightly, and if the digital signal has value '-1,' the sound wave is decreased by the same amount. The recording is therefore represented by the change (or "delta") over a very small increment of time, either '1' for an increase or '-1' for a decrease. Hence, the encoding scheme is known as "delta modulation." The result is a close but imperfect approximation of the original sound wave, illustrated on the upper graph by 'x' with a caret above it. The fidelity of the reconstructed sound wave to the original will depend in large part on the "sample rate"—the length of the time interval represented by each discrete value in the digital signal. Representing all of the nuances of the original

[1] More complex forms of encoding are also discussed in Nuijten's patent application. For simplicity, we focus here on delta modulation.

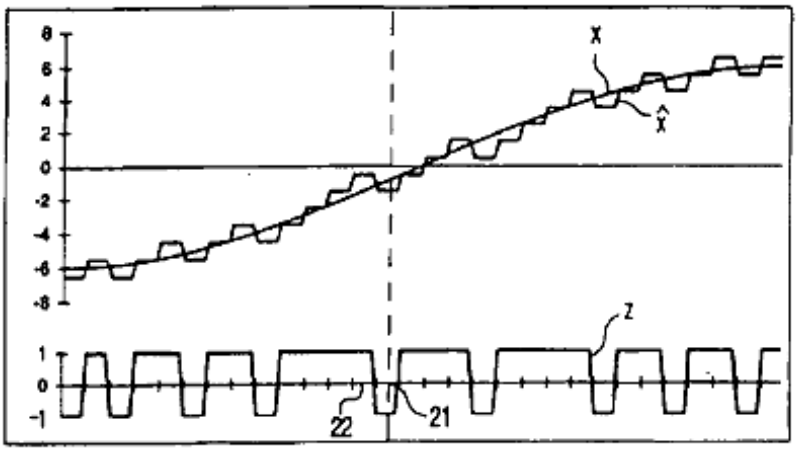
sound wave in order to produce a rich, clear recording may require tens or hundreds of thousands of samples per second.

The above-illustrated signal has no watermark. Nuijten's application next illustrates in Figure 3 what occurs when the signal is modified to add a watermark:



The watermark Nuijten posits here is imposed on the signal by altering, if necessary, every hundredth value of the digital signal. A reader seeking to extract the watermark from the digital signal would therefore view only every hundredth value, disregarding the other 99 along the way; by stringing together all such values, the watermarked data may be discerned. Every point where a portion of the watermark is found represents a possibility that the signal may be distorted. If the watermark value designated for a certain position and the original value at that same position happen to coincide, there is no need to modify the original and hence no distortion. About half of the time, though, those values will not coincide and the digital signal will be altered. The result is shown in the diagram: the digital value at the point labeled '21' and illustrated by a vertical dashed line has been changed from '1' in the original to '-1.' The reconstructed signal is thus decreased where it should be increased, and the encoded signal departs from the original in a pronounced manner.

Nuijten's application teaches that this departure may be minimized by making an additional change to the watermarked digital signal, as shown in Figure 4:



Here, the value preceding the one that was modified by the watermark has also been modified: it was '-1' in the original signal, but is now '1.' The signal is therefore increased, then decreased (where in the original it was decreased, then increased). The resulting encoding has the same watermark as the above example, but as the diagram indicates, it tracks the original sound wave much more accurately. There is still some small loss in encoding quality relative to the unwatermarked original, but the magnitude of that loss has been greatly decreased.

The above-described procedure is most naturally expressed as a series of steps for adding a low-distortion watermark to a signal, and indeed Nuijten has already obtained allowance of ten claims (Claims 1-10) directed to such a process. Claim 1 is the broadest process claim allowed. It reads:

> A method of embedding supplemental data in a signal, comprising the steps of:
>
> encoding the signal in accordance with an encoding process which includes the step of feeding back the encoded signal to control the encoding; and modifying selected samples of the encoded signal to represent the supplemental data prior to the feedback of the encoded

> signal and including the modifying of at least one further sample of the encoded signal preceding the selected sample if the further sample modification is found to improve the quality of the encoding process.

Nuijten's Claims 11-13, also allowed by the PTO, are directed to "[a]n arrangement for embedding supplemental data in a signal," including "encoder means for encoding the signal" and other structural features that carry out the above process. Finally, Nuijten's allowed Claim 15 is directed to "[a] storage medium having stored thereon a signal with embedded supplemental data," where the stored signal has essentially the encoding properties described above. Thus, Nuijten has been allowed claims to the process he invented, a device that performs that process, and a storage medium holding the resulting signals. None of these claims is before us on appeal.

B. <u>The Claims on Appeal</u>

The claims whose disallowance Nuijten appeals are not traditional step-by-step process claims, nor are they directed to any apparatus for generating, receiving, processing, or storing the signals. As mentioned above, such claims have been allowed. The claims on appeal seek to cover the resulting encoded signals <u>themselves</u>. Claim 14 of Nuijten's application is the only independent claim of the four rejected by the PTO. It reads:

> <u>A signal</u> with embedded supplemental data, the signal being encoded in accordance with a given encoding process and selected samples of the signal representing the supplemental data, and at least one of the samples preceding the selected samples is different from the sample corresponding to the given encoding process.

(emphasis added). Claims 22, 23, and 24 depend on Claim 14, respectively adding requirements that the embedded data be a watermark, that the signal be a video signal, and that the signal be an audio signal.

C. Procedural History

The Examiner rejected a number of claims in Nuijten's application for obviousness-type double patenting, and rejected Claims 14, 15, and 22-24 as directed to nonstatutory subject matter under § 101. On appeal, the Board reversed the double-patenting rejections. As to Claim 15, it found that "[t]he storage medium in claim 15 nominally puts the claim into the statutory category of a 'manufacture'" and thus reversed the Examiner's § 101 rejection of that claim. However, it affirmed the Examiner's § 101 rejections of Claims 14 and 22-24 on two grounds. First, it noted that "[t]he signal . . . has no physical attributes and merely describes the abstract characteristics of the signal and, thus, it is considered an 'abstract idea'" unpatentable under Diamond v. Diehr, 450 U.S. 175, 185 (1981). Second, the Board determined that the claims at issue fell into none of the four statutory categories of patentable subject matter: "process, machine, manufacture, or composition of matter." 35 U.S.C. § 101. In the Board's view, the claims were not directed to a process because they did not "recite acts"; not a machine because "the signal . . . has no concrete tangible physical structure"; and "not composed of matter and [therefore] clearly not a 'composition of matter.'" Finally, the Board noted that "[t]he signal does not have any physical structure or substance and does not fit the definition of a 'manufacture' which requires a tangible object." Accordingly, the Board rejected Claims 14 and 22-24 solely on the basis of unpatentability under § 101. Nuijten timely appealed the Board's decision to this court, which has jurisdiction under 28 U.S.C. § 1295(a)(4)(A).

II. DISCUSSION

Whether a claim is valid in light of § 101 is a question of law that we review de novo. AT&T Corp. v. Excel Commc'ns, Inc., 172 F.3d 1352, 1355 (Fed. Cir. 1999). Section 101 states:

> 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.

Language setting forth a variety of categories of matter deemed patentable has existed throughout the history of American patent law. The country's first patent statute permitted a patent on "any art, manufacture, engine, machine or device." Patent Act of 1790 § 4, 1 Stat. 109, 111 (1790). Soon thereafter, Congress amended the patent laws, changing the language to allow a patent for "any new and useful art, machine, manufacture or composition of matter." Patent Act of 1793 § 1, 1 Stat. 318, 319 (1793).[2] The next substantial amendment to the patent laws left this statutory language unchanged. Patent Act of 1836 § 6, 5 Stat. 117, 119 (1836). This four-category language has persisted to the present day, with the exception of the technical change of "art" to "process," defined as "process, art or method," in 1952. 35 U.S.C. § 100; see Part II.B.1, infra.

The claims on appeal cover transitory electrical and electromagnetic signals propagating through some medium, such as wires, air, or a vacuum. Those types of signals are not encompassed by any of the four enumerated statutory categories: "process, machine, manufacture, or composition of matter." Before addressing in detail

[2] "This bill was probably one written by Thomas Jefferson himself." P.J. Federico, The Patent Act of 1793, 18 J. Pat. Off. Soc'y, Feb. 1936, at 77.

our rationale for this rejection, though, we begin by resolving a dispute between Nuijten and the PTO about the claims' scope.

A. Claim Construction

As in any other context in which the scope and meaning of the claims bears on the ultimate determination at hand, we must start by considering the issue of claim construction. See State St. Bank & Trust Co. v. Signature Fin. Group, 149 F.3d 1368, 1370 (Fed. Cir. 1998) (stating that "whether the . . . patent is invalid for failure to claim statutory subject matter under § 101[] is a matter of both claim construction and statutory construction"). Claim construction is a question of law reviewed de novo on appeal. In re Baker Hughes, Inc., 215 F.3d 1297, 1301 (Fed. Cir. 2000); Cybor Corp v. FAS Techs., Inc., 138 F.3d 1448, 1451 (Fed. Cir. 1998) (en banc).

The claim construction dispute between Nuijten and the PTO turns on a somewhat esoteric and metaphysical point, namely: are the claims at issue limited to covering only physical instances of signals, or do they also cover intangible, immaterial strings of abstract numbers? The PTO suggests that "claim 14 can be read to claim a signal that is merely data"—that is, merely numerical information without any physical embodiment. Nuijten disagrees, arguing that "a signal must have sufficient physical substance to be discerned and recognized by a recipient." That is, a signal can be sensed and received by some physical apparatus, if not directly by a person.

Nuijten's position on this issue is correct in a limited way. A "signal" implies signaling—that is, the conveyance of information. To convey information to a recipient a physical carrier, such as an electromagnetic wave, is needed. Thus, in order to be a "signal," as required by the claim, some carrier upon which the information is embedded

is required. See Arrythmia Research Tech., Inc. v. Corazonix Corp., 958 F.2d 1053, 1059 ("The view that there is nothing necessarily physical about 'signals' is incorrect." (quotation marks omitted)).

However, while the claims are limited so as to require some physical carrier of information, they do not in any way specify what carrier element is to be used. The only limitations in Claim 14 address the signal's informational content. Specifically, the signal must encode some supplemental data, it must have been encoded according to a "given encoding process," and a sample, or single data point, located before the location of the supplemental data must be different from the original. The text of the claims is not limited by any specified physical medium, nor do the dependent claims add any physical limitations. They again require only that the signal carry certain information—a watermark, video, or audio. Therefore, any tangible means of information carriage will suffice for all of the claims at issue. Nuijten's claims can of course be embodied by conventional, known means, such as electrical signals, modulated electromagnetic waves, and pulses in fiber optic cable. So long as some object or transmission carries the information specified by Nuijten's claim, it falls within that claim's scope regardless of its physical form. In summary, some physical form for the signal is required, but any form will do, so long as a recipient can understand the message—the nature of the signal's physical carrier is totally irrelevant to the claims at issue.

B. The Appealed Claims are Not in Any Statutory Category

Nuijten and the PTO agree that the claims include physical but transitory forms of signal transmission such as radio broadcasts, electrical signals through a wire, and light pulses through a fiber-optic cable, so long as those transmissions convey information encoded in the manner disclosed and claimed by Nuijten. We hold that such transitory embodiments are not directed to statutory subject matter.

Our inquiry here, like that of the Board, will consider whether a transitory, propagating signal is within any of the four statutory categories: process, machine, manufacture, or composition of matter. Before embarking on an analysis considering each of the four categories, we must address a prior statement of this court which Nuijten argues forecloses such an analysis. In State Street Bank & Trust Co. v. Signature Financial Group, Inc., 149 F.3d 1368, 1375 (Fed. Cir. 1998), we noted that "[t]he question of whether a claim encompasses statutory subject matter should not focus on which of the four categories of subject matter a claim is directed to—process, machine, manufacture, or composition of matter—but rather on the essential characteristics of the subject matter, in particular, its practical utility." However, we do not consider this statement as a holding that the four statutory categories are rendered irrelevant, non-limiting, or subsumed into an overarching question about patentable utility. Indeed, State Street recognized that "the [claimed] subject matter must fall into at least one category of statutory subject matter," id. at 1375 n.9, and specifically found that the claim at issue was directed to a machine, id. at 1375. In telling courts where they "should not focus" their analysis, State Street was advising not to be concerned about debates over "which of the four categories," id. (emphasis added), subject matter

falls into—that is, not to be overly concerned with pigeonholing subject matter once the court assures itself that some category has been satisfied. If, for instance, a court determines that a claim encompasses either a process or machine but is unsure which category is appropriate, it need not resolve the ambiguity. The claim must be within at least one category, so the court can proceed to other aspects of the § 101 analysis.[3] See State Street, 149 F.3d at 1371 ("[I]t is of little relevance whether claim 1 is directed to a 'machine' or a 'process.'"). State Street sets forth a sound premise, but this case presents a different situation. The essence of the dispute between the parties is whether a transitory signal is covered by any statutory category. The four categories together describe the exclusive reach of patentable subject matter. If a claim covers material not found in any of the four statutory categories, that claim falls outside the plainly expressed scope of § 101 even if the subject matter is otherwise new and useful. We must therefore determine whether any of the four categories encompass the claims on appeal, and it is appropriate to consider each of the categories in turn.

1. Process

Nuijten suggests that a signal of the type covered by the claims is a "process" under that term's statutory meaning, arguing both that a process need not be defined by reference to an act or series of steps, and that his signal claims do refer to the performance of acts. Nuijten first notes that "process" is defined as "process, art or method," 35 U.S.C. § 100, and suggests that an "art" is somehow broader than the

[3] Of course, a claim that is so unclear as to be ambiguous about whether it covers a process or a machine might be invalid for failure to "particularly point[] out and distinctly claim[] the subject matter which the applicant regards as his invention," 35 U.S.C. § 112 ¶ 2, but claim definiteness is a requirement separate from patentability under § 101.

usual understanding of "process," transcending any requirement of steps or action. The presence of "art" in the statutory definition and its meaning can best be understood by reference to the legislative history of the Patent Act of 1952. The report of the Senate Committee on the Judiciary notes:

> The present law [i.e., the pre-1952 patent statute] states that any person who has invented or discovered any "new and useful art, machine, manufacture, or any new or useful improvement thereof" may obtain a patent. That language has been preserved except that the word "art" which appears in the present statute has been changed to the word "process." "Art" in this place in the present statute has a different meaning than the words "useful art" in the Constitution, and a different meaning than the use of the word "art" in other places in the statutes, and it is interpreted by the courts to be practically synonymous with process or method. The word "process" has been used to avoid the necessity of explanation that the word "art" as used in this place means "process or method," and that it does not mean the same thing as the word "art" in other places."
>
> The definition of "process" has been added in section 100 to make it clear that "process or method" is meant, and also to clarify the present law as to the patentability of certain types of processes or methods as to which some insubstantial doubts have been expressed.

S. Rep. No. 82-1979, at 5 (1952). The Supreme Court and this court have consistently interpreted the statutory term "process" to require action. See Gottschalk v. Benson, 409 U.S. 63, 70 (1972) ("A 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." (emphasis added) (quoting Cochrane v. Deener, 94 U.S. 780, 788 (1876))); NTP, Inc. v. Research in Motion, Ltd., 418 F.3d 1282, 1316 (Fed. Cir. 2005) ("A process is a series of acts." (quoting Minton v. Nat'l Ass'n of Sec. Dealers, Inc., 336 F.3d 1373, 1378 (Fed. Cir. 2005))); In re Kollar, 286 F.3d 1326, 1332 (Fed. Cir. 2002) ("[A] process . . . consists of a series of acts or steps . . . . It consists of doing something, and therefore has to be

carried out or performed."). Nuijten's argument that his claims might be covered by the "process" category even if they do not recite acts therefore lacks merit.

Nuijten also notes that his signal claims recite acts, noting that the claimed signal must be "encoded in accordance with a given encoding process." But all that recitation implies is that these are potentially product-by-process claims "in which the product is defined at least in part in terms of the method or process by which it is made." SmithKline Beecham Corp. v. Apotex Corp., 439 F.3d 1312, 1315 (Fed. Cir. 2006) (quoting Bonito Boats, Inc. v. Thunder Craft Boats, Inc., 489 U.S. 141, 158 (1989)). Such claims are still directed to the ultimate product, not the underlying process. See Id. at 1317 ("Regardless of how broadly or narrowly one construes a product-by-process claim, it is clear that such claims are always to a product, not a process."). The presence of acts recited in the claim does not transform a claim covering a thing—the signal itself—into one covering the process by which that thing was made.

Since a process claim must cover an act or series of acts and Nuijten's signal claims do not, the claims are not directed to a process.

2. Machine

The Supreme Court has defined the term "machine" as "a concrete thing, consisting of parts, or of certain devices and combination of devices." Burr v. Duryee, 68 U.S. (1 Wall.) 531, 570 (1863). This "includes every mechanical device or combination of mechanical powers and devices to perform some function and produce a certain effect or result." Corning v. Burden, 56 U.S. 252, 267 (1854). A transitory signal made of electrical or electromagnetic variances is not made of "parts" or "devices" in any mechanical sense. While such a signal is physical and real, it does not possess

concrete structure in the sense implied by these definitions. No part of the signal—the crests or troughs of the electromagnetic wave, or perhaps the particles that make it up (modern physics teaches that both features are present simultaneously) is a mechanical "device" or "part." A propagating electromagnetic signal is not a "machine" as that term is used in § 101.[4]

3. Manufacture

The question of whether the claimed signals are "manufactures" is more difficult. They are man-made, in the sense of having been encoded, generated, and transmitted by artificial means. However, artificiality is insufficient by itself to render something a "manufacture." The Supreme Court has defined "manufacture" (in its verb form) as "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. 303, 308 (1980) (emphasis added) (quoting Am. Fruit Growers, Inc. v. Brogdex Co., 283 U.S. 1, 11 (1931)).[5] The term is used in the statute in its noun form, Bayer AG v. Housey Pharms., Inc., 340 F.3d 1367,

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[4] An apparatus that generates the signal is of course a machine. Nuijten has obtained allowance of claims covering such a device, and those claims are not before us on appeal.

[5] The dissent criticizes our use of this definition and would prefer one from "a dictionary that dates to the eighteenth century." Dissent at 7. However, this statutory language was re-enacted in 1952 after the Supreme Court defined "manufacture" in American Fruit Growers. By reenacting the language used in previous versions of the statute without change to the meaning of the word "manufacture," Congress "incorporated the definition of [manufacture] that had evolved in the courts." In re Schrader, 22 F.3d at 295. Even were this not the case, the Court has reaffirmed the American Fruit Growers definition in Chakrabarty. Thus, we must apply the Fruit Growers/Chakrabarty definition. Indep. Ink, Inc. v. Ill. Tool Works, Inc., 396 F.3d 1342, 1351 (Fed. Cir. 2005), vacated 547 U.S. 28 (2006) ("It is the duty of a court of appeals to follow the precedents of the Supreme Court until the Court itself chooses to expressly overrule them.").

1373 (Fed. Cir. 2003), and therefore refers to "articles" resulting from the process of manufacture. The same dictionary the Supreme Court relied on for its definition of "manufacture" in turn defines "article" as "a particular substance or commodity: as, an article of merchandise; an article of clothing; salt is a necessary article." 1 Century Dictionary 326 (William Dwight Whitney ed., 1895) (emphasis in original).

These definitions address "articles" of "manufacture" as being tangible articles or commodities. A transient electric or electromagnetic transmission does not fit within that definition. While such a transmission is man-made and physical—it exists in the real world and has tangible causes and effects—it is a change in electric potential that, to be perceived, must be measured at a certain point in space and time by equipment capable of detecting and interpreting the signal. In essence, energy embodying the claimed signal is fleeting and is devoid of any semblance of permanence during transmission.[6] Moreover, any tangibility arguably attributed to a signal is embodied in the principle that it is perceptible—e.g., changes in electrical potential can be measured. All signals within the scope of the claim do not themselves comprise some tangible article or commodity.[7] This is particularly true when the signal is encoded on an

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[6] Of course, such a signal could be stored for later use, but the result of such storage would be a "storage medium" containing the signal. Such a storage medium would likely be covered by allowed Claim 15 of Nuijten's application, which is not before us on appeal.

[7] The dissent perpetuates a common mischaracterization of the holding in Alappat, 33 F.3d at 1544 by suggesting that we have conflated the "result" of the "useful, concrete, and tangible result" inquiry with a "thing" that must be useful, concrete and tangible. The dissent is wrong. In Alappat, we decided the question of determining whether a machine, including a number of digital electronic circuits that performed mathematical operations on electrical signals (a function we deemed "true of all digital electrical circuits") was an "abstract idea" because the function performed by the machine was, in essence, a mathematical algorithm. Alappat, 33 F.3d at 1544. We concluded that the combination of digital electronic circuits was "not a disembodied

electromagnetic carrier and transmitted through a vacuum—a medium that, by definition, is devoid of matter.[8] Thus, we hold that Nuijten's signals, standing alone, are not "manufacture[s]" under the meaning of that term in § 101.[9]

4. Composition of matter

As to the final statutory category, Nuijten does not challenge in his opening brief the Board's conclusion that "[t]he signal is not composed of matter and is clearly not a 'composition of matter.'" We note, however, that the Supreme Court has defined "composition of matter" to mean "all compositions of two or more substances and all composite articles, whether they be the results of chemical union, or of mechanical

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mathematical concept which may be characterized as an "abstract idea," but rather a specific machine to produce a useful, concrete, and tangible result." Id. (emphasis added). We reiterated these principles in finding that the machine claimed in State Street was not an abstract idea. See State Street, 149 F.3d at 1368. We have even considered the "useful, concrete, and tangible result" factors in determining whether a claim to a process was patent-eligible. See AT&T Corp. v. Excel Commc'ns, 172 F.3d 1352, 1358 (Fed. Cir. 1999). The dissent agrees that the claimed signal is not a "machine." We have never held that a manufacture is ever required to produce any result. Thus, the "useful, concrete, and tangible result" inquiry is simply inapplicable here.

[8] We recognize the wave-particle duality as applied to electromagnetic energy. However, the fact that photons traveling at or near the speed of light behave in some ways like particles does not make them tangible articles.

[9] Neither In re Hruby, 373 F.2d 997 (CCPA 1967), nor O'Reilly v. Morse, 56 U.S. (15 How.) 62 (1853) is to the contrary. Hruby dealt with a 35 U.S.C. § 171 design patent for an aesthetically pleasing water fountain rather than a § 101 utility patent, and is therefore of limited applicability to this case. The subject of a design patent need not have any practical utility. Compare § 101 ("new and useful") with § 171 ("new . . . and ornamental"). We do not decide whether a signal of the sort addressed in this case would merit a design patent. In the Morse telegraph case, the Supreme Court approved Samuel Morse's Claim 5 covering his "system of signs" (i.e., Morse code). 56 U.S. (15 How.) at 86. The written description of the patent describes Morse code as part of its description of the actual process of signaling. Id. at 94-95. While its dated language obscures the question somewhat, Morse's Claim 5 is a process claim covering the method (or "art") of signaling. The analogous claims in Nuijten's patent application are those that cover the process of generating signals rather than the signals themselves. Again, those claims have been approved by the PTO and are not at issue in this appeal.

mixture, or whether they be gases, fluids, powders or solids." Chakrabarty, 447 U.S. at 308. A signal comprising a fluctuation in electric potential or in electromagnetic fields is not a "chemical union," nor a gas, fluid, powder, or solid. Nuijten's signals are not "composition[s] of matter."

III. CONCLUSION

A transitory, propagating signal like Nuijten's is not a "process, machine, manufacture, or composition of matter." Those four categories define the explicit scope and reach of subject matter patentable under 35 U.S.C. § 101; thus, such a signal cannot be patentable subject matter. The Board's rejection of the application's Claims 14, 22, 23, and 24 is therefore

AFFIRMED.

Each party shall bear its own costs.

United States Court of Appeals for the Federal Circuit

2006-1371
(Serial No. 09/211,928)

IN RE PETRUS A.C.M. NUIJTEN

LINN, Circuit Judge, concurring-in-part and dissenting-in-part.

I am pleased to join Part II.A of the majority opinion because I agree that a "signal," as used in the claims at issue, refers to something with a "physical form." Majority Op. at 9–10. However, I respectfully disagree with the majority's holding that the claims in suit are not directed to statutory subject matter under 35 U.S.C. § 101. I therefore dissent in part from Part II.B of the opinion and from the judgment.

This case presents challenging questions that go beyond the single patent claim at issue. In determining the scope of patentable subject matter, we must reconcile cutting-edge technologies with a statute, the language of which dates back to the beginning of the Republic. Moreover, we decide this case against a backdrop of ongoing controversy regarding the wisdom of software patenting and our decision in State Street Bank & Trust Co. v. Signature Financial Group, Inc., 149 F.3d 1368 (Fed. Cir. 1998). I appreciate the majority's desire to draw an exclusionary line. However, mindful of our duty to interpret the law as Congress wrote it rather than attempt "to pre-empt congressional action by judicially decreeing what accords with 'common sense and the public weal,'" Tenn. Valley Auth. v. Hill, 437 U.S. 153, 195 (1978), I respectfully disagree that the majority's holding is compelled by or consistent with precedent or the

language of the statute. Indeed, I fear that it risks further confusing an already uncertain set of doctrines.

The majority bases its holding on the Century Dictionary definition of "manufacture" quoted by the Supreme Court in American Fruit Growers, Inc. v. Brogdex Co., 283 U.S. 1, 11 (1931), and again in Diamond v. Chakrabarty, 447 U.S. 303, 308 (1980): "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." I respectfully disagree that this definition limits the term "manufacture" to non-transitory, tangible things. When it defined "manufacture" as above, the Supreme Court emphasized that "[i]n choosing such expansive terms as 'manufacture' . . . modified by the comprehensive 'any,' Congress plainly contemplated that the patent laws would be given wide scope." Chakrabarty, 447 U.S. at 308. Because the patent claim at issue contemplates "some physical carrier of information," Majority Op. at 10, the claim requires that some input "material"—whether a pulse of energy or a stone tablet—has been given a "new form[]," "qualit[y]," or "propert[y]" by direct human action or by a machine. The resulting signal is thus a "manufacture" in the "expansive" sense of § 101. See also Am. Fruit, 283 U.S. at 11 (offering as a second definition of "manufacture," "anything made for use from raw or prepared materials").

Because I believe the claimed signal is a manufacture, it is necessary for me also to examine the alternative argument that the claimed signal is an unpatentable "abstract idea" under Gottschalk v. Benson, 409 U.S. 63, 67 (1972). The answer to this argument is best found in § 101's textual requirements that statutory subject matter be "new" and "useful," which are limits on the four statutory categories that otherwise encompass

"anything under the sun that is made by man." Chakrabarty, 447 U.S. at 309 (quoting S. Rep. No. 1979, 82d Cong., 2d Sess., at 5 (1952); H.R. Rep. No. 1923, 82d Cong., 2d Sess., at 6 (1952)). As I explain in the following analysis, it is my view that the claim at issue is both "new" and "useful" and is not an abstract idea.

Because I conclude that the claim at issue is directed to a "new and useful" "manufacture," I believe it is patentable under 35 U.S.C. § 101. Accordingly, I would reverse.

I. The Definition of "Manufacture"

I agree with the majority that the subject of Nuijten's signal claims is not a "machine," "process," or "composition of matter" as used in 35 U.S.C. § 101. As the majority recognizes, however, "[t]he question of whether the claimed signals are 'manufactures' is more difficult." Majority Op. at 15. As mentioned, the Supreme Court quoted in American Fruit the following definition of "manufacture," upon which the majority relies today: "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." 283 U.S. at 11 (quoting 5 Century Dictionary 3620 (William Dwight Whitney ed., 1895)), quoted in Diamond v. Chakrabarty, 447 U.S. 303, 308 (1980). Based on this definition and the associated definition of "article," the majority concludes that manufactures must be "tangible," a definition that excludes "[a] transient electric or electromagnetic transmission." Majority Op. at 16. With all due respect, I believe that these conclusions are erroneous.

First, the majority's holding is unsupported by the authority it cites. Even if accepted as controlling, see infra at 5–7, the American Fruit definition of "manufacture"

is not limited to tangible or non-transitory inventions by its own terms, nor does the claimed signal fail to be "material" in the relevant sense. The raw "materials" that take new form to become "manufactures" need not be tangible or permanent inputs: the Century Dictionary defines "material" to mean, inter alia, "that which composes or makes a part of anything."[1] "Material" II.2, 5 Century Dictionary 3657.

The majority's definition for "article"—"a particular substance or commodity"—likewise provides no indication that the substance must last any longer than is necessary to be useful. See Majority Op. at 16. Moreover, an article does not cease to be an article when it "must be measured . . . by equipment capable of detecting and interpreting" it. Id. Myriad inventions, particularly in the chemical arts, can only be detected using equipment—this is inevitable if patents are to cover advanced technologies. Indeed, we have squarely held that transitory inventions are patentable under § 101. For example, in In re Breslow, we held that chemical intermediates are patentable compositions of matter under § 101 even if they are "transitory, unstable, and non-isolatable." 616 F.2d 516, 519, 521–22 (C.C.P.A. 1980). In so holding, we recognized that the compounds "can as well be considered 'manufactures' as 'composition[s] of matter'"). Id. at 522; see also Zenith Labs. v. Bristol-Myers Squibb Co., 19 F.3d 1418, 1422 (Fed. Cir. 1994) (noting that infringement may occur where a pharmaceutical is converted into a claimed chemical compound in vivo).

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[1] Our statement that an invention is patentable subject matter when it "produce[s] a useful, concrete, and tangible result," see In re Alappat, 33 F.3d 1526, 1544 (Fed. Cir. 1994) (en banc) (emphasis added), does not impose a requirement that a patentable manufacture must be a tangible thing. Rather, the fact that an invention gives rise to some tangible result is one indication that it is not an unpatentable abstract idea. Id.; see also infra at 14.

In any event, it is doubtful that looking to a definition of "article" is necessary. The American Fruit Court quoted a second definition for "manufacture" from the Century Dictionary in addition to the one repeated in Chakrabarty: "anything made for use from raw or prepared materials." 283 U.S. at 11. This definition does not, by its terms, require that a "manufacture" be an "article" or a transformed "raw material," only that it be something—"anything"—made from them.

Second, the majority simply assumes, without reference to its own construction of the claim, that Nuijten's signal is "fleeting." Majority Op. at 16. The claim refers to multiple "samples," one "preceding" the next, in a specified relationship. In conjunction with the specification's references to "prediction" of a watermark bit's effect on subsequent bits of the input signal and the invention's preferred use for audio or video signals, it is apparent that the claimed signal must extend over some interval of time. In In re Hruby, 373 F.2d 997 (C.C.P.A. 1967), we held that it was not the dynamic position of any given water droplet, but rather the overall pattern, that was patentable; likewise, here, it is the overall signal, not the physical manifestation of a single bit, that constitutes the invention. Just as the design of a fountain lasts so long as the water is flowing, the signal lasts so long as the transmission of the signal is in progress. In many embodiments—for example, when the signal encodes an audio or video signal representing a symphony or a full-length motion picture that is being watched in real time—the transmission may be in progress for a significant period of time. And as the majority holds, the claim makes no assumptions about what physical form the signal might take. The claim therefore encompasses embodiments, such as inscriptions on paper, in which the signal itself may last indefinitely.

Third, neither American Fruit Growers nor Chakrabarty confronted or decided a question of tangibility or permanence. The question in American Fruit Growers was whether "an orange, the rind of which has become impregnated with borax, through immersion in a solution, and thereby rendered resistant to blue mold decay," was a "manufacture" within the meaning of the predecessor to § 101. 283 U.S. at 11. The court answered the question in the negative, not because an orange is not "tangible," but because treated citrus fruits do not "possess[] a new or distinctive form, quality, or property," and thus are not made by man. Id. Likewise, in Chakrabarty, the Court held that a genetically-engineered bacterium was patentable because it was "a nonnaturally occurring manufacture or composition of matter—a product of human ingenuity having a distinctive name, character [and] use." 447 U.S. at 309–10 (quotation marks omitted) (alteration in original). Indeed, as I will discuss below, the Chakrabarty Court cited the American Fruit definition of "manufacture" only in support of the proposition that the term was "expansive" and that "Congress plainly contemplated that the patent laws would be given wide scope." Id. at 308. In neither case did the Court decide or discuss the question that is before us today.

Fourth, the language we are called to interpret is venerable. As the majority recognizes, with the exception of the substitution of "process" for "art," the four categories of statutory subject matter in § 101 have remained unchanged since the 1793 Patent Act. Act of Feb. 21, 1793, ch. 11, § 1, 1 Stat. 318. "Manufacture" was a statutory category even in the very first United States Patent Act of 1790. Act of Apr. 10, 1790, ch. 7, § 1, 1 Stat. 109. Indeed, "manufactures" were the subject of the British Statute of Monopolies of 1623, 21 Jac. 1, ch. 3. See generally Ex parte Lundgren, No.

2003-2088, 2005 Pat. App. LEXIS 34, at *32–*50 (B.P.A.I. Sep. 28, 2005) (Barrett, A.P.J., concurring-in-part and dissenting-in-part) (discussing history of statutory subject matter).

In part because of this, I question whether this case can be decided by reference to a dictionary definition of "manufacture." See Alappat, 33 F.3d at 1553 (Archer, C.J., concurring-in-part and dissenting-in-part) ("These terms may not be read in a strict literal sense entirely divorced from the context of the patent law."). To the extent such a definition might be helpful, however, it should be one that is contemporary with the statutory language, and thus a dictionary that dates to the eighteenth century. See, e.g., St. Francis Coll. v. Al-Khazraji, 481 U.S. 604, 610–12 (1987) (using mid-nineteenth-century dictionaries to construe 1866 Civil Rights Act).

One example of a contemporary dictionary is Samuel Johnson, A Dictionary of the English Language (3d ed. 1768), available at http://books.google.com?id=bXsCAAAAQAAJ, which defines manufacture as "[a]ny thing made by art."[2] "Art," in turn, is defined as "[t]he power of doing something not taught by nature and instinct"; "[a] science"; "[a] trade"; "[a]rtfulness, skill, dexterity." Id. This connection is significant because of the parallel use of "art" and "manufacture" in the 1790 and 1793 Patent Acts and because of the use of the term "useful Arts" in the Patent Clause of the

[2] The majority criticizes my use of an alternative dictionary definition to the one the Supreme Court enunciated in Chakrabarty. Majority Op. at 15 n.5. However, the alternative definition is in no way inconsistent with the Chakrabarty one, nor with the second definition of "manufacture" that the Supreme Court provided in American Fruit, which like Chakrabarty remains good law. Under such circumstances, we do not breach our duty to follow Supreme Court precedent by looking to additional sources to further inform our understanding of the statutory language.

Constitution.[3] U.S. Const., art. I, cl. 8; see also In re Comiskey, No. 2006-1286, slip op. at 14 (Fed. Cir. Sept. 20, 2007) ("The Constitution explicitly limited patentability to 'the national purpose of advancing the useful arts—the process today called technological innovation.'" (quoting Paulik v. Rizkalla, 760 F.2d 1270, 1276 (Fed. Cir. 1985) (en banc)); Karl B. Lutz, Patents and Science: A Clarification of the Patent Clause of the U.S. Constitution, 18 Geo. Wash. L. Rev. 50, 54 (1949) ("The term 'useful arts,' as used in the Constitution . . . is best represented in modern language by the word 'technology.'").

Thus, it appears that rather than delineate specific, narrow categories, Congress has consistently intended statutory subject matter to cover the full scope of technological ingenuity, however it might best be claimed. Thus, "art" and "process[es]" might be viewed, in rough terms, as the exercise of technological skill, "manufacture[s]" and "composition[s] of matter" as the products of that skill, and "machine[s]" as the tools through which that skill is exercised. See Comiskey, slip op. at 18 (observing that a method claim involving a mental process or algorithm qualifies as a "process" under

[3] The majority cites the legislative history of the 1952 Patent Act for the proposition that "art" is not "broader than the usual understanding of 'process.'" Majority Op. at 12–13. The drafters of the 1952 patent act changed "art" to "process" in § 101 in recognition of the fact that "art" in § 101 had been interpreted by the courts to apply to process and method claims. However, the inclusion of "art" in the new § 100(b) definition of "process" is a strong suggestion that Congress intended the change in language to be clarifying rather than narrowing. Regardless, this change certainly did not narrow the scope of "manufacture."

Even if the 1952 Senate Committee on the Judiciary was correct that "art," as used in the pre-1952 patent statutes, "has a different meaning than the words 'useful art' in the Constitution," S. Rep. No. 82-1979, at 5 (1952), and applies only to what we now describe as process claims, I believe that the four categories of statutory subject matter have consistently been intended to complement one another and to protect the full scope of technological ingenuity—the "useful Arts."

§ 101 when it "(1) is tied to a machine or (2) creates or involves a composition of matter or manufacture").

We and the Supreme Court have each recognized and applied this broad approach, frequently declining to decide in which statutory category a claim belongs. See, e.g., Chakrabarty, 447 U.S. at 307–08 (deciding the patentability of a claimed microorganism without determining whether it was a "manufacture" or "composition of matter"); Gottschalk v. Benson, 409 U.S. at 67–68 (quoting a principle of patentability from Funk Bros. Seed Co. v. Kalo Co., 333 U.S. 127 (1948), and stating, "We dealt there with a 'product' claim, while the present case deals with a 'process' claim. But we think the same principle applies."); State Street Bank, 149 F.3d at 1375 ("The question of whether a claim encompasses statutory subject matter should not focus on which of the four categories of subject matter a claim is directed to . . . but rather on the essential characteristics of the subject matter . . . ." (emphasis omitted)).

Of course, as we noted in State Street Bank, a claim must be drafted to at least one of the four categories. 149 F.3d at 1375 n.9. As the allowed and disallowed claims in this case demonstrate, however, claims to essentially the same invention can frequently be drafted, with at most subtle differences in scope, to either processes or manufactures. Patentability does not depend on which form the claim takes. Cf. Parker v. Flook, 437 U.S. 584, 588–90, 593 (1978) (holding that where the "only novel feature" of an "otherwise conventional" method is an unpatentable algorithm, the mere addition of the conventional method steps to an unpatentable claim does not confer patentability, because to do otherwise "would make the determination of patentable subject matter depend simply on the draftman's art").

Fifth, and finally, I believe the majority does not follow the guidance that the Supreme Court provided in Chakrabarty as to how we should interpret § 101. As the Court observed, "Congress plainly contemplated that the patent laws would be given wide scope." 447 U.S. at 308. Accordingly, Chakrabarty embraces the notion that the scope of patentable subject matter includes "anything under the sun that is made by man." Id. at 309 (quoting S. Rep. No. 82-1979, at 5 (1952); H.R. Rep. No. 82-1923, at 6 (1952)). Granted, Chakrabarty also cautions that there are exceptions to these sweeping pronouncements: "This is not to suggest that § 101 has no limits or that it embraces every discovery. The laws of nature, physical phenomena, and abstract ideas have been held not patentable." Id. But altogether, the most straightforward interpretation of the Supreme Court's guidance in Chakrabarty is that an invention qualifies as patentable subject matter if it (1) is "made by man," and (2) does not involve an attempt to patent "laws of nature, physical phenomena, [or] abstract ideas." Indeed, this is the analysis the Chakrabarty Court appears to follow: "Judged in this light, respondent's micro-organism plainly qualifies as patentable subject matter. His claim is not to a hitherto unknown natural phenomenon, but to a nonnaturally occurring manufacture or composition of matter—a product of human ingenuity 'having a distinctive name, character, [and] use.'" Id. at 309–10; see also AT&T Corp. v. Excel Commc'ns, Inc., 172 F.3d 1352, 1355, 1361 (Fed. Cir. 1999) (applying § 101 by subtracting from "anything under the sun that is made by man" only the three exceptions enumerated by the Supreme Court). The Court's analysis leaves little room for the term "manufacture" to impose additional limitations on the scope of patentable subject matter.

II. "Abstract Ideas" and the Requirements of Section 101

I now turn to the question of whether Nuijten's claimed signal falls within one of the exceptions from patentable subject matter. To best answer this question, I consider the text of the statute. See Diamond v. Diehr, 450 U.S. 175, 182 (1981).

35 U.S.C. § 101 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.

In addition to the requirement that patentable subject matter fall within one of the four statutory categories ("process, machine, manufacture, or composition of matter"), it must also be "new and useful."[4] As with the term "manufacture," we must be sensitive to the fact that modern everyday usage may be a poor guide to the meaning of such old and oft-interpreted text. Nonetheless, the terms "new" and "useful" define and delimit the exceptions from statutory subject matter.

A. "New"

"Novelty," as a patent doctrine, is ordinarily regarded as a requirement not of § 101 but of § 102. See Diehr, 450 U.S. at 189 ("It has been urged that novelty is an appropriate consideration under § 101. . . . Section 101, however, is a general statement of the type of subject matter that is eligible for patent protection 'subject to the conditions and requirements of this title.' Specific conditions for patentability follow and

[4] An argument can be made that the "new" and "useful" requirements also inhere to some extent in the statutory categories themselves; the first American Fruit definition of "manufacture" refers to "the production of articles for use from raw or prepared materials by giving to these materials new forms, qualities, properties, or combinations." 283 U.S. at 11 (emphases added); id. at 12 (rejecting argument that an orange impregnated with borax is a manufacture because it "remains a fresh orange fit only for the same beneficial uses as therefore"). Because the statutory terms "new," "useful," and "manufacture" appear together, this possibility does not alter the analysis.

§ 102 covers in detail the conditions relating to novelty."). Nonetheless, precedent supports attributing to the term "new" in § 101 a separate requirement that statutory subject matter be a type of invention that can be described as a "new" creation rather than the discovery of a pre-existing principle. See Titanium Metals Corp. of Am. v. Banner, 778 F.2d 775, 780–81 (Fed. Cir. 1985) (emphasizing the requirement of § 101 that "what is sought to be patented, as determined by the claims, be new" and observing that "[s]ection 102, the usual basis for rejection for lack of novelty or anticipation, lays down certain principles for determining the novelty required by § 101"); cf. Diehr, 450 U.S. at 211 (Stevens, J., dissenting) (discussing the difference between the so-called "discovery" requirement of § 101 and the "novelty" requirement of § 102). This accords with the language of the legislative history, discussed above, that patentable subject matter comprises "anything under the sun that is made by man." Chakrabarty, 447 U.S. at 309 (emphasis added). To be "made by man," something must not be pre-existing in nature; it must be, literally, an invention.

As the Supreme Court observed in Funk Bros., "patents cannot issue for the discovery of the phenomena of nature" because such phenomena "are part of the storehouse of knowledge of all men. They are manifestations of laws of nature, free to all men and reserved exclusively to none. . . . If there is to be invention from such a discovery, it must come from the application of the law of nature to a new and useful end." 333 U.S. at 130, quoted in Chakrabarty, 447 U.S. at 309. Thus, a discovery or invention can fail to be "new" in the § 101 sense even if it has not previously been known to man or recorded in the prior art—that is, even if it is "novel" under § 102. Certain innovations, no matter how new to human thought, are not the type of

technological invention to which Congress has extended patent protection, but instead are considered to be abstract truths that were not "made by man." "The underlying notion is that a scientific principle . . . reveals a relationship that has always existed." Flook, 437 U.S. at 593 n.15.

This insight, I believe, is at the core of the judicial doctrine by which laws of nature, natural phenomena, and abstract ideas are excluded from patentable subject matter. For example, in Gottschalk v. Benson, the Supreme Court considered a proposed patent claim for a method for converting binary-coded decimal numbers ("BCD") into pure binary numbers. Quoting Funk Bros., the Court distinguished "a hitherto unknown phenomenon of nature" from "the application of the law of nature to a new and useful end," 409 U.S. at 67 (quoting 333 U.S. at 130). Applying this distinction, the Court observed that the "claim is so abstract and sweeping as to cover both known and unknown uses of the BCD to pure binary conversion." Id. at 68. Thus, the effect of allowing the patent would be to allow "a patent on the algorithm itself," and such a patent was impermissible. Id. at 72. Although the Court did not make this connection explicit, I believe that one reason why the method for converting between the binary and binary-coded decimal systems was deemed to be unpatentably abstract was that the claims attempted to monopolize a timeless mathematical relationship among integers, even if the particular representations of the integers may have been new to computer science. See id. at 67–68. In other words, the algorithm might have been novel under § 102, but—like all purely mathematical algorithms—it was not "new" under § 101.[5]

[5] A similar observation answers Justice Breyer's apparent criticism of State Street Bank in his dissent from dismissal of certiorari in Laboratory Corp. of America Holdings v. Metabolite Laboratories, Inc., 126 S. Ct. 2921 (2006). Justice Breyer

B. "Useful"

Section 101 also requires that patented subject matter be "useful." Although we have treated the utility requirement of § 101 as a distinct concept from the question of whether an invention qualifies as patentable subject matter, a patent claim directed to a law of nature, a physical phenomenon, or an abstract idea will ordinarily have practical applications that are too attenuated from the subject of the claim to be "useful." We recognized this in In re Alappat and State Street Bank by requiring that patentable subject matter manifest a "useful, concrete, and tangible result," but the principle is not new to those cases. For example, in Funk Bros., the Supreme Court distinguished an unpatentable "hitherto unknown phenomenon of nature" from a patentable "application of the law of nature to a new and useful end." 333 U.S. at 130 (emphases added).

Even where a person of ordinary skill in the art might readily conceive of some application of an abstract principle, it is the application rather than the principle itself that must be patented. In Benson, the Supreme Court rejected patent claims to a system for converting binary-coded decimals to pure binary numbers because the claim was "so abstract as to cover both known and unknown uses of the . . . conversion. The end use may (1) vary from the operation of a train to verification of drivers' licenses to researching the law books for precedents and (2) be performed through any existing machinery or future-devised machinery or without any apparatus." 409 U.S. at 68. Put

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summarized State Street Bank as saying that "a process is patentable if it produces a 'useful, concrete, and tangible result,'" but observed that the Supreme Court "has never made such a statement" and cited, as examples of patent claims that would meet that test, but that the Supreme Court invalidated, the claims in Benson, Flook, and O'Reilly v. Morse, 56 U.S. (15 How.) 62 (1853) (involving a claim to "the use of electromagnetic current for transmitting messages over long distances") (discussed infra at 20). 126 S. Ct. at 2928. The State Street Bank test—which I will discuss more in Part II.B, infra—speaks only to the "useful" requirement of § 101.

differently, although mathematical algorithms and similarly abstract principles may be useful (in the casual sense of the term) in a wide variety of contexts, their utility is too far removed from what is claimed for them to be "useful" under § 101. See Brenner v. Manson, 383 U.S. 519, 534–35 (1966) (requiring that the "specific benefits" to be conferred by a claimed invention "exist[] in [the invention's] currently available form"); see also In re Fisher, 421 F.3d 1365, 1371 (Fed. Cir. 2005) (requiring that a claimed invention have "specific and substantial utility to satisfy § 101," and rejecting a claim to a gene sequence where the sequence has only been shown to have "biological activity").

A similar concept of whether the utility of claimed subject matter is too attenuated from what is actually claimed undergirds the "printed matter" doctrine. At oral argument, the PTO invoked printed matter cases in the context of why Nuijten's claim 15, to "a storage medium having stored thereon" a signal, was allowable even though (according to the PTO) claim 14, to the signal simpliciter, was not. Oral Arg. at 00:44:41–00:45:18, available at http://www.cafc.uscourts.gov/oralarguments/mp3/06-1371.mp3 (citing In re Lowry, 32 F.3d 1579 (Fed. Cir. 1994), and In re Beauregard, 53 F.3d 1583 (Fed. Cir. 1995) (order)). Under the "printed matter" doctrine, if the only distinction between a prior art storage medium and a claimed storage medium is the information stored thereon—rather than a different "functional relationship between the printed matter and the substrate"—then the claimed storage medium (with associated information) is unpatentably obvious over the prior art because the information lacks "patentable weight." In re Gulack, 703 F.2d 1381, 1387 (Fed. Cir. 1983). The "printed matter" rejection has been treated as a doctrine under § 103 rather than § 101, but it seems potentially more apposite as a consequence of the "useful" requirement of § 101. The

Supreme Court has applied similar reasoning in § 101 cases. See, e.g., Flook, 437 U.S. at 592 ("We think this case must also be considered as if the principle or mathematical formula were well known.").

In Lowry, the case upon which the PTO relied principally at oral argument, we considered the allowability of patent claims for a computer memory storage system containing a particular set of data structures that were useful for more quickly storing and retrieving data in a database system. 32 F.3d at 1580–82. We concluded that

> Lowry's data structures impose a physical organization on the data. . . . More than mere abstraction, the data structures are specific electrical or magnetic structural elements in a memory. According to Lowry, the data structures provide tangible benefits: data stored in accordance with the claimed data structures are more easily accessed, stored, and erased [and] represent complex data accurately and enable powerful nested operations. In short, Lowry's data structures are physical entities that provide increased efficiency in computer operation.

Id. at 1583–84. Consequently, we held, the PTO's printed matter rejection was erroneous. From this, the PTO apparently takes the position that functional but intangible software, data structures, signals, and the like are patentable under Lowry if they are encoded on a tangible medium, but unpatentable (as failing a tangibility requirement to be "manufactures") if the medium is not referenced in the claims. Absent Lowry, the PTO's position apparently would be that Nuijten's claim 14 (the signal, standing alone) is unpatentable subject matter under § 101, and that claim 15 (the storage medium containing the signal) is unpatentably obvious under § 103 over prior art storage media.[6]

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[6] The other case the PTO cited at oral argument, In re Beauregard, was not a decision by this court as to the merits of patentability. Rather, Beauregard was a precedential order dismissing an appeal because the PTO conceded that "computer programs embodied in a tangible medium, such as floppy diskettes, are patentable subject matter under 35 U.S.C. § 101 and must be examined under 35 U.S.C. §§ 102

The PTO's position makes little sense. As a doctrinal matter, the PTO should not look to § 101 sometimes and § 103 at other times to accomplish essentially the same end. As a matter of principle, there is little reason to allow patent claims to otherwise unpatentable, deemed abstractions just because those deemed abstractions are stored in a tangible medium, while rejecting the same inventions standing alone. Nuijten's signal involves the same degree and type of human ingenuity whether or not it happens to be encoded in the magnetic fields of a hard disk drive, the optical pits of a compact disc, a stream of photons propagating across a vacuum, or any other specific form that technology might put it in. The signal is either a "new and useful" manufacture or it is not. To allow a patent on a storage medium containing the signal but to deny one to the real underlying invention "make[s] the determination of patentable subject matter depend simply on the draftman's art" in the sense criticized by the Supreme Court in Flook. 437 U.S. at 593. It is incongruous to treat an individual watching a movie containing the signal of claim 14 in real time as any less of an infringer than someone watching the same movie after a short delay using the recording feature of, for example, a TiVo® digital video recorder. A better distinction is made based on the nature of the underlying invention, without regard to the particular way it is claimed. The "utility" requirement of § 101 provides a basis to differentiate patentable inventions involving the manipulation or transmission of information from unpatentable inventions whose only utility lies in the particular information they convey—often a difficult line to draw in computer-related arts.

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and 103." 53 F.3d at 1584. This concession probably derived from Lowry and, perhaps, In re Alappat.

A final word is in order about Alappat and State Street Bank. Alappat recognized that "a general purpose computer in effect becomes a special purpose computer once it is programmed to perform particular functions pursuant to instructions from program software." 33 F.3d at 1545. State Street Bank found patentability in a software system which essentially applied a mathematical algorithm to the implementation of a business method. 149 F.3d at 1375–77. In neither case was there any dispute about whether the real innovation lay in particular and unpatentable information, nor was there any question as to whether the inventions represented principles that too closely reflected the laws of mathematics and nature to be "new." In both cases, however, the claimed inventions achieved real-world results with sufficient directness and specificity to be "useful" as that term is used in § 101.

From these observations, it can be appreciated that, consistent with Flook, the outer limits of statutory subject matter should not depend on metaphysical distinctions such as those between hardware and software or matter and energy, but rather with the requirements of the patent statute: is an invention a "process," "machine," "manufacture," or "composition of matter," and is it "new" and "useful"?

III. Is a "Signal" Patentable Subject Matter?

Following this analysis, it is my view that Nuijten's claim 14 is directed to a new and useful manufacture.[7]

[7] In applying my proposed definitions for each of these terms, I express no opinion as to whether an invention can be a "manufacture," or for that matter whether it can be "useful" within the meaning of 35 U.S.C. § 101 and Article I, clause 8 of the Constitution, without having some discernible effect upon the world or effecting some physical transformation. Cf. Comiskey, slip op. at 17 (agreeing with the PTO's argument that a method claim qualifies as a "process" only if it (1) is "tied to a particular apparatus" or (2) "operate[s] to change materials to a 'different state or thing'"); see also

Claim 14 is directed to a "manufacture" because the signal is, in the broad sense discussed above, an "article," "produc[ed] . . . for use from raw or prepared materials by giving to these materials [a] new form[]." See Chakrabarty, 447 U.S. at 308. Put differently, it is a product of human "art," or ingenuity; it is an application of technology to provoke some purposeful transformation in the real world. Any contrary conclusion must depend on a too-literal reading of either "article" or "material," neither of which appears in the statute, and neither of which any precedent—until today—has imposed as a limitation on the otherwise "expansive" scope of § 101. No matter what form the signal of claim 14 may take, it must involve "some physical carrier of information" that is created or manipulated through human activity, and that physical carrier must function "to convey information to a recipient"—it must signal. See Majority Op. at 9–10.

Moreover, claim 14 is not directed to an abstract mathematical or scientific principle that fails to qualify as "new" under Funk Bros. and Benson. The claimed signal is artificial in character. The original input signal is "encoded in accordance with a given encoding process," causing it to undergo at least two transformations required by the language of the claim: first, "selected samples of the signal" are made to represent a

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Ex parte Bilski, Appeal No. 2002-2257, slip op. at 32 (B.P.A.I. March 8, 2006) (holding that "a 'process' under § 101 requires a transformation of physical subject matter to a different state or thing."). As the majority holds, Nuijten's signal must be detectable to be a "signal." Nor do I express an opinion as to whether "useful" may mean "technological" and thereby require either a result or an art that is technological in character. See Comiskey, slip op. at 14 (observing that "the framers consciously acted to bar Congress from granting letters patent in particular types of business," as compared with the monopolies granted by the English Crown). But see Lundgren, 2005 Pat. App. LEXIS 34, at *11 ("Our determination is that there is currently no judicially recognized separate 'technological arts' test to determine patent eligible subject matter under § 101."). The precise contours of these doctrines, particularly applied in the context of software and the virtual worlds it may create, pose difficult questions for other days and other cases.

second stream of “supplemental data”; and second, in order to reduce the impact of the first transformation, “at least one of the samples preceding the selected samples” is made to be “different from the sample corresponding to the given encoding process.” These transformations may apply various laws of physics or mathematics, but they cannot be said to be mere representations or principles of them; neither one is a natural or pre-existing way in which two streams of data may combine, for instance. The signal itself is man-made.

The signal is also “useful” in a direct and specific way. The invention is directed to encoding and communicating data, and that is precisely what the signal does. Any information that it conveys is wholly distinct from the invention itself; the signal is an information carrier, not an attempt to claim information itself. Moreover—though my analysis does not rely on this fact—the claim construction that we unanimously adopt today requires that the signal have a physical manifestation that is directly linked to its purpose. Whether a smoke signal, a sound, or a set of encoded and perhaps encrypted bits traveling across a wireless network in the form of radio waves, a signal must be detectable in order to successfully signal anything. No intermediate steps, layers of interpretation, or speculative eventual uses separate the signal from the claimed purpose: simply put, the signal signals.

The correctness of these conclusions is supported also by the Supreme Court’s decision in a surprisingly analogous case from over 150 years ago, O’Reilly v. Morse, 56 U.S. (15 How.) 62 (1853). In Morse, Samuel Morse (of Morse code fame) was allowed a patent “for a process of using electromagnetism to produce distinguishable signs for telegraphy.” Benson, 409 U.S. at 68 (discussing Morse, 56 U.S. (15 How.) at

111). The Supreme Court disallowed Morse's eighth claim, for the use of "electromagnetism, however developed for marking or printing intelligible characters, signs, or letters, at any distances," as the impermissible patenting of a scientific principle. Morse, 56 U.S. (15 How.) at 112. As the Court later reiterated in The Telephone Cases, however, claims to specific uses of electromagnetism were patentable: "The effect of that decision [Morse] was, therefore, that the use of magnetism as a motive power, without regard to the particular process with which it was connected in the patent, could not be claimed, but that its use in that connection could." 126 U.S. 1, 534 (1888). In particular, the Court permitted Morse's fifth claim, to the use of telegraphy to convey Morse code: "the system of signs, consisting of dots and spaces, and of dots, spaces, and horizontal lines, for numerals, letters, words, or sentences, substantially as herein set forth and illustrated, for telegraphic purposes." 56 U.S. (15 How.) at 86.[8]

The "system" and constituent "signs" of Morse's fifth claim are not "tangible articles or commodities." See Majority Op. at 16. Rather, the claim is directed to a signal—a particular way of encoding information so that it can be conveyed (in this case in the form of electrical impulses on a telegraph wire) in a useful manner at a distance. Morse's signaling system conveyed certain important parts of a message—"numerals, letters, words, or sentences," but not lowercase letters, pictures, sound, etc.—under a particular set of constraints. Nuijten's signal does the same—it conveys two streams of data, one primary stream and one lower-bandwidth "supplemental" stream—in a manner such that the supplemental stream is conveyed losslessly, and the primary

[8] Intriguingly, Morse's claim was permitted as an "art" rather than a "manufacture." 56 U.S. (15 How.) at 101. See supra at 6 & n.3.

stream is conveyed so as to minimize the effects of lost bits upon certain underlying encodings of data. Both Morse's signal and Nuijten's are "new" and "useful," and both are patentable.

IV. Conclusion

For these reasons, I would reverse.