

PATENTS ACT 1977

APPLICANT Marathon Oil Company et al

ISSUE Whether patent application
GB0525899.1 complies with section 1(2)

HEARING OFFICER C L Davies

Introduction

- 1 Patent application GB 0525899.1 was filed in the name of Marathon Oil Company and Compagnie Generale de Geophysique (“the applicant”) on 20 December 2005 and it claims priority from a US patent application US 11022597, dated 22 December 2004. The UK application was published as GB2421822A on 5 July 2006.
- 2 The examiner, Mr. Jennings, issued an examination report on 29 April 2009 which indicated that the claimed invention was excluded under section 1(2) as a mathematical method and a program for a computer. Further correspondence between the applicant and the examiner has not resolved the issue. A hearing was offered on 27 January 2010 and the applicant asked for a decision on the papers. The un-extended section 20 period expired on 29 April 2010.

The application

- 3 The invention can be used for finding subterranean resources, such as oil, gas, water or minerals. To determine whether these resources are likely to be present, an extensive knowledge of the underground volume is required. Although direct measurements may be made in the small region around a well bore, the data obtained is unlikely to be a good representation of the properties of rock and fluid throughout a large underground volume. Of course, large scale drilling in a potential oil field purely for measurement purposes is clearly undesirable. Therefore, the use of seismic data and models which relate the seismic data to geological and petro-physical quantities are potentially very useful.
- 4 In the first sentence of the description, the invention is said to relate to “*a method for predicting quantitative values of a designated rock or fluid property*” and the description goes on to recognize the need to more effectively integrate seismic data with geological and petro-physical models in order to accurately characterize subterranean reservoirs.

The claims

- 5 Amended claims were most recently filed on 21 August 2009 and there are three independent claims (1, 2 and 19). Claim 1 reads as follows:

A method for determining a value of a designated rock or fluid property in a subterranean geologic volume, the method comprising:

assigning a first predicted value of a rock or fluid property to a cell within a multi-dimensional layered model that is correlated to a subterranean geologic volume;

calculating a first predicted value of a seismic response for said cell from a response model using said first predicted value of said rock or fluid property and based upon compressional velocity, shear velocity and bulk density, wherein said response model is responsive to changes in predicted values of said rock or fluid property;

comparing synthetic trace that are generated from said first predicted value of seismic response to the corresponding traces obtained from sets of actual seismic data corresponding to the subterranean geologic volume to ascertain a difference between said synthetic traces and said corresponding traces, said step of comparing involving maintaining consistency between the types, scales and dimensions of said first predicted value of a designated rock or fluid property and said actual seismic data; and

adjusting said first predicted value of said designated rock or fluid property in response to said difference to create a second predicted value of said designated rock or fluid property, wherein said second predicted value generally reduces said difference.

6. Claim 2 reads as:

A method for determining an error-minimized value of a designated rock or fluid property at a location in a subterranean geologic volume which is characterized by a multi-dimensional layered model volume having a plurality of model subvolumes, said method comprising:

assigning a first predicted value of a rock or fluid property to each of said plurality of subvolumes;

calculating a first predicted value of a seismic response for the interface between at least two groups of subvolumes and based upon compressional velocity, shear velocity and bulk density;

comparing synthetic trace that are generated from said first predicted value of seismic response to the corresponding traces obtained from a plurality of response volumes of actual seismic data corresponding to the subterranean geologic volume to determine a first difference between said synthetic traces and said corresponding traces, said step of comparing involves maintaining consistency between the types, scales and dimensions of said first predicted value of a designated rock or fluid property and said plurality of response volumes of actual seismic data; and

adjusting said first predicted value of said designated rock or fluid property in response to said difference to create a second predicted value of said designated rock or fluid property, wherein said second predicted value generally reduces said first difference.

7. Claim 19 reads as:

A method of characterizing a subterranean geologic volume, the method comprising:

assigning a first predicted value of a rock or fluid property to a cell within a multi-dimensional layered model that is correlated to a subterranean geologic volume; simultaneously calculating first predicted values of a seismic response for multiple angles of incidence for said cell from a response model using said first predicted value of said rock or fluid property and based upon compressional velocity, shear velocity and bulk density;

simultaneously comparing synthetic traces that are generated from said first predicted values of seismic response for multiple angles of incidence to corresponding traces obtained from corresponding multiple angles of incidence of actual seismic data from a subterranean geologic volume to ascertain the difference between said synthetic traces and said corresponding traces; and

adjusting said first predicted value of said designated rock or fluid property in response to said difference to create a second predicted value of said designated rock or fluid property, wherein said second predicted value generally reduces said difference.

8. Although there are slight differences in the scope of these claims, claims 2 and 19 follow essentially the same steps as claim 1 by comparing synthetic traces with corresponding traces from actual seismic data for the purpose of providing a second predicted value. So it seems clear that if one claim is patentable then they all are. Indeed, I note that in the letter dated 21 January 2010, the applicant has constructed its arguments around claim 1 and so although the arguments may be focused around claim 1, they also apply to claims 2 and 19. I shall consider the dependent claims as and when I need to.

Issue to be decided

9. The issue to be decided here is whether the claimed invention is a method of improving an existing model, as suggested by the examiner, or whether the claimed invention fundamentally relates to using a model in a patentable method of measuring fluid and rock properties, as suggested by the applicant. I note that in response to the second examination report (at lines 24-26 of the applicant's letter of 21 January 2010) the applicant says:

"It is accepted that the measurement is indirect (it being the aim of the invention to avoid large scale exploratory drilling), but it is a measurement of a physical property nonetheless."

10. This is an interesting point and at the outset I will say that I do not have any difficulty with the concept of "indirect" measurement. There are many quantities in the real world that cannot be measured directly for a variety of reasons. However, if an associated quantity can be measured, and there is knowledge of the relationship between those quantities, then the data may be processed and a useful result may be obtained. It may also not be limited to this simple illustration.

The law

11. The legislation which is relevant to excluded inventions is set out in section 1(2) of the Patents Act 1977, which reads as follows:

It is hereby declared that the following (among other things) are not inventions for the purposes of this Act, that is to say, anything which consists of –

- (a) *a discovery, scientific theory or mathematical method;*
- (b) *a literary, dramatic, musical or artistic work or any other aesthetic creation whatsoever;*
- (c) *a scheme, rule or method for performing a mental act, playing a game or doing business, or a program for a computer;*
- (d) *the presentation of information;*

but the foregoing provision shall prevent anything from being treated as an invention for the purposes of this Act only to the extent that a patent or application for a patent relates to that thing as such.

12. In considering patentability I shall, in line with IPO practice, use the structured approach set out by the Court of Appeal in its judgment in *Aerotel/Macrossan*¹. The test comprises the following four steps:

- 1) properly construe the claim
- 2) identify the actual contribution
- 3) ask whether the actual contribution falls solely within the excluded subject matter
- 4) check whether the contribution is technical in nature

13. It is well known that more recently the Court of Appeal, in the case of *Symbian*², confirmed that this structured approach is one means of answering the question of whether the invention reveals a technical contribution to the state of the art. In other words, *Symbian* confirmed that the four-step test is equivalent to the prior case law test of 'technical contribution', as per *Merrill Lynch*³, *Gale*⁴ and *Fujitsu*⁵.

Claim construction

14. The applicant and examiner differ on the meaning of claim 1 and of course the applicant suggests that an indirect measurement is being made. Without the benefit of a hearing to determine what is important and what is not I will consider these differences briefly.
15. Firstly, in the letter of 21 January 2010, the applicant differentiates between the model and the set of values which populate it. The model is a representation of an underground volume and is composed of elements dependent upon various dimensions and scales. The applicant argues that the model may be empty, populated or repopulated but the model itself does not change. Arguably the examiner does not draw quite the same distinction between the model and the set of values which populate it leading to the suggestion that as the set of values change the model effectively changes.

¹ *Aerotel Ltd v Telco Holdings Ltd & Ors* Rev 1 [2007] RPC 7

² *Symbian Ltd's Application* [2008] EWCA Civ 1066, [2009] RPC 1

³ *Merrill Lynch's Appn* (1989) [1989] RPC 561

⁴ *Gale's Appn* [1991] RPC 91

⁵ *Fujitsu Limited's Appn* [1997] RPC 608

16. I consider that the model has a basic structure which does not change but as the set of values which populate that basic structure change then the populated (or repopulated) model effectively provides us with different information about the underground volume it represents and its predicted seismic response. In other words the overall representation changes and I consider that is the important point.
17. Secondly, the applicant describes a “*measurement*” as a “*value (of a property) obtained from the act aiming at retrieving this value*”, whilst a “*measurement process*” is defined as the “*act of retrieving the value (of a property)*”. The examiner considers these to be broad definitions because the act of measurement is more than just retrieving a value by some means and it cannot, for example, encompass merely estimating a value. It is more likely to be associated with the output of a detector.
18. I believe the examiner makes a good point here but I am also mindful of not interpreting the terms “*measurement*” or “*measurement processes*” too narrowly, especially bearing in mind my previous comments about indirect measurement (see paragraph 10).
19. In the letter of 21 January 2010, the applicant summarizes what it considers each part of claim 1 to mean. Overall, the applicant says the invention should be construed as “*a measurement process*” comprising steps where:
 - “*a model is defined and is populated with a predicted set of values*”
 - “*a predicted seismic response is calculated based on a predicted set of values*”
 - “*the predicted seismic response is compared with the actual seismic response*”
 - “*the model is repopulated using the comparison of the previous step, thereby creating new set of values which provides a measurement of the property values*”
20. This interpretation is in many ways not that different from the examiner’s view of what the claim means with the exception of the applicant’s assertion that the method is a “*measurement process*” and that the new set of values are in effect “*measurements of the property values*”.
21. The well known principles of claim construction are set out in *Kirin-Amgen v Hoechst Marion Roussel Ltd* [2005] RPC9 where Lord Hoffmann summarized the approach at paragraph 69 by asking the question:
 - “*what would the person skilled in the art have understood the patentee to have used the language of the claim to mean?*”
22. Although I take the applicant’s comments on board, I consider that the skilled person would interpret the claimed invention as a model or representation of an underground volume which provides a prediction of its seismic response based on the values of the rock or fluid properties which are initially put into a model. These are referred to as first predicted values of the rock or fluid properties. Then the model provides synthetic traces, generated from the predicted seismic responses, which are compared to corresponding traces obtained from sets of actual seismic data. In simple terms, the first predicted value (which may be a first estimate) is adjusted until the differences between the synthetic trace and the trace obtained from actual seismic data is reduced or minimized. At this stage the adjusted value or the second predicted value is considered to be more representative of the value of the rock or fluid property in the real world.

23. The applicant is arguing that the second predicted value is an indirect measurement of the rock or fluid property. Of course, this process can be continued in an iterative manner, if necessary, to get a more accurate result but this is not an explicit feature of the independent claims.
24. I shall go on to consider the difference in the applicant's and the examiner's interpretation of the claim which cross over into the assessment of the contribution.

Identifying the contribution

25. In *Aerotel/Macrossan*, the Court of Appeal recognised⁶ that the second step is more problematical because it involves an exercise of judgment often involving the problem said to be solved, how the invention works, what its advantages are. The Court said this can be best summed up by asking the question: what has been added to the stock of human knowledge?
26. The main area of contention involves proper identification of the contribution made. As is often the case, depending on whether one accepts the applicant's view of the contribution or that of the examiner, two different conclusions can be reached on whether the claimed invention is excluded under section 1(2).
27. The examiner argues in his letter of 27 January 2010 that the contribution, in broad terms, is a method of integrating real seismic data with a geological model initially populated with predicted numerical values in order to provide refined numerical values. Thus the seismic data is used to produce a more accurate model from which numerical values can be obtained.
28. Whilst in its arguments, the applicant re-iterates the point that the model does not change and is distinct from the values which populate it. It says that the invention aims to minimize measurement errors by using actual seismic data. The applicant believes the contribution is thus defined as "*a more effective way of improving the accuracy of predicted values of a rock or fluid characteristic in a geological volume using real seismic measurements.*"
29. I need to be careful about taking a view of the contribution that is too narrow and it is often easy, especially in measurement subject matter, to determine the contribution by considering only the novel and inventive parts of the claim whereas the law requires an assessment of the claimed invention as a whole.
30. Clearly, the arguments in this case are finely balanced. However, when adopting the correct approach and viewing the claimed invention as a whole, I consider that the contribution lies in using real seismic data to improve a mathematical model (which is run on a computer). As the predicted or modeled seismic response approaches that of the real seismic response, the model of the underground volume is considered to be more accurate and so the set of values which populate it are considered to be more representative of the equivalent set of values in the real world. Although the method appears to provide valuable information, that is, a prediction of what the rock and fluid properties might be, it is not really providing a measurement. Accordingly, my view is consistent with the examiner's point of view.

⁶ para. 43 of *Aerotel/Macrossan*

Does the contribution fall solely within excluded matter?

31. Two previous Office decisions have been referred to during the correspondence. The first is that of *Institute du Petrole & ELF EP's Application* (BL O/201/03) which was decided prior to *Aerotel/Macrossan* but I note that the hearing officer considered case law which the court, in *Symbian*, considered to be equivalent.
32. The invention of *ELF* related to the construction of a model of an underground formation. The model was optimized to fit a set of measured data by minimizing the difference between predictive data from the model and real test data. The invention was rejected as a mathematical method. The applicant argues that its invention is different because it does not relate to the construction of a model, whereas the examiner argues that there is a close resemblance between the present claims and those disallowed in *ELF*.
33. In the second, *WesternGeco Limited's Application* (BL O/135/07), the hearing officer applied the four step test and took the decision in *ELF* into account. Claims to the processing of geophysical data were found to fall solely within the mathematical method and computer program exclusions, whilst claims having the further step of processing data to determine one or more physical properties of the earth's interior were allowed.
34. The decision in *ELF* suggests to me that the present invention is not patentable. It also seems to me that the allowed claims (14 and 15) in the *WesternGeco* case related to the processing of measured geophysical data to determine a physical property.
35. The applicant points out in the letter of 20 August 2009, that the hearing officer said at paragraph 31 of the *WesternGeco* decision: "*Claim 14 provides the additional step of determining one or more parameters relating to physical properties of the earth's interior from the processed geophysical data. This I believe is significant because it moves the contribution of the invention of claim 14 towards that considered patentable in Vicom*". I consider that this is different from the present claimed invention where the real seismic data is used for comparison with the synthetic traces and is not processed to determine a physical property.
36. Having already decided what I consider the contribution to be, I do not think the claimed invention is saved by the fact that real seismic data is used for comparison with the synthetic data in order to create a second predicted value. As the method is also clearly meant to be implemented by a program run on a computer, I consider that the contribution made by the invention, taking the independent claims as a whole, falls solely within excluded matter.
37. Having failed the third step, I need not consider the fourth step of the test.

Conclusion

38. I have found that the invention defined by independent claims 1, 2 and 19 of the application wholly relate to a mathematical method and a program for a computer as such and are therefore excluded from patentability. I refuse the application for failure to comply with section 1(2)(a) and section 1(2)(c) of the Patents Act 1977.
39. The remaining dependent claims relate to further details about the mathematical processes carried out by a computer program or they merely indicate what the rock or fluid properties are or they define the volumes referred to in the main claims. So it appears that there is nothing in the dependent claims which can save the application by way of amendment.

Appeal

40. Under the Practice Direction to Part 52 of the Civil Procedure Rules, any appeal must be lodged within 28 days of the date of this decision.

C Davies

Deputy Director acting for the Comptroller