UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte CYRUS SHAHABI and ROLFE SCHMIDT

Appeal 2008-2472
Application 10/310,667
Technology Center 2100

Decided:[1] April 20, 2009

Before ALLEN R. MACDONALD, ST. JOHN COURTENAY III, and DEBRA K. STEPHENS, *Administrative Patent Judges*.

STEPHENS, *Administrative Patent Judge*.

DECISION ON APPEAL

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[1] The two-month time period for filing an appeal or commencing a civil action, as recited in 37 C.F.R. § 1.304, begins to run from the decided date shown on this page of the decision. The time period does not run from the Mail Date (paper delivery) or Notification Date (electronic delivery).

STATEMENT OF THE CASE

Appellants appeal under 35 U.S.C. § 134 from a final rejection of claims 1-17 and 20-38. We have jurisdiction under 35 U.S.C. § 6(b).

We AFFIRM-IN-PART.

Introduction

According to Appellants, the invention is a system and method for using a wavelet transform of a polynomial range-sum query to increase speed (Abstract; Spec. 10, ¶ [0038] and 11, ¶ [0040]).

Exemplary Claim(s)

Claims 1, 20 and 37 are exemplary claims and are reproduced below:

1. A method, comprising:

processing at least one query using a wavelet transformation to produce a transformed query; and

performing a range-sum query on a database using the transformed query to produce a result.

20. An article of manufacture, comprising:

a computer-readable medium; and

instructions on the computer readable medium for directing a computer to:

process at least one query using a wavelets algorithm to obtain a transformed query; and

perform a range-sum query on a database using the transformed query to produce a proximate, progressive, and/or exact result.

37. A database system for performing a range-sum query in a database comprising:

a computer readable medium comprising instructions for causing a computer to:

process at least one query using a wavelets algorithm to obtain a transformed query; and

perform a range-sum query on a database using the transformed query to produce a proximate, progressive, and/or exact result.

Prior Art

The prior art relied upon by the Examiner in rejecting the claims on appeal is:

Chakrabarti	6,760,724 B1	Jul. 6, 2004

Chee-Yong Chan, et al., *Hierarchical Cubes for Range-Sum Queries*, Proceedings of the 25th International Conference on Very Large Data Bases (VLDB), 675-686 (1999) (hereinafter "Chan").

Yi-Leh Wu, et al., *Using Wavelet Decomposition to Support Progressive and Approximate Range-Sum Queries over Data Cubes*, Proceedings of the 9th International Conference on Information and Knowledge Management (CIKM), 414-421 (2000) (hereinafter "Wu").

Rejections

The Examiner rejected claims 1, 17, 20, 36, 37, and 38 as being directed to non-statutory subject matter under 35 U.S.C. § 101.

The Examiner rejected claims 1, 5-7, 12, 17, 20, 24-26, 31, and 37 under 35 U.S.C. § 103(a) as being obvious over the combination of Chan and Chakrabarti.

The Examiner rejected claims 2-3, 4, 8-11, 13-16, 21-23, 27-30, 32-35, 36, and 38 under 35 U.S.C. § 103(a) as being obvious over the combination of Chan, Chakrabarti, and Wu.

ISSUES

35 U.S.C. § 101: claims 1, 17, 20, 36, 37, and 38

Appellants assert their invention obtains a query and produces tangible results and computer readable media that receives a signal is statutory subject matter (App. Br. 5).

The Examiner, in contrast, finds the claims recite non-statutory material since the steps or processes are abstract ideas producing a non-tangible result, or are on a computer-readable medium that receives a signal or are directed to software per se (Ans. 4 and 16).

Issue: Have Appellants met the burden of showing the Examiner erred in concluding that the invention recited in claims 1, 17, 20, 36, 37, and 38 is directed to non-statutory subject matter?

PRINCIPLES OF LAW

§ 101

Section 101 of the Title 35 of the United States Codes 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.

35 U.S.C. § 101 (2002).

Under § 101, there are four categories of subject matter that are eligible for patent protection: (1) processes; (2) machines; (3) manufactures; and (4) compositions of matter. *See id*. While the scope of patentable subject matter encompassed by § 101 is "extremely broad" and intended to "include anything under the sun that is made by man," it is by no means unlimited. *In re Comiskey*, 554 F.3d 967, 977 (Fed. Cir. 2009) (quoting *Diamond v. Chakrabarty*, 447 U.S. 303, 309 (1980)). For example, laws of nature, abstract ideas, mental processes, and natural phenomena are excluded from patent protection. *Diamond v. Diehr*, 450 U.S. 175, 185 (1981); *Gottschalk v. Benson*, 409 U.S 63, 67 (1972); *Comiskey*, 554 F.3d at 978.

"[A]n applicant may show that a process claim satisfies § 101 either by showing that his claim is tied to a particular machine, or by showing that his claim transforms an article" into a different state or thing. *In re Bilski*, 545 F.3d 943, 961 (Fed. Cir. 2008) (en banc); *see also Benson*, 409 U.S. at 70. One articulated basis for the machine-or-transformation test is "the prevention of pre-emption of fundamental principles." *Bilski*, 545 F.3d at 963.

"A transitory, propagating signal . . . 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." *In re Nuijten*, 500 F.3d 1346, 1357 (Fed. Cir. 2007). "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." *Id*. at 1354.

FINDINGS OF FACT (FF)

Appellants' Invention

(1) Appellants' invention provides optimal progressive estimates of the query (Spec. 3, ¶ [0008]). The invention can be implemented without unwieldy storage and maintenance cost for higher order polynomials (Spec. 2, ¶ [0005] and Spec. 3, ¶[0008]).

(2) The systems and techniques of Appellants' invention can be realized in digital electronic circuitry, integrated circuitry, specially designed ASICs (application specific integrated circuits), computer hardware, firmware, *software*, and/or combinations thereof (Spec. 63, ¶ [00198], emphasis added). These computer programs (also known as programs, software, software applications or code) include machine instructions for a programmable processor, and can be implemented in a high-level procedural and/or object-oriented programming language, and/or in assembly/machine language (*id*. ¶ [00199]).

(3) "Machine-readable medium" refers to any computer program product, apparatus and/or device (e.g., magnetic discs, optical disks, memory, Programmable Logic Devices (PLDs)) used to provide machine instructions and/or data to a programmable processor, including a machine-readable medium that *receives machine instructions as a machine-readable signal* (*id*., emphasis added). The term "machine-readable signal" refers to any signal used to provide machine instructions and/or data to a programmable processor (*id.)*.

ANALYSIS

Claim 1

Independent claim 1 recites a method that includes the steps of processing at least one query and performing a range-sum query using the processed query (*see* claim 1). This claim is not a process tied to a particular machine, nor is the claim directed to a manufacture, or composition of matter. To be eligible for patent protection under § 101, the process claim must be analyzed using the machine-or-transformation test. *Bilski*, 545 F.3d at 954. The machine-or-transformation test requires a process claim to (1) be tied to a particular machine, or (2) transform an article into a different state or thing. *Id.*

Bilski – Machine Prong

Claim 1 does not recite a machine and therefore, is not tied to any particular machine. We construe the scope of the claimed “database” as broadly but reasonably encompassing a collection of data elements in the

abstract. Thus, it is our view that the two steps of "processing" and "performing" could be performed as mental steps. Accordingly, claim 1 does not meet the machine prong set forth in *Bilski*.

Bilski – Transformation Prong

Claim 1 recites two steps – processing a query using a wavelet transformation and performing a range-sum query on a database using the processed or transformed query. While claim 1 transforms data, we find nothing in the language of claim 1 that transforms physical subject matter into a different state or thing. Accordingly, we conclude that claim 1 does not constitute a statutory process under 35 U.S.C. § 101. For the foregoing reasons, we sustain the Examiner's rejection of independent claim 1 as being directed to non statutory subject matter under 35 U.S.C. § 101.

Claim 17

Claim 17 recites the *method* of claim 1 implemented in a computer program on a computer readable medium (*see* claim 17). Here, we find inclusion of the computer readable medium does not impose meaningful limits on the scope of claim 1 so as to render the claim statutory. Considering claim 17 as statutory merely because of the additional recitation of a computer readable medium would exalt form over substance. Otherwise, claim 17 would effectively preempt the abstract idea represented by claim 1. Moreover, claim 17 does not recite a method consistent with *Biliski's* machine or transformation test, as discussed *supra*. For these

reasons, we sustain the Examiner's rejection of independent claim 17 as being directed to non statutory subject matter under 35 U.S.C. § 101.

Claims 20 and 36-38

Claim 20 recites *an article of manufacture* that comprises a computer-readable medium and instructions on the computer-readable medium; claim 36 recites a computer program on computer readable medium; claim 37 recites *a database system* on a computer-readable medium; and claim 38 recites a database system including a computer readable medium. Appellants define the system of their invention as being implemented in hardware, firmware, *software*, and/or combinations thereof including the computer-readable medium (FF 1, emphasis added). It follows then that the database system recited in claim 37 may be entirely in software.

Each of claims 20 and 36-28 also recite a computer-readable medium. We look to Appellants' definition of machine-readable medium for the definition of the computer-readable medium recited in the claims as Appellant appears to use them interchangeably. Machine-readable medium is defined in Appellants' Specification as any computer program product, apparatus and/or device used to provide machine instructions and/or data to a programmable processor, including a machine-readable medium that *receives machine instructions as a machine-readable signal* (FF3). A "machine-readable signal" refers to any signal used to provide machine instructions and/or data (FF3). Based on these definitions, we find a

machine-readable medium could be a carrier signal that receives a data signal.

During prosecution, "the PTO gives claims their 'broadest reasonable interpretation.'" *In re Bigio*, 381 F.3d 1320, 1324 (Fed. Cir. 2004) (quoting *In re Hyatt*, 211 F.3d 1367, 1372 (Fed. Cir. 2000)). Thus, a computer-readable medium recited in the claims may be interpreted as a transitory, propagating signal which is not a process, machine, manufacture, or composition of matter. Therefore, we conclude claims 20 and 36-38 do not recite statutory material under 35 U.S.C. § 101.

CONCLUSION

Appellants *have not* met the burden of showing the Examiner erred in concluding the invention as recited in claims 1, 17, 20, 36, 37, and 38 is non-statutory material.

ISSUES

35 U.S.C. § 103(a): claims 1, 5-7, 12, 17, 20, 24-26, 31, and 37

Appellants assert their invention is not obvious over Chan and Chakrabarti since neither Chan nor Chakrabarti teaches a query that is transformed according to a wavelet transformation (App. Br. 8). Specifically, Appellants contend although Chan teaches transforming a query, this transformation does not use a wavelet transformation (App. Br. 9). Additionally, Appellants assert Chakrabarti teaches using a wavelet transformation on query results – not on the query itself (*id.*).

The Examiner contends Chan teaches a query algorithm using a decomposition or deposition wavelet technique, transforms a given range-sum query into a transformed query (Ans. 16). The Examiner further asserts Chakrabarti teaches using wavelet decomposition on electronic data which is querying the wavelet-co-efficient synopses of electronic data (Ans. 17).

Issue: Have Appellants met the burden of showing the Examiner erred in concluding Chan and Chakrabarti teach "using a wavelets algorithm to obtain a transformed query"?

35 U.S.C. § 103(a):

Claims 2-3, 4, 8-11, 13-16, 21-23, 27-30, 32-35, 36, and 38

Appellants assert their invention is not obvious over Chan, Chakrabarti and Wu since none of these references teaches transforming the query using wavelet coefficients (App. Br. 11). Further to the arguments Appellants asserted with respect to claim 1, as set forth above, Appellants contend that although Wu teaches progressive range sum queries, Wu does not, alone or in combination with the other references, teach transforming the query using wavelet coefficients or forming a transformed query table of a plurality of wavelet coefficients with descending values (*id*.).

The Examiner contends Wu teaches wavelet-based decomposition of data cubes by using wavelet transformation and Chakrabarti teaches querying the wavelet-coefficient synopses of electronic data (Ans. 17). Therefore, the Examiner concludes combining the elements of Chakrabarti

and Wu into the system of Chan would have been obvious to one skilled in the art (Ans. 15 and 17).

Issue: Have Appellants met the burden of showing the Examiner erred in concluding Chan, Chakrabarti, and Wu teach or suggest generating a transformed query table comprising wavelet coefficients with values in descending order and using those wavelet coefficients in a range-sum query (the transformed query) that defines a subset of the dimensions of the data cube?

PRINCIPLES OF LAW

Claim Construction

"The Patent and Trademark Office (PTO) must consider all claim limitations when determining patentability of an invention over the prior art." *In re Lowry*, 32 F.3d 1579, 1582 (Fed. Cir. 1994) (citing *In re Gulack*, 703 F.2d 1381, 1385 (Fed. Cir. 1983)). "Claims must be read in view of the specification, of which they are a part." *Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 979 (Fed. Cir. 1995) (en banc).

Obviousness

Appellants have the burden on appeal to the Board to demonstrate error in the Examiner's position. *See In re Kahn*, 441 F.3d 977, 985-86 (Fed. Cir. 2006) ("On appeal to the Board, an applicant can overcome a rejection [under § 103] by showing insufficient evidence of *prima facie*

obviousness or by rebutting the *prima facie* case with evidence of secondary indicia of nonobviousness.") (quoting *In re Rouffet*, 149 F.3d 1350, 1355 (Fed. Cir. 1998)).

The Supreme Court in *Graham v. John Deere*, 383 U.S. 1 (1966), stated that three factual inquiries underpin any determination of obviousness:

> Under § 103, the scope and content of the prior art are to be determined; differences between the prior art and the claims at issue are to be ascertained; and the level of ordinary skill in the pertinent art resolved. Against this background, the obviousness or nonobviousness of the subject matter is determined. Such secondary considerations as commercial success, long felt but unsolved needs, failure of others, etc., might be utilized to give light to the circumstances surrounding the origin of the subject matter sought to be patented. As indicia of obviousness or nonobviousness, these inquiries may have relevancy.

Id. at 17-18.

FINDINGS OF FACT (FF)

Chan's Invention

(4) Chan discloses using a new class of cube representations (Hierarchical Cubes) that is a more efficient approach to processing range-sum queries (Abstract). A Hierarchical Cube is constructed, queried and updated (*id.)* A range-sum query is then performed using the Hierarchical Cube (*id.*).

(5) An algorithm rewrites a range sum query into a collection of local range-sum queries by first invoking a rewrite algorithm to obtain a set of local range-sum queries and then rewriting each local range-sum query into a collection of local prefix range-sum queries (§ 3.4.2 and Figure 7).

The Hierarchical Rectangular Cube-Query, also applied, is the main algorithm used to evaluate a range-sum query Q using an n-dimensional Hierarchical Rectangular Cube (*id.*).

Chakrabarti's Invention

(6) Chakrabarti teaches a method and system for querying data by creating wavelet-coefficient synopses of the data and then querying the synopses in the wavelet-coefficient domain to obtain a wavelet-coefficient query result (Abstract).

(7) Wavelet-coefficient synopses of the electronic data are generated; the wavelet-coefficient synopses are queried using modified standard SQL operators implemented using novel query processing algorithms to obtain a wavelet-coefficient result; and the wavelet coefficient result is rendered to obtain an approximate result (col. 3, ll. 34-46, col. 11, l. 66 to col. 12, l. 19 and col. 18, ll. 48-51).

(8) The wavelet-coefficient synopses are generated by decomposing the electronic data to be queried into wavelet-coefficients (col. 3, ll. 47-49). Wavelet-coefficients are generated using multi-dimensional Haar wavelets or other types of wavelets (col. 4, ll. 54-57).

Wu's Invention

(9) Wu teaches a new technique for evaluating range queries in data cubes (p. 415, § 1. Introduction).

(10) Instead of processing queries on original data cubes, wavelet-based decomposition of the original data cubes is performed using the Haar

wavelet basis resulting in a hierarchical structure of wavelet coefficients at increasing resolution levels (p. 415, § 2.1, p. 416, § 2.2).

(11) The wavelet decomposition results in a hierarchical structure of wavelet coefficients at increasing resolution levels (p. 416, § 2.2). A range-sum query is executed progressively starting with a low-resolution data cube subsequently constructing the parts of the cube at a finer resolution (*id.*).

ANALYSIS

35 U.S.C. § 103(a): Claims 1, 5-7, 12, 17, 20, 24-26, 31, and 37

Chan teaches altering representations of the data into Hierarchical Cubes and rewriting a range sum query into a collection of queries (FF 4-5). In contrast, Appellants invention discloses transforming the query itself (*see* claim 1 and analogous language in claim 20 and 38).

Chakabarti does not disclose using wavelet transformation to transform the query results as suggested by the Examiner (Ans. 6). Instead, Chakabarti teaches generating wavelet-coefficient synopses of the electronic data that are then queried to obtain a wavelet-coefficient result (FF 5-6).

After reviewing the record before us, it is our view that the weight of the evidence supports Appellants' contention that the Examiner has not sufficiently shown the correspondence between the claim elements and the relevant portions of the cited references to establish a prima facie case of obviousness. We find neither Chan nor Chakabarti, taken alone or in combination, fairly teaches or suggests using a wavelet transformation to produce a transformed query. We find the gap in the combined teachings of

the cited references to be uncomfortably wide and we decline to bridge the gap in the references with theories or speculation.

Therefore, we find Appellants have met the burden of showing the Examiner erred in concluding Chan and Chakrabarti teach "using a wavelets algorithm to obtain a transformed query" as recited in independent claims 1, 20, and 37. Since claims 5-7, 12, and 17 depend from independent claim 1 and claims 24-26 and 31 depend from claim 20, we additionally reverse the rejections of claims 5-7, 12, 17, 24-26, and 31 stand with claims 1, 20, and 37.

35 U.S.C. § 103(a):

Claims 2-4, 8-11, 13-16, 21-23, 27-30, 32-35, 36, and 38

The Examiner cites Wu as rendering the present invention as recited in claims 2-4, 8-11, 13-16, 21-23, 27-30, 32-35 when taken in combination with Chan and Chakabarti. As discussed above, neither Chan nor Chakabarti, taken alone or in combination, teaches using a wavelets algorithm to obtain a transformed query.

As to the Wu reference, Wu teaches using the Haar wavelet-based decomposition of data cubes to acquire a hierarchical structure of wavelet coefficients (FF 10). Wu further teaches a wavelet transformation is performed on the original function to produce wavelet coefficients (FF 10). The range-sum query is then performed on the data cube at progressively increasing resolution (FF 11).

We thus find whereas Appellants' invention uses a wavelet transform on the query to create a range-sum query which is then used on the data cube, Wu performs the wavelet transformation on the data cube and then performs the range-sum query. Wu does not teach or suggest performing a range-sum query using wavelet coefficients of the transformed *query*, instead Wu teaches performing a range-sum query *on* the data cube to produce a transformed data cube (FF 11 and Fig. 2).

Based on these teachings, we find none of Chan, Chakabarti, or Wu, taken alone or in combination, teaches or suggests using a wavelet transformation to produce a transformed query. Therefore, after considering the totality of the record before us, we conclude Appellants have met the burden of showing the Examiner erred in concluding that Chan and Chakrabarti teach "using a wavelets algorithm to obtain a transformed query".

CONCLUSION

Based on the findings of facts and analysis above, we conclude Appellants have met the burden of showing the Examiner erred in concluding Chan and Chakrabarti teach or suggest "using a wavelets algorithm to obtain a transformed query. Further, Appellants have met the burden of showing the Examiner erred in concluding Chan, Chakrabarti, and Wu teach or suggest generating a transformed query table comprising wavelet coefficients with values in descending order and using those wavelet coefficients in a range-sum query (the transformed query) that defines a subset of the dimensions of the data cube.

Accordingly, Appellants have met the burden of showing the Examiner erred in rejecting claims 1, 5-7, 12, 17, 20, 24-26, 31, and 37 under 35 U.S.C. § 103(a) as being obvious over Chan and Chakrabarti and claims 2-4, 8-11, 13-16, 21-23, 27-30, 32-35, 36, and 38 under 35 U.S.C. § 103(a) as being obvious over Chan, Chakrabarti, and Wu.

DECISION

The Examiner's rejection of claims 1, 17, 20, 36, 37, and 38 under 35 U.S.C. § 101 is affirmed.

The Examiner's rejection of claims 1, 5-7, 12, 17, 20, 24-26, 31, and 37 under 35 U.S.C. § 103(a) as being obvious over Chan and Chakrabarti is reversed, as is the rejection of claims 2-4, 8-11, 13-16, 21-23, 27-30, 32-35, 36, and 38 under 35 U.S.C. § 103(a) as being obvious over Chan, Chakrabarti, and Wu.

AFFIRMED-IN-PART

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