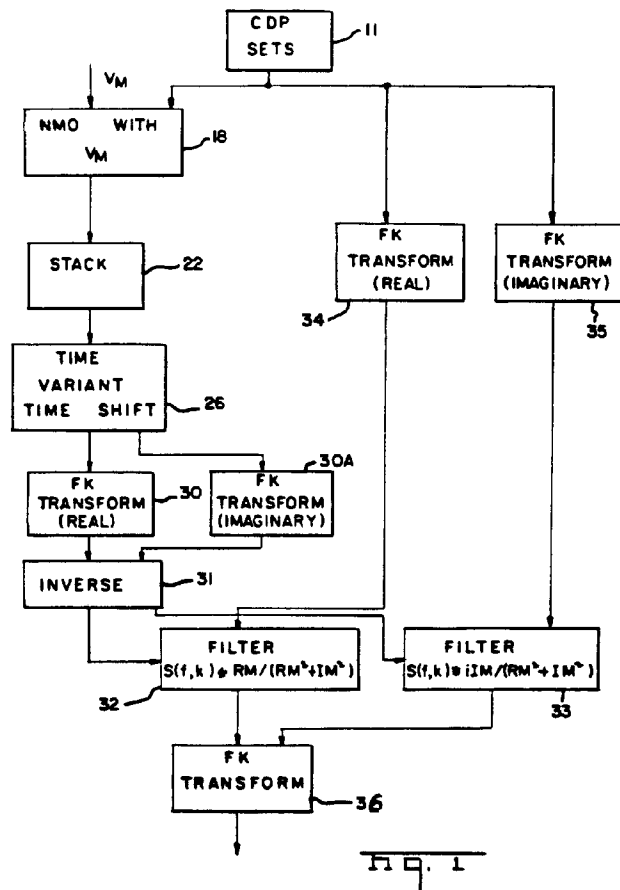


Sections 2, 28(3)

The method of filtering multiple reflections from seismograms were held to be in a useful art and to be more than mere calculations. Rejection withdrawn.

This decision deals with Applicant's request for review by the Commissioner of Patents of the Final Action of application 385,965 (Class 349-16) filed September 15, 1981. Assigned to Mobil Oil Corporation, it is entitled F-K FILTERING OF MULTIPLE REFLECTIONS FROM A SEISMIC SECTION. The inventor is W.H. Ruehle. The Examiner in charge issued a Final Action on November 25, 1983, refusing to allow the application. By letter dated March 25, 1988, the Applicant withdrew his request for a hearing.

The invention relates to a system, shown in figure 1 below, for obtaining a seismic section from sets of common depth point (CDP) seismic reflections which are plotted as per distance (X) and time (T) in arrays (X-T), and more particularly for enhancing the primary reflections and suppressing the distortion caused by multiple reflections in the X-T arrays.



A correction is made at 18 to align the multiple reflections in the CDP sets 11, followed by stacking the corrected set 22 to obtain an estimate of multiple reflections. The reverse of the correction 18 is performed to obtain a time variant time shift 26 of the multiple reflections of the CDP set, after which that set is transformed 30, 30A, into real and imaginary portions and then into a frequency and wave number array $(f-k)$. This array is inverted 31, to be inversely proportional to the amplitude of the multiple reflections. The seismic section itself is divided into real and imaginary parts by the $(f-k)$ transforms 34, 35 whereby the seismic section is converted into an array $S(f-k)$ of real and imaginary parts by the real $(f-k)$ transform 34, and the imaginary $(f-k)$ transform 35. The real parts from 30 and 34 proceed to filter 32, the imaginary parts from 30A and 35 proceed to filter 33. In filters 32, 33, each sample of the $S(f-k)$ arrays is weighted by a factor inversely proportional to the amplitude of the corresponding sample in the $(f-k)$ transform of the multiple reflections in order to suppress multiple reflections. Conversion of the filtered $(f-k)$ array to a normal X-T array then occurs at 36 and results in a suppression of the multiple reflections.

In the Final Action, the Examiner said, in part, as follows:

...

In the Schlumberger case the process involved the transformation of seismic signals representative of well logging data into more useful data indicative of earth formation characteristics. The discovery of relating seismic data by mathematical transformation to the physical result of formation characteristics was not held patentable.

The issue in the present case is similar to the Schlumberger case whereby a series of mathematical transformations on a seismogram produces a more useful seismogram. Such discoveries are clearly not patentable in accordance with Schlumberger. The Re Johnson et al case referred to by Applicant is not Canadian Law.

Office guidelines 2 and 3 (P.O.R., August 1, 1978, p. 26)
read as follows:

2. Claims to a new method of programming a computer are not patentable.
3. Claims to a computer programmed in a novel manner, expressed in any and all modes, where novelty lies solely in the program or algorithm, are not directed to patentable subject matter under Section 2 of the Patent Act.

The present discovery of effecting a series of steps on a seismogram in order to convert it into a filtered seismogram providing a more useful seismic section is one of calculations or programming as referred to in the above guidelines. Since no novel structural apparatus has been disclosed this discovery is not patentable.

...

The Applicant argued the merits of his case on the basis of the guidance provided by several Court cases, amongst them, Schlumberger v. The Commissioner of Patents 56 C.P.R. (2d) 204, and In re Johnson, Parrack and Lundsford (1978) 200 USPQ 199.

In discussing the Schlumberger case, the Applicant refers to certain passages therefrom as follows:

What is new here is the discovery of the various calculations to be made and of the mathematical formulae to be used in making these calculations. If those calculations were not to be effected by the computers, but by men, the subject matter of the application would clearly be mathematical formulae and a series of purely mental operations; as such, in my view, it would not be patentable.

and

What the appellant claims as an invention here is merely the discovery that by making certain calculations according to certain formulae, useful information could be extracted from certain measurements. This is not, in my view, an invention within the meaning of Section 2.

The Applicant assesses the In re Johnson case in the following terms, in part, as follows:

... The invention, for which applicants had sought a patent, involved methods for removing undesired seismic signals or noise components from recorded seismic data. The removal of noise facilitated interpretation of the seismic data and thereby assisted in the determination of subterranean structure.

The Court unequivocally stated that, after the decision in Flook (Parker v. Flook (1978) 198 USPQ 1983), a conclusion that patent protection is proscribed for all inventions "algorithmic in character" is overbroad and erroneous. The Court began its analysis by determining whether the method claims recited methods of calculating, as were present in Flook. The Court found two important factual distinctions between the claims at issue and the claims in Flook. Unlike the applicant in Flook, the applicants in the instant appeals (sic) alleged no novel mathematical formula. Furthermore, the products produced by the applicants' (sic) claimed process were new, noiseless seismic traces recorded on a record medium, and not mere mathematical values. The significant limitations, recited in the claims, of operating on a recorded, unenhanced seismic trace led the Court to find that the claims recited statutory processes and not methods of calculation, under the Flook criterion.

The Court then went on to consider whether the claims merely recited mathematical algorithms in a non-statutory manner, applying the Freeman (in re Freeman (1978) 197 USPQ 464) test to conduct the Benson (409 U.S. 63, 175 USPQ 673 (1972)) inquiry. The Court found that the claims as a whole, including all of its steps, did not merely recite a mathematical formula or a method of calculation. Careful interpretation of each claim in the light of the supporting disclosure was held to be necessary to determine whether the claim merely defined a method of solving a mathematical problem; if not, then the claim defined a process, which is statutory subject matter.

...

The Applicant explains that his method relates to conversion of a seismic trace into a more useful version, noting as follows, in part:

...

... The applicant in this application does not merely claim as an invention the discovery that by making certain calculations according to certain formulae, useful information could be extracted from certain measurements, as was the case in Schlumberger. Rather, the instant application discloses the production of a new result, i.e. a new enhanced seismogram, by the method of the invention.

It is submitted that seismograms are physical apparitions and that the operations upon them are physical steps. It is submitted that the possible expression of the physical apparitions in mathematical terms is irrelevant.

...

The issue before the Board is whether or not the application and the claims present statutory subject matter in view of Sections 2 and 28(3) of the Patent Act. Claim 1 reads:

A method of filtering multiple reflections from seismograms representing the earth's formations comprising:

- (a) generating first seismograms representing the amplitude of seismic primary and multiple reflections as a function of time and distance along a line of exploration;
- (b) transforming said first seismograms into an f-k array of first real and first imaginary parts representing amplitude as a function of frequency and wave number;
- (c) normal moveout correcting said first seismograms with the apparent velocity of said multiple reflections to align said multiple reflections;
- (d) stacking said normal moveout corrected first seismograms having aligned multiple reflections,
- (e) inverse normal moveout correcting said stacked first seismograms to produce second seismograms representing multiple reflections,
- (f) transforming said second seismograms with aligned multiple reflections into an f-k array of second real and second imaginary parts,
- (g) determining the inverse of said second real and second imaginary parts of the f-k array of said second seismograms,
- (h) filtering said first real part of the f-k array of said first seismograms by weighting all samples of said first real part with corresponding samples of the inverse of said second real part of the f-k array of said second seismograms,
- (i) filtering said first imaginary part of the f-k array of said first seismograms by weighting all samples of said first imaginary part with corresponding samples of the inverse of said second imaginary part of the f-k array of said second seismograms, and
- (j) transforming said filtered first real and first imaginary parts into third seismograms representing an enhanced representation of the earth's formation with suppressed multiple reflections as a function of time and distance along said line of exploration.

Both the Examiner and the Applicant have isolated the nature of the invention, namely, the conversion of a seismogram. The Examiner holds the conversion amounts to no more than calculations. The Applicant has pointed out that his invention pertains to work that is done on seismograms whereby an undesired characteristic previously caused by multiple reflections is suppressed. The Applicant has explained how the various steps of his method have produced an enhanced seismogram by removing undesired signals. He has discussed that whereas in Schlumberger the discovery related to making certain calculations for extracting certain measurements, the Applicant's system of conversion of seismic traces to remove undesirable characteristics presents more than mere calculations, in that the Applicant's system improves upon the physical steps in producing a more useful seismogram.

The Examiner has refused the application and the claims in view of Section 28(3) of the Act which reads:

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

We see that mathematical calculations may be part of the Applicant's system in that the seismic reflections are stored as an array of samples in a digital computer, and that Fourier transforms convert the array into amplitude and a function of frequency and wave number. We observe however, that the steps of the method work on the seismograms whereby the multiple reflections are suppressed. It is our opinion these steps bring another dimension to the kind of invention that the Applicant has presented. We regard the invention as pertaining to a useful system of filtering multiple reflections from seismograms, and as such we believe that more than calculations are involved. We are satisfied the nature of the Applicant's invention removes it from any of the categories identified in Section 28(3), and hence from being solely algorithmic.

Having so stated that the Applicant's system is useful and does not relate solely to calculations or algorithms, it is our further view that the method as described and claimed by the Applicant lies in the field of a useful art and is permissible under Section 2 of the Patent Act, which defines invention as follows:

"invention" means 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.

We recommend therefore, that the rejection of the application and claims for lack of statutory subject matter under Section 28(3) and Section 2 of the Patent Act, be withdrawn.

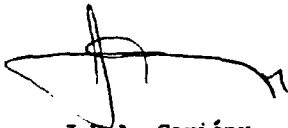


M.G. Brown
Acting Chairman
Patent Appeal Board



S.D. Kot
Member

I have reviewed the prosecution of this application. I concur with the findings and the recommendations of the Patent Appeal Board. Accordingly, I withdraw the refusal of the application and the claims, and I remand the application to the Examiner for prosecution consistent with the recommendation.



J.R.A. Gariépy
Commissioner of Patents

Dated at Hull, Quebec
this 19th day of September 1988

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