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**Datasheet for the decision  
of 13 November 2023**

**Case Number:** T 1401/20 - 3.5.01

**Application Number:** 14817595.3

**Publication Number:** 3014062

**IPC:** G06Q10/06

**Language of the proceedings:** EN

**Title of invention:**

SYSTEM AND METHOD FOR SELECTING A DRILLING PATH BASED ON COST

**Applicant:**

Motive Drilling Technologies Inc.

**Headword:**

Drilling path/MOTIVE DRILLING

**Relevant legal provisions:**

EPC Art. 52(2) (a), 56, 123(2)  
RPBA 2020 Art. 13

**Keyword:**

Inventive step - (no - all requests)  
Amendments after summons - auxiliary requests 1A to 7A  
(admitted, address the Board's objections) - auxiliary request  
8 (not admitted, introduces new issues)



**Beschwerdekammern**  
**Boards of Appeal**  
**Chambres de recours**

Boards of Appeal of the  
European Patent Office  
Richard-Reitzner-Allee 8  
85540 Haar  
GERMANY  
Tel. +49 (0)89 2399-0  
Fax +49 (0)89 2399-4465

Case Number: T 1401/20 - 3.5.01

**D E C I S I O N**  
**of Technical Board of Appeal 3.5.01**  
**of 13 November 2023**

**Appellant:** Motive Drilling Technologies Inc.  
(Applicant) 1807 Ross Avenue, Suite 460  
Dallas, TX 75201 (US)

**Representative:** Uexküll & Stolberg  
Partnerschaft von  
Patent- und Rechtsanwälten mbB  
Beselerstraße 4  
22607 Hamburg (DE)

**Decision under appeal:** **Decision of the Examining Division of the  
European Patent Office posted on 23 January 2020  
refusing European patent application No.  
14817595.3 pursuant to Article 97(2) EPC.**

**Composition of the Board:**

**Chairman** M. Höhn  
**Members:** L. Falò  
C. Schmidt

## **Summary of Facts and Submissions**

- I. This is an appeal against the examining division's decision to refuse European patent application No. 14817595.3.
- II. The application was refused on the ground of lack of inventive step of all requests in view of notorious technical means. D1, WO 2012/173601, D2, WO 2010/053618 and D3, US 2009/056935, were cited as examples of documents disclosing such means.
- III. In the statement setting out the grounds of appeal, the appellant requested that the decision of the examining division be set aside and a patent be granted on the basis of the main request or of the first to seventh auxiliary requests. The main request and the first to sixth auxiliary requests correspond to those refused by the division. All the requests were filed or re-filed with the statement of grounds.
- IV. In the communication accompanying the summons to oral proceedings, the Board informed the appellant that it tended to consider the requests not inventive in view of document D2, and further raised clarity objections (Article 84 EPC) in respect of claim 1 of all requests.
- V. In a letter of reply to the summons, the appellant filed auxiliary requests 1A to 7A and auxiliary request 8.
- VI. Oral proceedings were held as a videoconference on 13 November 2023.

VII. The appellant's final requests were that the decision under appeal be set aside and that a patent be granted on the basis of the main request or one of the auxiliary requests 1 to 7, filed with the letter setting out the grounds of appeal, or on the basis of auxiliary requests 1A to 7A or 8, filed with letter dated 13 October 2023. The appellant confirmed during oral proceedings that the requests were to be considered in this order.

VIII. Claim 1 of the main request reads:

*A method for selecting one of a plurality of convergence paths, comprising:*

- identifying, by a computer system (250), a plurality of geometric convergence paths (108, 110, 112, 114, 116, 118), wherein each of the geometric convergence paths provides a convergence solution from a defined bottom hole assembly (BHA) location to a target path (104) for a borehole of a well;*
- calculating, by the computer system (250), a distance of each of the plurality of geometric convergence paths from the target path (104) of the well, an amount of curvature of each of the plurality of geometric convergence paths, and an estimated amount of time needed to drill each of the plurality of geometric convergence paths;*
- determining, by the computer system (250), if one or more of the plurality of geometric convergence paths is an illogical option;*

- *eliminating from consideration, by the computer system (250), any of the plurality of geometric convergence paths determined to be an illogical option;*
- *eliminating from consideration, by the computer system (250), any of the plurality of geometric convergence paths determined to violate any one or more rules;*
- *selecting, by the computer system (250), one of the plurality of geometric convergence paths not eliminated from consideration;*
- *outputting, by the computer system (250), the selected geometric convergence path;*
- *creating, by the computer system (250), a drilling plan based on the selected geometric convergence path;*  
*and*
- *drilling the well, by a drilling rig, using the drilling plan.*

IX. Claim 1 of the first auxiliary request differs from the main request in that the preamble specifies that the selection of the path is carried out *"by means of a computer system (250) coupled to a drilling rig, the computer system comprising a processor (252); and a memory (254), coupled to the processor (252) and configured to store a plurality of instructions executable by the processor (252), the instructions including instructions for"*. The claim further includes, prior to the drilling step, the step of *"providing the drilling plan to the drilling rig"*, and replaces the expression *"drilling the well, by a drilling rig, using the drilling plan"* with *"drilling*

*the well, by the drilling rig, using the drilling plan to realign the BHA with the target path (104)".*

X. The second and third auxiliary requests are based on the first auxiliary request, with amendments to the dependent claims only.

XI. The fourth auxiliary request is based on the second auxiliary request, with the addition, at the end of claim 1, of the following features:

*wherein the step of calculating further comprises:*

- dividing the geometric convergence path into a plurality of path segments;*
- identifying a distance of each path segment from the target path (104);*
- for each path segment, identifying a segment value based on a distance of the path segment from the target path, wherein the target path is assigned a zero value and the segment value of the path segment increases the farther the path segment is from the target path; and*
- combining the value of the path segments to calculate the offset value of the geometric convergence path;*
- wherein identifying the segment value includes identifying the path segment's location on a value curve based on the distance of the path segment from the target path and wherein the value curve includes nonlinear and non-symmetrical values; and*

*- wherein dividing the geometric convergence path into the plurality of path segments is based on a predefined unit of length.*

XII. The fifth auxiliary request is based on the second auxiliary request. Claim 1 additionally specifies that the method is *"for drilling a borehole by means of a drilling system (200) comprising a computer system"*. In the same claim, the second "eliminating" step further specifies that the one or more rules *"define a threshold for maximum allowable dogleg severity, a threshold for a maximum allowable curvature for the entire path, and/or a threshold for an overall curvature"*.

XIII. The sixth auxiliary request is based on the second auxiliary request, with the omission of some of the dependent claims.

XIV. The seventh auxiliary request is based on the sixth auxiliary request, with the addition, in the "calculating" step of claim 1, of the following feature:

*"wherein the number of geometric convergence paths that are calculated depend on selected parameters, wherein said parameters being applied to limit the minimum and/or maximum length of a path, the maximum allowable dogleg severity, the direction and/or the inclination to thereby reduce the number of geometric convergence paths"*.

XV. Auxiliary requests 1A to 7A are based on the auxiliary requests 1 to 7, respectively. For each request, claim 1 has been amended to include, in the "determining" step, the expression:

*"wherein the illogical option comprises a path which extends in the wrong direction before converging"*

and, in the "drilling" step, the expression:

*"along the selected geometric convergence path".*

XVI. The eighth auxiliary request is based on auxiliary request 7A, with the following amendments to claim 1:

- modification of the feature *"identifying, ... , a plurality of ..."* by *"generating, ... during drilling, a plurality of ..."*

- before the "generating" step, the further steps of *"determining a location of a defined bottom hole assembly (BHA) in a well being drilled and a target path for a borehole of the well", and "during drilling and/or in response to determining that the borehole is off the target path:"*

- the "calculating" step further specifies that *"the time needed to drill each of the plurality of geometric convergence paths comprises a total of the time associated with each of at least one rotary drilling segment of the geometric convergence path and/or at least one sliding segment of the geometric convergence path"*

- the omission of the "creating" step

- after the "providing" step, the further feature of *"updating the drilling plan with the selected geometric convergence path".*



XVII. The appellant's arguments, in so far as relevant to the present decision, can be summarised as follows:

In the invention the generation of the paths and the update of the drilling plan are done during the drilling operation. In D2, on the contrary, this is done before the drilling operations are started. All the data processing steps have a technical character and should be taken into account for the assessment of inventive step.

### **Reasons for the Decision**

1. The invention concerns carrying out drilling operations for the extraction of minerals and, in particular, calculating a drilling path so as to return to a desired target path, for example when a bottom hole assembly (BHA) has gone off course (paragraphs [0003], [0015]). Potentially viable paths can have very different associated costs, which may be difficult to quantify (paragraphs [0015], [0018]). For example, a shorter path may require more sliding, which in turn requires more time and introduces additional complexity (paragraph [0018]).

The invention aims to select a path which satisfies one or more defined cost parameters (paragraph [0015], last sentence, paragraph [0032]).

2. To achieve this, a computer generates a number of geometric paths converging to a desired target path. The number of the paths to be generated is limited by applying various technical constraints, such as the minimum and/or maximum length of a path, the maximum

allowable dogleg severity, the direction or the inclination (paragraph [0034]). The computer then filters the set of paths to eliminate options which are "illogical" or violate a given set of rules (for example, a maximum allowable curvature), and assesses the cost of each remaining path according to a cost curve. The path which best meets predefined cost requirements is selected and used to control the bottom hole assembly (paragraphs [0034] to [0039], Figures 5B, 5C, 5D).

#### Admissibility of the requests - Article 13 RPBA

3. Auxiliary requests 1A to 7A and 8 were filed after receipt of the summons to oral proceedings. Any amendment to a party's appeal case after it has filed its grounds of appeal is subject to the party's justification and may be admitted only at the discretion of the Board (Article 13(1) RPBA). Moreover, any amendment made after notification of a summons to oral proceedings shall, in principle, not be taken into account, unless there are exceptional circumstances which have been justified with cogent reasons by the party concerned (Article 13(2) RPBA).
4. The Board decided to admit auxiliary requests 1A to 7A into the proceedings because they addressed the Board's objections of lack of clarity, raised for the first time in the annex to the summons to oral proceedings.
5. The Board further decided not to admit auxiliary request 8 because it introduced prima facie new issues under Article 123(2) EPC, in particular in view of the following features:

- 5.1 *"Determining a location of a defined bottom hole assembly (BHA) in a well being drilled and a target path for a borehole of the well"*

According to paragraphs [0031] and [0033], cited in support by the appellant, the BHA location and the target path are "obtained", rather than "determined".

- 5.2 *Performing the steps following the determination of the target path and of the BHA "during drilling and/or in response to determining that the borehole is off the target path"*

Paragraph [0031] only mentions the condition of the BHA being off the target path. According to paragraph [0021], a cost comparison may be carried out *"if the borehole is being drilled and the BHA is off of the target path"*. The condition "during drilling" is not mentioned in isolation.

- 5.3 *"Updating the drilling plan with the selected geometric convergence path"*

Paragraphs [0031] and [0033] only mention calculating a convergence plan to realign the BHA with the target path as defined by the drilling plan, but do not disclose updating the drilling plan.

Inventive step

6. The Board finds it expedient to start with the assessment of the amended seventh auxiliary request (auxiliary request 7A).
7. The examining division refused the application under Article 56 EPC in view of notoriously known technical

means. The Board is however of the opinion that document D2 is a better starting point for assessing inventive step.

8. D2 discloses a method for planning and executing drilling operations (paragraphs [0002], [0013], [0014]). The method includes generating, by a computer, a plurality of drilling trajectories through one or more "targeted regions" and/or "targeted segments" based on several desired constraints, including geometric constraints, completion length, potential risk, cost, inclination or dogleg severity (paragraphs [0013], [0039], [0040] to [0042], [0056], [0057]). The one or more generated trajectories are then evaluated ([0013], [0014]) based on the geometric constraints ([0042], [0043]), the potential risks and costs ([0013], [0059]) and a consistency check with underlying models and known data ([0047], [0058]), in order to determine one or more potential drilling paths ([0058]), so as to perform the drilling operation according to an optimum well trajectory ([0014], last sentence).
9. Even though D2 does not explicitly disclose the feature of eliminating paths which are illogical because they extend in the wrong direction before converging, this is an obvious factor to take into account when checking the generated paths against geometric constraints (as in paragraphs [0042], [0057]) and/or when performing the consistency check against known data (paragraph [0047]).
10. Claim 1 further differs from D2 in that each path provides a convergence to a given target path, which represents a desirable or optimal solution. In D2, the paths are generated so as to converge with one or more

"targeted regions" and/or "targeted segments" (see for example D2, Figure 1).

The Board is however of the opinion that it would be obvious for the skilled person, faced with the technical problem of aligning the BHA with a given target path, to adapt the system of D2 by replacing the targeted areas or segments with the target path.

11. It is common ground that D2 does not disclose the features concerning the calculation of the distance to the target paths and the offset value of the generated paths. The features concerned are the following:
  - *dividing the geometric convergence path into a plurality of path segments;*
  - *identifying a distance of each path segment from the target path (104);*
  - *for each path segment, identifying a segment value based on a distance of the path segment from the target path, wherein the target path is assigned a zero value and the segment value of the path segment increases the farther the path segment is from the target path; and*
  - *combining the value of the path segments to calculate the offset value of the geometric convergence path;*
  - *wherein identifying the segment value includes identifying the path segment's location on a value curve based on the distance of the path segment from the target path and wherein the value curve includes nonlinear and non-symmetrical values;*

*- wherein dividing the geometric convergence path into the plurality of path segments is based on a predefined unit of length.*

12. These features essentially define a basic form of numerical integration and thus a mathematical method, which is *per se* non-technical (Article 52(2)(a) EPC).

Moreover, since the remaining method steps do not make use of the values calculated therein, it is not possible to identify any technical effect going beyond those inherent in their execution on computer means.

It follows that these features do not make a technical contribution and, hence, cannot support an inventive step.

13. The appellant argued that, according to the invention, the generation of the paths and the selection of a drilling plan occurred during the drilling operation, while in D2 they occurred at the planning phase. That was analogous to the dynamic adaptation of the route displayed by a navigation system while a vehicle is moving.

The Board finds these arguments unconvincing, if only because the wording of the claim is not restricted to the case in which the steps are executed during the drilling operations. Furthermore, it can also be assumed that if the BHA has left the target path, it would rather stop drilling in the wrong direction until a convergence path had been calculated, which is comparable to a planning phase.

The Board additionally observes that applying the teaching of D2 to the generation of a path during

drilling would be obvious for the skilled person, the only adaptation needed being the replacement of the initial position of the BHA with the current one.

14. In view of the above, the Board concludes that the distinguishing features of claim 1 cannot establish an inventive step over D2.

Claim 1 of the auxiliary request 7A is therefore not inventive (Article 56 EPC).

15. The same objection as to lack of inventive step applies, *a fortiori*, to the higher-ranking requests, which are more general.
16. Since none of the appellant's admissible requests is allowable, the appeal must be dismissed.

## **Order**

**For these reasons it is decided that:**

The appeal is dismissed.

The Registrar:

The Chairman:



T. Buschek

M. Höhn

Decision electronically authenticated