IN RE HIROYUKI IWAHASHI, YOSHIKI NISHIOKA and MITSUHIRO HA-KARIDANI

No. 89-1019

UNITED STATES COURT OF APPEALS FOR THE FEDERAL CIRCUIT

888 F.2d 1370; *1989 U.S. App. LEXIS 16805*; *12 U.S.P.Q.2D (BNA) 1908*

November 7, 1989, Decided

PRIOR HISTORY: [**1] Appealed from: United States Patent & Trademark Office Board of Patent Appeals and Interferences.

CASE SUMMARY:

PROCEDURAL POSTURE: Appellant sought review of a decision of the United States Patent and Trademark Office Board of Patent Appeals rejecting its patent application under *35 U.S.C.S. § 101*.

OVERVIEW: Appellant objected to the rejection of its patent application based on the finding of the United States Patent and Trademark Office Board of Patent Appeals and Interferences that the subject matter was a nonstatutory mathematical algorithm under *35 U.S.C.S. § 101*. The court reversed the rejection based on its finding that appellant's auto-correlation circuit for use in pattern recognition was an algorithm that was implemented in a specific manner to define structural relationships between physical elements of the claim. The court found that it was no ground for holding a claim was directed to nonstatutory matter to say it included or was directed to an algorithm. The court concluded that the fact that an apparatus operated according to an algorithm did not make it nonstatutory.

OUTCOME: The court reversed the decision that rejected appellant's patent application because the fact that appellant's apparatus operated according to an algorithm did not make it nonstatutory for patent purposes.

CORE TERMS: algorithm, auto-correlation, input, co-efficient, subject matter, memory, nonstatutory, mathematical, apparatus, patent, invention, circuitry, calculating, drawings, signal, specification, electronic, square, calculation, multiplier, formula, squared, means-plus-function, step-by-step, performing, sentence, accuracy, preempt, solving, output

LexisNexis(R) Headnotes

Patent Law > Subject Matter > General Overview
[HN1] Determination of whether a claim preempts nonstatutory subject matter as a whole requires a two-step analysis. First, it must be determined whether the claim directly or indirectly recites an "algorithm" in the Benson sense of that term, for a claim which fails even to recite an algorithm clearly cannot wholly preempt an algorithm. Second, the claim must be further analyzed to ascertain whether in its entirety it wholly preempts that algorithm.

Computer & Internet Law > Patent Protection > General Overview
Patent Law > Subject Matter > Processes > Computer Software & Mental Steps
Patent Law > Subject Matter > Processes > New Uses
[HN2] It is no ground for holding a claim is directed to nonstatutory subject matter to say it includes or is directed to an algorithm.

Patent Law > Subject Matter > General Overview
[HN3] Once a mathematical algorithm has been found, the claim as a whole must be further analyzed. If it ap-

pears that the mathematical algorithm is implemented in a specific manner to define structural relationships between the physical elements of the claim, in apparatus claims, or to refine or limit claim steps, in process claims, the claim being otherwise statutory, the claim passes muster under *35 U.S.C.S. § 101*.

Patent Law > Subject Matter > General Overview
[HN4] The fact that the apparatus operates according to an algorithm does not make it nonstatutory.

Patent Law > Claims & Specifications > General Overview
Patent Law > Infringement Actions > Claim Interpretation > Means Plus Function
[HN5] *35 U.S.C.S. § 112*, para. 6 states that each means-plus-function definition shall be construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof.

COUNSEL: Charles Gorenstein, Birch, Stewart, Kolasch & Birch, of Falls Church, Virginia, argued for Appellant. With him on the brief was Michael K. Mutter.

John C. Martin, Associate Solicitor, Office of the Solicitor, of Arlington, Virginia, argued for Appellee. With him on the brief was Fred E. McKelvey, Solicitor.

JUDGES: Rich, Circuit Judge, Nichols, Senior Circuit Judge, * and Bissell, Circuit Judge.

> * Judge Nichols heard oral argument but, due to illness, did not participate in the decision.

OPINION BY: RICH

OPINION

 [*1371]   RICH, Circuit Judge

This appeal is from the decision of the United States Patent and Trademark Office (PTO) Board of Patent Appeals and Interferences (board), dated May 24, 1988, adhered to on reconsideration, affirming the examiner's final rejection of the single claim of applicants' patent application serial No. 454,022, filed December 28, 1982, entitled "Auto-Correlation Circuit for Use in Pattern Recognition." The sole ground of rejection is that the subject matter claimed is nonstatutory under *35 U.S.C. § 101* because it [**2]   is merely a mathematical algorithm. We reverse.

The real party in interest, according to appellants' brief, is Sharp Kabishiki Kaisha (Sharp Corporation).

The opening sentence of the specification states: "This invention relates to an auto-correlation unit for use in pattern recognition to obtain auto-correlation coefficients as for stored signal samples." The embodiment more particularly discussed as a species of pattern recognition is voice recognition. The prior art calculation of auto-correlation coefficients is described as being based on a calculation formula involving a multiplication step. The specification states the disadvantage to be as follows:

> Those state-of-the-art units for calculation of the auto-correlation coefficients have the disadvantage of requiring expensive multipliers and also complicated circuitry. As a result the auto-correlation unit circuitry within the entire pattern recognition apparatus is proportionately large and auto-correlation calculation demands a greater amount of time during recognition.
>
> . . . .
>
> The principal object of this invention is to provide an auto-correlation unit for pattern recognition which evaluates auto-correlation coefficients [**3]   by means of a simple circuitry without the need for an expensive multiplier as well as eliminating the above discussed disadvantages.

Underlying the auto-correlation unit claimed, is a plethora of mathematical demonstration by which the applicants purport to show that the approximated value of the desired coefficient can be obtained *without multipliers* by obtaining the *square* of the sum of two of the factors in the equation and calculating the auto-correlation coefficient therefrom according to a stated formula. The specification concludes:

> As explained in the foregoing, this invention offers a highly cost effective auto-correlation unit for pattern recognition with simple circuitry without the need to use an expensive multiplier, but [*1372] which has comparatively high accuracy and can, moreover, calculate auto-correlation coefficients at high speed.

Fig. 1 of the application drawings is described as "a block diagram schematically showing an embodiment of this invention" and appears as follows:

[SEE FIGURE IN ORIGINAL]

Fig. 2 is described as "a block diagram showing in more detail the embodiment of this invention" and appears as follows:

[**4] [SEE FIGURE IN ORIGINAL]

We shall not attempt a description of the electronic circuitry shown by these drawings beyond explaining, for the better understanding of the claim, that the units designated "ROM" and "RAM" are, respectively, a read only memory and a random access memory, terms well understood by those skilled in the art. "CPU" is a central processing unit. In this case, the function of the ROM, 2 or 15, which is a permanent information storage device, is to deliver as output the *square* of a number fed to it as input. It is the electronic equivalent of a table in which one can look up the square of numbers over a desired range.

[*1373] We next reproduce the claim on appeal and do so by presenting a copy of the claim as it has been presented in the Solicitor's brief, to which we have added the letters in brackets designating at [a] the preamble or introductory clause and at [b] through [h] the several means-plus-function and other elements of the combination of elements recited. Under the heading "Drawings" (the Solicitor's heading was "Fig. 1") we have copied verbatim the Solicitor's designations. Element [d], it will be noted, is not in means-plus-function [**5] form but specifies a "read only memory" or ROM, as the Solicitor says. Element [f] is an anomalous clause seemingly intended to indicate what data are stored in the ROM. It is not clear that a *means* for storing anything in the ROM is part of the disclosed "unit" since the application indicates that the squared values are "previously memorized" in the ROM. However, that has nothing to do with the sole question before us which is whether the claim as a whole is, in the words of the Solicitor, "directed to nonstatutory subject matter," so we shall not comment further on element [f].

Claim	Drawings
[a] An auto-correlation unit for providing auto-correlation coefficients for use as feature parameters in pattern recognition for N pieces of sampled input values X[n] (n=0 to N -1), said unit comprising:	
[b] means for extracting N pieces of sample input values X[n] from a series of sample values in an input pattern expressed with an accuracy of optional multi-bits;	Not shown in Fig. 1; analog to digital converter 11 in Fig. 2.
[c] means for calculating the sum of the sample values X[n] and X[n]- r (t=0-P, P< N);	Adder 1.
[d] a read only memory associated with said means for calculating;	ROM 2.
[e] means for feeding to said read only memory the sum of the sampled input values as an address signal;	Signal path connecting adder 1 to ROM 2.
[f] means for storing in said read only memory the squared value of each sum, (X[n] + X[n]- r)2	Internal structure of ROM 2 after being programmed to store squared values.
[g] means for fetching and outputting the squared values of each such sum of the sample input values from said read only memory when said memory is addressed by the sum of the sample input values; and	Read pulse (not shown) which is applied to ROM 2; in Fig. 2, signal f[1] or f[2], applied to ROM

Claim	Drawings
	15.
[h] means responsive to the output (X [n] +	Calculating circuit
X[n]- r) 2	5.
of said read only memory for pro-	
viding an auto-correlation coefficient for use	
as a feature parameter according to the fol-	
lowing formula:	
[SEE FORMULA IN ORIGINAL]	

[**6] [*1374] This is one more in the line of cases stemming from the Supreme Court decision in *Gottschalk v. Benson, 409 U.S. 63, 34 L. Ed. 2d 273, 93 S. Ct. 253 (1972)*, decided by our predecessor, the United States Court of Customs and Patent Appeals. They include in chronological order, *In re Chatfield, 545 F.2d 152, 191 U.S.P.Q. (BNA) 730 (CCPA 1976)*, cert. denied 434 U.S. 875, 98 S. Ct. 226, 54 L. Ed. 2d 155, 195 U.S.P.Q. (BNA) 465 (1977), *In re Freeman, 573 F.2d 1237, 197 U.S.P.Q. (BNA) 464 (CCPA 1978)*, *In re Maucorps, 609 F.2d 481, 203 U.S.P.Q. (BNA) 812 (CCPA 1979)*, *In re Walter, 618 F.2d 758, 205 U.S.P.Q. (BNA) 397 (CCPA 1980)*, *In re Abele, 684 F.2d 902, 214 U.S.P.Q. (BNA) 682 (CCPA 1982)*, and *In re Meyer, 688 F.2d 789, 215 U.S.P.Q. (BNA) 193 (CCPA 1982)*. The list is not exhaustive but representative.

Out of these cases came the *Freeman-Walter* test to determine whether a claim defines nonstatutory subject matter. It was stated in *Freeman* as follows:

[**7] [HN1] Determination of whether a claim preempts nonstatutory subject matter as a whole, in the light of *Benson*, requires a two-step analysis. First, it must be determined whether the claim directly or indirectly recites an "algorithm" in the *Benson* sense of that term, for a claim which fails even to recite an algorithm clearly cannot wholly preempt an algorithm. Second, the claim must be further analyzed to ascertain whether in its entirety it wholly preempts that algorithm.

573 F.2d at 1245, 197 USPQ at 471. The opinion next discusses the meaning of "algorithm" quoting from *Chatfield* footnote 5:

Over-concentration on the word "algorithm" alone, for example, may mislead. The Supreme Court carefully supplied a definition of the particular algorithm before it [in *Benson*], i.e., "[a] procedure for solving a given type of *mathematical* problem." The broader definition of algorithm is "a step-by-step procedure for solving a problem or accomplishing some end." *Webster's New Collegiate Dictionary (1976)*.

. . . It would be unnecessarily detrimental to our patent system to deny inventors patent protection on the *sole* ground that their [**8] contribution could be broadly termed an "algorithm". [Emphasis of "sole" original, otherwise ours.]

In footnote 8 of the *Freeman* opinion the court further said:

The preferred definition of "algorithm" in the computer art is: "A fixed step-by-step procedure for accomplishing a given result; usually a simplified procedure for solving a complex problem, also a full statement of a finite number of steps." C. Sippl & C. Sippl, Computer Dictionary and Handbook (1972).

Id. at 1246 n. 8, 197 USPQ at 471 n. 8. Appellants state that the apparatus claimed "may properly be characterized as a computer."

We note these discussions of the meaning of "algorithm" to take the mystery out of the term and we point out once again that every step-by-step process, be it electronic or chemical or mechanical, involves an algorithm in the broad sense of the term. Since *§ 101* expressly includes processes as a category of inventions which may be patented and § 100(b) further defines the word "process" as meaning "process, art or method, and includes a new use of a known process, machine, manu-

facture, composition of matter, or material," it follows [**9] [HN2] that it is no ground for holding a claim is directed to nonstatutory subject matter to say it includes or is directed to an algorithm. This is why the proscription against patenting has been limited to *mathematical* algorithms and abstract *mathematical* formulae which, like the laws of nature, are not patentable subject matter.

The above-listed line of CCPA cases held some claims statutory and other claims nonstatutory, depending entirely on what they said. We have to do the same here. Appellants cautiously admit that their claim "at least indirectly, recites an algorithm in some manner," and thus [*1375] meets the first part of the *Freeman-Walter* test, but argue strenuously and convincingly that it does not meet the second part of the test, relying, inter alia, on the following statement in *Walter* (footnote omitted):

> [HN3] Once a mathematical algorithm has been found, the claim *as a whole* must be further analyzed. If it appears that the mathematical algorithm is implemented in a specific manner to define structural [**10] relationships between the physical elements of the claim (in apparatus claims) or to refine or limit claim steps (in process claims), the claim being otherwise statutory, the claim passes muster under § 101.

618 F.2d at 767, 205 USPQ at 407 (footnote omitted). Though the claim starts out by saying in clause [a] that it is a "unit", appellants prefer to characterize what they claim as apparatus with specific structural limitations. By the Solicitor's own analysis of the claim in the column labeled "Drawings", supra, we are constrained to agree. Appellants emphasize that they specify a ROM in clause [d] to which is fed an input from an adder specified in clause [c]. The Solicitor states that [c] and [d] are connected together by a signal path. Next are means in the form of disclosed electronic circuitry which take from the ROM its output in the form of squares of numbers supplied as ROM input and feed them to a calculating circuit [h]. The claim as a whole certainly defines apparatus in the form of a combination of interrelated means and we cannot discern any logical reason why it should not be deemed statutory subject matter as either a machine [**11] or a manufacture as specified in § 101. [HN4] The fact that the apparatus operates according to an algorithm does not make it nonstatutory. *See In re Abele, 684 F.2d at 906, 214 USPQ at 686*. See also the discussion of that case in *In re Grams, 888 F.2d 835, 12*

U.S.P.Q.2d (BNA) 1824 (Fed. Cir. 1989), slip opin. at 11-12. We therefore hold that the claim is directed to statutory subject matter.

In the Solicitor's brief the summary of argument states that the claim "encompasses any and every means for performing the functions recited therein." We point out that the claim is a combination of means all but one of which is a means-plus function limitation, the one exception being the ROM, clause [d], which is a specific piece of apparatus. The claim is therefore subject to the limitation stated [HN5] in *35 U.S.C. § 112* para. 6 that each means-plus-function definition "shall be construed to cover the corresponding structure, material, or acts described in [**12] the specification and equivalents thereof." [1] This provision precludes the Solicitor's interpretation of the claim. The Solicitor's summary also contends that since the claim should be interpreted as he does, we should regard it as though it were a method claim. Since he is wrong on the first score, he is wrong on the second.

> [1] The accuracy of this statement may be questioned in view of a sentence in the opinion in *In re Sweet, 55 C.C.P.A. 1191, 393 F.2d 837, 841-42, 157 U.S.P.Q.2d (BNA) 495, 499 (CCPA 1968)*, which reads: "[A] recitation of "means" for performing a function is interpreted broadly to cover all means capable of performing the stated function and *is not limited to the particular structure which the application may disclose*." (Emphasis added.) This statement, considered in a vacuum, is partly true and partly untrue. It must be read, however, in light of the opinion as a whole. It should not be removed from its context. The untrue part is the initial statement that the means clause is interpreted to cover *all* means to perform the function. It should have said it is interpreted to cover the means disclosed and *all equivalents* thereof which perform the function. The immediately preceding two paragraphs of the opinion show that the court actually was reading the "means" clause "in the light of *35 U.S.C. 112* [last paragraph]," just as we are doing here. The statute is set forth in note 5. The truth of the emphasized portion of the above sentence is beyond question because the "means" clause includes equivalents of the disclosed structure. *Section 112* para. 6 cannot be ignored when a claim is before the PTO any more than when it is before the courts in an issued patent.

[**13] The decision of the board is *reversed*.

REVERSED.