

Commissioner's Decision #1232  
Décision du commissaire #1232

TOPIC: J-10  
SUJET: J-10

Application No: 2,047,731  
(International Classification: G06F-007/38)  
Demande No: 2,047,731  
(Classification internationale: G06F-007/38)

## COMMISSIONER'S DECISION SUMMARY

C.D. 1232 .. App'n 2,047,731

### Non-statutory subject matter

The examiner rejected this application under the provisions of Sections 2 and 27(3) of the Patent Act on the basis that what is claimed is nothing more than a general purpose computer which is programmed to calculate Jth roots and reciprocals of Jth roots. The Board determined that the application discloses and claims an apparatus which is specifically designed to carry out the applicant's new method of calculating Jth roots and reciprocals of Jth roots.

The application was returned to the examiner for further prosecution.

IN THE CANADIAN PATENT OFFICE

DECISION OF THE COMMISSIONER OF PATENTS

Patent application number 2,047,731, having been rejected under Rule 47(2) of the Patent Regulations, the Applicant asked that the Final Action of the Examiner be reviewed. The rejection has consequently been considered by the Patent Appeal Board and by the Commissioner of Patents. The findings of the Board and the ruling of the Commissioner are as follows:

Agent for Applicant

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This decision deals with the Applicant's request for a review by the Commissioner of Patents of the Examiner's Final Action dated August 11, 1995 on patent application number 2,047,731 (International Classification G06F-007/38) filed on November 13, 1990 and entitled "Apparatus for High Speed Determination of JTH Roots and Reciprocals of JTH Roots". The Applicant is Motorola Inc., assignee of inventor Brett L. Lindsley. In the Final Action, the Examiner rejected all of the claims of the application, as well as the whole application, for lack of patentable subject matter in view of Section 2 and Section 27(3) of the Patent Act. A hearing was held on November 26, 1997, at which time, the Applicant was represented by Mr Gary O'Neil of Gowling, Strathy & Henderson.

The application relates to an apparatus which processes an electrical signal to determine a reciprocal of the  $j^{\text{th}}$  root of an input value. Figure 1 appearing below shows a general flow chart of the implementation of the invention.

Claim 1, which is the only independent claim, reads as follows:

A numeric processing apparatus for processing electrical signals to determine a reciprocal of a desired  $j^{\text{th}}$  root of an input value  $S$  other than  $S = \sqrt{4}$ ,  $\sqrt{0}$ , or Not-a-Number(NaN), based on an input value  $m$  reflecting a desired convergence rate  $m$  in a selected error equation and an input value  $j$  reflecting a magnitude of  $j$  for a desired reciprocal  $j^{\text{th}}$  root, comprising:

A) first selecting means for applying electrical signals responsive to the input value  $S$  to select an input value  $S$  other than  $S = \sqrt{4}$ ,  $\sqrt{0}$ , or NaN;

B) second selecting means for applying electrical signals responsive to the input value  $j$  to select  $j$ ;

C) third selecting means for applying electrical signals responsive to the input value  $m$  to select  $m$ ;

D) a read-only memory storage unit coupled to the first selecting means and the second selecting means for applying electrical signals to determine  $b$  such that  $b$  is approximately equal to the reciprocal of the  $j^{\text{th}}$  root of  $S$ ;

E) second determining means coupled to the second selecting means and the read-only memory storage unit for applying electrical signals to determine  $b^j$  such that  $b$  is raised to the power of  $j$ ;

F) third determining means coupled to the read-only memory storage unit and the second determining means for applying electrical signals to determine  $x$  such that  $x = S \cdot b^j$ ;

G) fourth determining means coupled to the second selecting means, the third selecting means, and the third determining means for applying electrical signals to determine a convergence factor  $d$  such that  $d$  is obtained as a solution of an error equation  $x \cdot \{f_j[m](x)\}^j = 1 - \epsilon^m$ , also expressible as  $(1 - \epsilon) \cdot \{f_j[m](\epsilon)\}^j = 1 - \epsilon^m$ , noting that as  $f_j[m](1 - \epsilon)$  is a function of  $\epsilon$ , then  $f_j[m](\epsilon)$  is also a function of  $\epsilon$ , where:

$$\epsilon = 1 - x;$$

$f_j[m](\epsilon)$  is an  $m-1^{\text{th}}$  order polynomial in terms of  $\epsilon$  that when raised to the  $j^{\text{th}}$  power and multiplied by  $(1 - \epsilon)$  causes an error  $\epsilon$  to decrease by the  $m^{\text{th}}$  power;

$$f_j[m](\epsilon) = 1 + A_1\epsilon^1 + A_2\epsilon^2 + A_3\epsilon^3 \dots + A_{m-1}\epsilon^{m-1};$$

$$0 < 1 - \epsilon < 2;$$

$\{f_j[m](\epsilon)\}^j$  is expanded and multiplied by  $(1 - \epsilon)$  as indicated; all terms that contain  $\epsilon^p$  such that  $p > m$  are eliminated, obtaining an equation with coefficients  $g_1$  through  $g_m$  of the form

$$1 + g_1\epsilon^1 + g_2\epsilon^2 + g_3\epsilon^3 \dots + g_m\epsilon^m = 1 - k\epsilon^m;$$

the coefficients of terms  $\epsilon^1, \epsilon^2, \epsilon^3, \dots, \epsilon^{m-1}$  are equated to zero yielding solutions for the  $A_1$  through  $A_{m-1}$  coefficients above;

$(1 - x)$  is substituted for  $\epsilon$  to obtain

$$f_j[m](x) = 1 + K_1x^1 + K_2x^2 + K_3x^3 \dots + K_{m-1}x^{m-1},$$

where the  $K$ 's are functions of the  $A$ 's;

such that convergence factor  $d = f_j[m](x)$ ;

H) fifth determining means coupled to the second selecting means and the fourth determining means for applying electrical signals to determine  $d^j$  such that  $d$  is raised to the power of  $j$ ;

I) sixth determining means coupled to the third determining means and the fifth determining means for applying electrical signals to determine a new  $x$  such that  $x = x \cdot d^j$ ; and

J) seventh determining means coupled to the first determining means and the fourth determining means for applying electrical signals to determine a new  $b$  such that  $b = b \cdot d$  and  $b$  appear as an output signal.

In his Final Action the Examiner rejected all of the claims as well as the application itself stating, in part, that:-

The refusal of all of the claims as well as the remainder of the application is maintained for lack of patentable subject matter in view of Sections 2 and 27(3) of the Patent Act.

The application teaches a mathematical technique for high speed

determination of Jth roots and reciprocals of Jth roots.

What is claimed is a numeric processing apparatus embodying nothing more than a particular function of a general purpose computer with the purpose of calculating Jth roots and reciprocals of Jth roots.

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The apparatus claimed merely solves mathematical formulae which are assimilated to a mere scientific principle or abstract theorem.

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It is obvious to anyone skilled in the art that what the alleged invention is teaching is a mathematical algorithm which is claimed as a device. It is this mathematical algorithm that the application teaches and which has in fact been discovered. The fact that it is claimed as a device - or possibly as a computer program - is irrelevant to the question A...what, according to the application has been discovered...@. How the alleged invention was or could be implemented - in computer hardware, software or both - is not relevant as far as patentability is concerned.

In its reply to the Final Action, the Applicant has provided a detailed review of the development of the law with respect to the patentability of computer related inventions, as outlined in decisions of various United States courts. It was also stated that the only Canadian court decision with respect to computer related inventions, Schlumberger vs. The Commission of Patents 56 C.P.R. 2d (p. 204), is not relevant in the present case.

The Applicant stated, in part, that:

The Examiner makes reference to and apparently relies on the decision of the Federal Court of Appeal in Schlumberger vs. The Commission of Patents 56 C.P.R. 2d (p. 204). As will be set forth in more detail hereafter, this decision is considered to be irrelevant to the present case in that it relates merely to the issue of the patentability of a computer program per se.

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.... The first and to date the only decision for guidance in this area is the decision of the Federal Court of Appeal in Schlumberger Canada Ltd. vs. The Commission of Patents (56 C.P.R.) (2d) 204. The Schlumberger application related primarily to the production of data useful in geological exploration. In carrying out the process, certain input measurements derived from test holes were recorded on magnetic tape and subsequently fed into a computer. The computer was programmed according to prescribed mathematical formulae, and the information was converted by the computer into useful information such as graphs or figures of tables which could be read by geologists.

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It is quite evident from the above that this case is diametrically opposed as far as its facts are concerned to the Schlumberger case referred to above wherein an attempt was made to obtain protection for a method of operating a computer in a selected manner to accomplish certain mathematical calculations, the end result being merely numbers useful in making certain decisions by skilled geologists. In contrast to Schlumberger, the present application describes and claims a device which, when considered as a whole, is new and useful as required by Section 2 and which is not a mere scientific principle or abstract theorem as prescribed by Section 27(3). Applicant's claims do not pre-empt the use by others of any form of program or algorithm per se; they only seek to pre-empt the use of the device set forth in the claims.

The Board must therefore decide whether or not Applicant=s invention is directed to an invention which is patentable under Sections 2 and 27(3) of the Patent Act.

Invention is defined in Section 2 of the Patent Act as follows:

.....any new and useful art, process, machine, manufacture or composition of matter, or any new and useful improvement in any art, process, machine, manufacture or composition of matter.

Subsection 27(3) of the Patent Act read at the time of the Final Action as follows:

No patent shall issue for an invention that has an illicit object in view, or for any mere scientific principle or abstract theorem.

The Board has done a complete review of the application in order to determine exactly what has been discovered. According to the Applicant=s disclosure, the alleged invention is directed to an apparatus for high speed determination of  $J^{\text{th}}$  roots and reciprocals of  $J^{\text{th}}$  roots.

From this review, the Board has determined that the Applicant has discovered a convergence algorithm for use with selected convergence rates, including higher order convergence rates which gives improved efficiencies on mathematical computations of  $J^{\text{th}}$  roots, has converted this algorithm into a series of method steps and finally has developed a device to carry out this series of steps.

It is widely accepted that it is not possible to obtain a patent containing claims to an algorithm per se. Similarly, a method which does nothing more than set out the step needed to solve the algorithm is not patentable.

An apparatus claim which consists exclusively of a series of means-plus-functions statements is usually considered to be nothing more than a disguised method claim and if the method itself is not patentable, this type of apparatus claim is also not patentable.

As can be seen from the wording of claim 1, the apparatus disclosed and claimed in the instant application is more than just a series of means-plus-function statements. It includes, in



section D), a read-only memory unit which is coupled to the first selecting means and the second selecting means. This is a specific piece of computer hardware and, as such, this claim is necessarily limited to a specific configuration of at least one physical element as well as some elements which are ordinary components of a well-known digital computer which are programmed to carry out desired functions.

The Board has concluded that the Applicant has invented a device which is specifically adapted to carry out the method of solving the algorithm which the Applicant has developed. This device, while it does contain many means-plus-function statements, also includes at least one specific piece of computer hardware which is a real physical element. As a result, the Board believes that the claims of this application go beyond being directed to a mere scientific principle or abstract theorem. The Applicant is not seeking to exclude others from using the algorithm itself but is seeking to exclude others from using the specific device which is claimed.

In summary, the Board recommends that the refusal of all of the claims as well as that application itself be withdrawn and that the application be returned to the examiner for further prosecution.

P.J. Davies  
Chairman

M. Howarth  
Member

M. Wilson  
Member

I concur with the findings and the recommendation of the Patent Appeal Board. Accordingly,

I return the application to the Examiner for further prosecution consistent with this decision.

S. Batchelor

Commissioner of Patents

dated at Hull, Quebec

this 3rd day of November 1998