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# Datasheet for the decision of 7 October 2021

**Case Number:** T 1528/17 - 3.2.03

**Application Number:** 08875686.1

**Publication Number:** 2364397

**IPC:** E21B44/00

**Language of the proceedings:** EN

**Title of invention:**
METHOD AND APPARATUS FOR REDUCING STICK-SLIP

**Patent Proprietor:**
National Oilwell Varco, L.P.

**Opponent:**
ENGIE Electroproject B.V.

**Headword:**

**Relevant legal provisions:**
RPBA Art. 12(4)
EPC Art. 54, 56, 111, 123(2)
RPBA 2020 Art. 11

**Keyword:**
Late-filed facts - submitted with the statement of grounds of appeal
Late-filed evidence - submitted with the statement of grounds of appeal - abuse of procedure (no)
Late-filed request - submitted with the reply to the statement of grounds of appeal - admitted (yes) - request could have been filed in first instance proceedings (no)
Novelty - main request (no) - auxiliary request (yes)
Amendments - intermediate generalisation - allowable (no)
Inventive step - common general knowledge - obvious modification
Remittal - (yes) - special reasons for remittal

**Decisions cited:**

**Catchword:**

Europäisches Patentamt
European Patent Office
Office européen des brevets

**Beschwerdekammern**

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**Case Number: T 1528/17 - 3.2.03**

# D E C I S I O N
# of Technical Board of Appeal 3.2.03
# of 7 October 2021

| | |
|---|---|
| **Appellant:** (Patent Proprietor) | National Oilwell Varco, L.P.<br>7909 Parkwood Circle Drive<br>Houston, Texas 77036 (US) |
| **Representative:** | Docherty, Andrew John<br>Marks & Clerk LLP<br>Aurora<br>120 Bothwell Street<br>Glasgow G2 7JS (GB) |
| **Appellant:** (Opponent) | ENGIE Electroproject B.V.<br>Computerweg 21<br>1033 RH Amsterdam (NL) |
| **Representative:** | Algemeen Octrooi- en Merkenbureau B.V.<br>P.O. Box 645<br>5600 AP Eindhoven (NL) |
| **Decision under appeal:** | **Interlocutory decision of the Opposition Division of the European Patent Office posted on 28 April 2017 concerning maintenance of the European Patent No. 2364397 in amended form.** |

**Composition of the Board:**

| | |
|---|---|
| **Chairman** | G. Patton |
| **Members:** | B. Miller |
| | N. Obrovski |

## Summary of Facts and Submissions

I. European patent No. 2 364 397 ("the patent") relates to a method of damping stick-slip oscillations in a drill string.

The patent as a whole was opposed on the grounds that its subject-matter lacked novelty and inventive step (Article l00(a) EPC).

II. In its interlocutory decision, the opposition division found that

- claim 1 as granted and as amended on the basis of auxiliary request 1 dated 14 November 2016 lacked novelty,
- claim 1 as amended on the basis of auxiliary request 2 filed during the oral proceedings on 14 December 2016 lacked inventive step, and
- the patent as amended on the basis of auxiliary request 3 filed during the oral proceedings on 14 December 2016 met the requirements of the EPC.

The interlocutory decision to maintain the patent in amended form on the basis of the then auxiliary request 3 was appealed by both parties. Since the patent proprietor and the opponent are both appellants and respondents in the appeal proceedings, for the sake of simplicity the Board will continue to refer to the parties as the patent proprietor and the opponent in the present decision.

III. The patent proprietor requested with its statement of grounds of appeal and its reply to the opponent's statement of grounds of appeal that the appealed

decision be set aside and the patent be maintained as granted or, alternatively, as amended on the basis of one of the following auxiliary requests:

- auxiliary request 1 filed with the submission dated 14 November 2016,
- auxiliary request 2 filed as auxiliary request 3 in the oral proceedings on 14 December 2016 and found allowable by the opposition division in its interlocutory decision, or
- auxiliary requests 3 to 5 filed with the response to the opponent's statement of grounds of appeal (submission dated 26 January 2018).

In addition, in the event that the main request and auxiliary requests 1 and 2 were to be deemed not allowable, the patent proprietor requested that the case be remitted to the opposition division.

The opponent requested that the appealed decision be set aside and the patent be revoked. In addition, it requested that auxiliary requests 3 to 5 not be admitted into the appeal proceedings.

IV. Evidence cited in the decision

A7: Van den Steen, L., "Suppressing Stick-Slip-Induced Drillstring Oscillations: A Hyperstability Approach", PhD thesis, University of Twente, 1997.

This document was filed by the opponent for the first time in appeal proceedings with its statement setting out the grounds of appeal.

V. In a communication pursuant to Article 15(1) of the Rules of Procedure of the Boards of Appeal (RPBA 2020),

the Board indicated its preliminary opinion to the parties.

VI. With the submission dated 12 March 2021 the patent proprietor refiled versions of auxiliary requests 4 and 5 and filed in addition new auxiliary requests 6 to 8.

VII. Oral proceedings were held on 7 October 2021 as a videoconference with the agreement of both parties.

At the end of the oral proceedings

a) the patent proprietor requested that the decision under appeal be set aside and that the patent be maintained as granted (main request) or, alternatively, in amended form on the basis of one of the following auxiliary requests:
- auxiliary request 1 filed with the submission dated 14 November 2016,
- auxiliary request 2, filed as auxiliary request 3 in the oral proceedings before the opposition division on 14 December 2016,
- auxiliary request 3 filed with the reply to the opponent's statement of grounds of appeal,
- auxiliary requests 4 and 5 filed with the reply to the opponent's statement of grounds of appeal and refiled with the submission dated 12 March 2021, or
- auxiliary requests 6 to 8 filed with the submission dated 12 March 2021.

The patent proprietor further requested that the case be remitted to the opposition division if the main request, auxiliary request 1 and auxiliary request 2 were to be deemed not allowable.

b) the opponent maintained its initial request that the decision under appeal be set aside and that the patent be revoked. It also requested that auxiliary requests 3 to 8 not be admitted into the proceedings. It further requested that the case be remitted to the opposition division, should auxiliary request 3 be admitted into the proceedings.

VIII. Independent method claim 1 as granted reads as follows (the feature numbering was introduced by the opponent and has been used by both parties):

(1) A method of damping stick-slip oscillations in a drill string,
(2) wherein the stick-slip oscillations comprise torsional waves propagating along said drill string, which method comprises the steps of:
(3) (a) damping said stick-slip oscillations using a drilling mechanism at the top of said drill string; and
(4) (b) controlling the speed of rotation of said drilling mechanism using a PI controller;
characterised by the step of
(5a) (c) tuning said PI controller so that said drilling mechanism absorbs most torsional energy from said drill string at a frequency that is at or near a frequency of said stick-slip oscillations by adjusting an I-term of said PI controller to be dependent on an approximate period of said stick slip oscillations and on the effective inertia of said drilling mechanism,
(5c) whereby said drilling mechanism has a frequency dependent reflection coefficient of said torsional waves, which reflection coefficient is substantially at a minimum at or near said

frequency of stick-slip oscillations.

Claim 1 according to auxiliary request 1 corresponds to claim 1 of the main request, except that feature 5(a) reads:

(5a) (c) tuning said PI controller so that said drilling mechanism absorbs most torsional energy from said drill string at a frequency that is at or near a frequency of said stick-slip oscillations by adjusting an I-term of said PI controller to be dependent **only** on an approximate period of said stick slip oscillations and on the effective inertia of said drilling mechanism,

Claim 1 according to auxiliary request 2 corresponds to claim 1 of the main request, except that the following features 5b and 6 have been added:

(5b) according to $I = \omega_s^2 J$ where $\omega_s$ is an approximate or estimated fundamental angular frequency of said stick-slip oscillations and $J$ is the effective inertia of said drilling mechanism

(6) (d) wherein the approximate or estimated fundamental angular frequency of said stick-slip oscillations is determined by automatic measurement, for example by a PLC, using the drill string geometry or computer observation of drive torque.

Claim 1 according to auxiliary request 3 corresponds to claim 1 of auxiliary request 2, except that features 2 and 5c have been amended to read:

(2) wherein the stick-slip oscillations comprise torsional waves propagating along said drill

string that, for the purposes of the method, is regarded as a transmission line for the torsional waves, which method comprises the steps of:

(5c) whereby said drilling mechanism has a frequency dependent reflection coefficient of said torsional waves, which reflection coefficient is substantially at a minimum at or near said frequency of stick-slip oscillations the minimum having a value between 0.5 (50%) and 0.9 (90%).

The remaining auxiliary requests filed in the appeal proceedings are not discussed hereinafter. The wording of their claims is therefore not relevant to this decision.

IX. The patent proprietor's arguments, as far as they are relevant to this decision, can be summarised as follows.

(a) A7 - Admittance into the appeal proceedings

A7 was filed for the first time in the appeal proceedings and gave rise to a fresh case. A7 could and should have been submitted in the opposition proceedings, since the opponent had already been aware of it, as was made evident by its filing in the opposition proceedings against the granted divisional application EP 2 549 055 B1.
The late filing of A7 constituted an abuse of the appeal procedure, which should be concerned only with reviewing the first-instance decision.

(b) Main request - Interpretation of claim 1

The skilled person would recognise that claim 1 was directed to a method of damping stick-slip oscillations which could be used for drill strings of any length encountered in the field while drilling a wellbore.

The skilled person would understand from features (1), (5a) and (5c) that the drill string referred to a transmission line in a real drilling mechanism and did not refer to a simple model such as a torsional pendulum. After all, a model would not be able to provide a correct estimation of the real stick-slip period as required by said features.

(c) Main request - Novelty in light of A7

A7 disclosed on pages 40 to 48 merely a concept for dimensioning a feedback circuit for a model of a drill string. In the last paragraph on page 45, A7 clearly taught that the model described on pages 40 to 45 was not even suitable for dampening stick-slip oscillations.

The results in chapter 10 of A7 demonstrated that the model described on pages 40 to 48 was not directly used as such in the experimental work underlying A7.

The control system of A7 was an active system, not a passive system as addressed by claim 1.

Neither the frequency of oscillation of the feedback circuit $\omega_f$ nor the resonant frequency of the free drill string disclosed in A7 was the same as the stick-slip oscillation $\omega_s$ defined in claim 1.

Therefore, A7 did not disclose a step of tuning the PI controller such that the drilling mechanism absorbs most torsional energy from the drill string at a frequency that is at or near a frequency of the stick-slip oscillations by adjusting an I-term of the PI controller to be dependent on an approximate period of those stick slip oscillations and on the effective inertia of the drilling mechanism.

(d) Auxiliary request 1 - Article 123(2) EPC

The amendment to claim 1 is based on the preferred embodiment described on page 15, first paragraph, of the application as filed (published as WO 2010/063982 A2). The skilled person reading the application as originally filed would understand unambiguously that the teaching of the first sentence on page 15 was independent of the equation (9) preceding this sentence. The advantages disclosed in the second sentence of the same paragraph clearly addressed the first sentence as an independent embodiment.

(e) Auxiliary request 2 - Novelty in light of A7

The subject-matter of claim 1 was novel, since A7 did not disclose the determination of the approximate or estimated fundamental angular frequency of stick-slip oscillations by automatic measurement using the drill string geometry or computer observation of drive torque.

(f) Auxiliary request 2 - Inventive step in light of A7

Neither A7 itself nor any other document on file hinted that the drive torque or the drill string geometry

could be used to automatically determine the fundamental angular frequency of stick-slip oscillations in the model disclosed on pages 40 to 48.

Hence, the subject-matter of claim 1 of auxiliary request 2 would not be obvious when starting from A7.

(g) Auxiliary request 3 - Admittance into the appeal proceedings

Auxiliary request 3 was filed as a direct consequence of the late filing of A7 by the opponent. For reasons of procedural fairness it was to be admitted into the proceedings.

X. The opponent's arguments on each of the above points can be summarised as follows.

(a) A7 - Admittance into the appeal proceedings

A7 had been filed in reaction to the events during the oral proceedings before the opposition division. During those oral proceedings the patent proprietor had filed the then auxiliary request 3 (now auxiliary request 2 in the appeal proceedings), which included a feature taken from the general description of the patent. The incorporation of this feature from the description had not been foreseeable for the opponent. Hence there had been no need to file further evidence prior to the oral proceedings even though A7 had been known to the opponent.

(b) Main request - Interpretation of claim 1

Claim 1 defined a method of damping stick-slip oscillations in a drill string. There was no reason to

consult the description and the drawings of the patent to give the wording of claim 1 a narrower meaning.
The skilled person would recognise that, for estimating the stick-slip period, the drill string may be regarded as a simple torsional pendulum described by a lumped parameter model, and that a more accurate model would provide a more accurate result.

(c) Main request - Novelty in light of A7

A7 dealt with models and methods for damping stick-slip induced oscillations in a drill sting. A7 disclosed in paragraph 2 of Chapter 2.4.1 that a silicon controlled rectifier drive comprising a PI controller driving the motor could be used.
It further disclosed, on pages 40 to 48 in chapters 2.3 and 2.4, that a basic model could be used for modelling the drill string based on a spring and a viscous damper. A7 further disclosed there that the model comprised a feedback circuit and how the feedback circuit had to be dimensioned.
A7 disclosed with regard to the spring on page 45 that $\kappa_f = \omega_f^2 J_3$, i.e. the I-term of the PI controller is equal to the square of the angular frequency and the effective inertia at the top of the drilling mechanism.
As disclosed on page 45 of A7, second bullet point, the resonant frequency $\omega_f$ of the feedback circuit should be tuned to that of the drill string.
Since the frequency of oscillation of the feedback circuit $\omega_f$ had to be tuned to the resonant frequency of the free drill string, it corresponded to the stick-slip oscillation $\omega_s$ as defined in claim 1.

Tuning the stiffness $\kappa_f$ referred to in A7 was equivalent to adjusting the I-term of a PI controller.

Although A7 taught, in the last paragraph on page 45, that further methods referred to in this paragraph were not suitable for dampening stick-slip oscillations, this teaching did not relate to the feedback circuit previously described in A7.

(d) Auxiliary request 1 - Article 123(2) EPC

The amendment to claim 1 constituted an intermediate generalisation of the preferred embodiment described in the first paragraph on page 15 of the application as filed (published as WO 2010/063982 A2). The skilled person reading the application as originally filed would understand unambiguously that the teaching of the first sentence on page 15 was linked to the equation (9) preceding this sentence.

(e) Auxiliary request 2 - Novelty in light of A7

Putting the concept of A7 into practice, the skilled person would inevitably have to determine the approximate or estimated fundamental angular frequency of stick-slip oscillations by means of an automatic measurement using the drill string geometry or computer observation of drive torque.

(f) Auxiliary request 2 - Inventive step in light of A7

Starting from A7 and putting the model described on pages 40 to 48 in practice, it would be obvious for the skilled person to determine the fundamental angular frequency of stick-slip oscillations by using standard parameters such as the drive torque or the drill string geometry and to employ an automated system.

Hence, the subject-matter of claim 1 of auxiliary request 2 was obvious when starting from A7.

(g) Auxiliary request 3 - Admittance into the appeal proceedings

Auxiliary request 3 was filed late and should have been filed during the opposition proceedings.

## Reasons for the Decision

1. Applicable Rules of Procedure

The revised Rules of Procedure of the Boards of Appeal (RPBA 2020) entered into force on 1 January 2020. Subject to the transitional provisions (Article 25 RPBA 2020), the revised version also applies to appeals pending on the date of entry into force. In the present case the statements of grounds of appeal were filed before 1 January 2020 and the replies to them were filed in due time. Thus, Article 12(4) to (6) RPBA 2020 does not apply, and Article 12(4) RPBA 2007 applies instead to these submissions (Article 25(2) RPBA 2020).

2. Document A7 - Admittance into the appeal proceedings

The opponent filed A7 for the first time with its statement of grounds of appeal.

According to Article 12(4) RPBA 2007, the Board has discretionary power as to whether to admit A7 into the appeal proceedings.

A7 is relied upon by the opponent to raise a new objection of lack of novelty and new objections of lack of inventive step against the subject-matter of claim 1 both as granted and as amended on the basis of auxiliary requests 1 and 2. The filing of A7 therefore entails an amendment to the opponent's opposition case.

Nevertheless, when exercising its discretion under Article 12(4) RPBA 2007, the Board has to take into account, *inter alia*, whether the filing of the new evidence can be considered to be a justified reaction to the events in the opposition proceedings.

During the oral proceedings before the opposition division, the patent proprietor filed auxiliary request 3, which included a feature taken from the general description of the patent:

"wherein the approximate or estimated fundamental angular frequency of said stick-slip oscillations is determined by automatic measurement, for example by a PLC, using the drill string geometry or computer observation of drive torque" (feature (6)).

The way to determine the fundamental angular frequency had not been a topic of discussion prior to the late filing of auxiliary request 3 during the oral proceedings before the opposition division. The incorporation of this feature from the description was therefore not foreseeable for the opponent.

Although an opponent can be expected to react to amendments based on the teaching of the dependent claims of a patent, an opponent cannot be expected to proactively file evidence for any possible hypothetical

amendment based on an embodiment described in a patent specification.

Hence, the opponent had no reason to file further evidence, such as A7, prior to the oral proceedings before the opposition division, even though A7 had been known to the opponent, as evidenced by its filing in the opposition proceedings against the granted divisional application EP 2 549 055 B1.

The filing of A7 with the statement of grounds of appeal can therefore be regarded as a direct consequence of the late filing of auxiliary request 3 by the patent proprietor and therefore as an appropriate reaction to the events in the opposition proceedings leading to the contested decision.

Therefore, the Board admitted document A7 into the appeal proceedings (Article 12(4) RPBA 2007).

3. Main request - Novelty in light of A7

3.1 Interpretation of claim 1

Even though it is explained in paragraphs [0045] and [0046] of the patent that a transmission-line model is used to describe the torsional waves comprised in the stick-slip oscillations and calculate a frequency-dependent reflection coefficient of the torsional waves at the drill string/top drive interface, there is no reason to read this limitation into the claim. The claim also covers alternative embodiments wherein the stick-slip frequency is estimated using other models, e.g. a lumped parameter model, to tune the I-term and thus to provide the desired damping effect, with the inevitable result that the reflection coefficient of

the torsional waves would be "substantially at minimum at or near" this frequency (feature (5c)), were it to be calculated.

It is further clear from the term "approximate" used in feature (5a) that the estimated or measured fundamental stick-slip period does not have to be completely accurate. The estimated or measured stick-slip period may be higher or lower than the actual fundamental period, yet still provide the desired damping effect. This understanding is confirmed by the teaching in the patent in paragraphs [0011], [0013], [0058] and [0062].

Claim 1 does not contain any specific feature which could limit its scope to a "passive" method in contrast to an "active" method which uses cascade feedback loops in series or relies on feedback of measured parameters as described in paragraph [0045] of the patent.

Since the patent, in paragraphs [0045], [0046], [0096] to [0098] and [0100], also clearly refers to models used to describe the drill string and the stick-slip oscillations, it can be concluded that in this technical context a model of damping stick-slip oscillations in a drill string is synonymous with the corresponding method in a real wellbore. Hence, documents describing a model of damping stick-slip oscillations in a drill string model are considered to inherently disclose a method according to claim 1.

3.2 Novelty in light of A7

A7 discloses a method for suppressing stick-slip-induced drill string oscillations based on a hyperstability approach (see title).

The drill string is modelled according to A7 as a torsional spring having a stiffness $k_f$ and a parallel viscous damper $c_f$, as disclosed on page 30 under the heading "The drillstring". The opening sentence of Chapter 1.4.1 of A7 makes it clear that the principle of damping torsional drill string vibrations involves providing the drive with a feedback circuit that changes the drive characteristics. Chapter 2 of A7 discloses the underlying modelling and basic concepts in more detail and discloses schematic and mechanical representations of the effect of the feedback circuit in figures 2.6 and 2.8.

The dimensioning and implementation of the feedback circuit is discussed in chapters 2.3-2.4 of A7, i.e. on pages 40 to 48. In particular, chapter 2.4.1 of A7 discloses the practical implementation of the damping principle using a silicon-controlled rectifier drive comprising a PID controller, wherein the D-part may usually be ignored.

A7 further discloses on page 30, in relation to the drill string model comprising a spring and parallel viscous damper, that the drive torque T3 operating at the drill string at a rotary speed can be expressed by

$$T_3 = c_f\left(\Omega_{ref} - \Omega_3\right) + k_f \int\left(\Omega_{ref} - \Omega_3\right)dt .$$

Comparing this equation with equation (2) of the patent, it is immediately clear that $c_f$ equals the P-term and $k_f$ equals the I-term of a PI-controller. Tuning the stiffness $k_f$ as referred to by A7 is therefore equivalent to adjusting the I-term of a PI controller as defined in claim 1.

As disclosed on page 45 of A7, the feedback circuit should be tuned to:

$$\omega_f = \sqrt{\frac{k_f}{J_3}} \text{ or } k_f = \omega_f{}^2 \cdot J_3$$

Hence, the stiffness $k_f$ depends on the inertia of the rotary table $J_3$ and the resonant frequency $\omega_f$ of the feedback circuit.

On the one hand, A7 further discloses on page 45, first paragraph, second bullet point, that the resonant frequency $\omega_f$ of the feedback circuit should be tuned to that of the drill string $\omega_s$. On the other hand, the drill string constitutes a torsional pendulum which has a tendency to oscillate in its fundamental mode (see paragraphs 1 and 2 of the summary of A7).

It follows that tuning the resonant frequency of the feedback circuit $\omega_f$ to the resonant frequency of the drill string $\omega_s$ is equivalent to adjusting the feedback circuit to a frequency that is at or at least near (approximate) to a frequency of the stick-slip oscillations as required by feature (5a) of claim 1, leading inevitably to the result defined in feature (5c) of claim 1.

The last paragraph on page 45 of A7 reads:

"*The structure resembles the classical tuned vibration absorber or dynamic absorber as described extensively in the literature [Den Hartog, 1984; Korenev, 1993] and which has been used in various applications [Mansour, 1972, Tondl, 1975; Rowbottom, 1981; Ebrahimi, 1988]. However, in the classical tuned absorber a freely selectable mass/spring(/damper) combination is added to a larger vibrating mass/spring system. In the present situation the inertias can not be adjusted. Another difference is that most systems described in the*

*literature are optimised for their frequency response, while, in the current problem, we wish to avoid sustained stick-slip oscillation, which requires a different approach.*"

Hence, this paragraph refers to and comments on further literature related to classic tuned absorbers. However, it neither explicitly refers to the feedback circuit discussed previously on pages 40 to 45 nor teaches that it would be unsuitable for damping stick-slip oscillations. Rather, it discloses in the last, controversial, sentence that most systems described in the literature require a different approach from optimisation for frequency response. The teaching of the last paragraph on page 45 of A7 therefore does not call into question the suitability of the concept of the feedback circuit described in A7 for damping oscillations when put into practice.

Hence, the subject-matter of claim 1 is not novel in view of the embodiment according to the basic concept disclosed on pages 40 to 48 of A7.

The ground of opposition pursuant to Article 100(a) EPC in combination with Article 54 EPC prejudices the maintenance of the patent as granted.

4. Auxiliary request 1 - Amendments (Article 123(2) EPC)

Claim 1 differs from claim 1 of the main request in that the word "only" has been introduced in feature (5a) in order to require that the integral gain (I) of the PI controller depends "only" on an approximate stick-slip period and on the effective inertia of the drilling mechanism.

Although the amendment as such finds a literal basis in the first sentence on page 15 of the application as filed (reference is made to the application as published: WO 2010/063982 A2), the sentence as a whole reads:

"*This realization is significant since, as a first step to achieving good damping, the I-term of the PI controller is only dependent on the stick-slip frequency and the effective inertia of the top drive 30.*"

The expression used "*This realization is significant*" clearly refers to the preceding teaching and hence to the specific relationship described by equation (9): $I = \omega_S^2 J$ with $\omega_S$ being an approximate or estimated fundamental angular frequency of the stick-slip oscillations and $J$ being the effective inertia of the drilling mechanism.

Separating the conclusion in the first sentence on page 15 from its technical context, and from the actual concrete finding on which this conclusion is based, results in an intermediate generalisation. As a matter of fact, an explicit relation for the I-term is originally disclosed with equation (9), whereas the amendment made in claim 1 of auxiliary request 1 encompasses relations which extend beyond this original disclosure but still lead to the same advantages as are defined in the following sentence on page 15 of the original publication.

Hence, the amendment to claim 1 of auxiliary request 1 does not fulfil the requirements of Article 123(2) EPC.

5. Auxiliary request 2 - Novelty in light of A7

5.1 A7 discloses, in the experimental section, calculations for the specific model developed by the author of A7, i.e. a hyperstable damping system, on which the work described in A7 is based.

This reading of A7 is confirmed by the experimental results provided in chapter 10 (starting on page 227). On page 229, A7 sets out a simulation which is stated as being "based on the theory developed in the preceding chapters".

Input data for the simulation are set out on page 229 (first bullet point) and the following input data for the simulation are defined:
$J_3$ = 812 kgm$^2$ and $\omega_s$ = 2.1 s$^{-1}$.

If $\kappa_f$ is calculated according to the equation presented on page 45 in regard to the basic model, the simulation of A7 should result in a value for $\kappa_f$ which is derived from
$\kappa_f = \omega_f^2 J_3 = \omega_s^2 J_3$ = 3580.92 Nm.

However, A7 teaches the use of a value of 5139 Nm (see page 230 under "Second phase, active damping system activated").

Hence, the specific values presented in A7 confirm that the further teaching, with regard to an additional torque term which is to be used according to the experimental section of A7, does not refer to the basic concept described on pages 40 to 48.

With respect to the basic concept disclosed on pages 40 to 48, A7 does not provide any teaching that the approximate or estimated fundamental angular frequency of the stick-slip oscillations is determined automatically or is at least determined by using the drill string geometry or computer observation of drive torque.

As a result, and in view of point 3.2 above, the only difference between the subject-matter of claim 1 of auxiliary request 2 and the direct and unambiguous disclosure of A7 is feature (6).

6. Auxiliary request 2 - Inventive step in light of A7

6.1 The parties agree that document A7 is a suitable starting point for the assessment of inventive step. The Board sees no reason to deviate from this assessment, since A7 deals with stick-slip oscillations and therefore focuses on the same purpose as the patent.

6.2 As stated above, feature (6) is the only difference between the subject-matter of claim 1 of auxiliary request 2 and the method of A7.

6.3 Determining the fundamental angular frequency of the stick-slip oscillations by automatic measurement using the drill string geometry or computer observation of drive torque has the effect that the basic concept of A7 can be put into practice.

The objective technical problem can therefore be regarded as putting the basic concept of A7 into practice.

6.4 Although no specific prior-art document has been submitted which discloses an automated system for determining the fundamental angular frequency of the stick-slip oscillations by using the drill string geometry or computer observation of drive torque, it is undisputed between the parties that the skilled person is familiar with various possibilities of estimating or determining the frequency of the stick-slip oscillations either by automatic measurement or manually, including methods based on the drill string geometry or drive torque.

The mere fact that various methods for determining the fundamental angular frequency of the stick-slip oscillations may exist, such as the manual estimations described in paragraph [0076] of the patent, does not automatically mean that the methods defined in claim 1 are not obvious to a person skilled in the art.

Rather, the arbitrary selection of two of a number of various alternative methods, which both parties concede are all as such known to the skilled person, falls within the customary practice of the skilled person when putting into practice the concept in A7.

Considering the drill string geometry in order to determine the fundamental angular frequency of the stick-slip is one of the most obvious choices for the skilled person. It is commonly known, and also argued by the patent proprietor, that the fundamental angular frequency of the stick-slip depends *inter alia* on the length of the drill string and hence on the drill string geometry. Choosing a manual or automatic method for the actual determination also comes within the scope of the skilled person's routine considerations when aiming to put the teaching in A7 into practice.

The subject-matter of claim 1 of auxiliary request 2 is therefore obvious when starting from the basic concept disclosed on pages 40 to 48 of A7.

6.5 The ground of opposition pursuant to Article 100(a) EPC in combination with Article 56 EPC prejudices the maintenance of the patent in amended form according to auxiliary request 2 (corresponding to the auxiliary request 3 found to be allowable by the opposition division).

7. Auxiliary request 3 - Admittance

Claim 1 according to auxiliary request 3 differs from claim 1 of auxiliary request 2 essentially in that further limiting features have been introduced to specify that a transmission-line model is used to achieve a specific damping effect as expressed by a specific range for the frequency-dependent reflection coefficient.

This limited request was filed by the patent proprietor for the first time in appeal proceedings in response to the opponent's grounds of appeal.

Although auxiliary request 3 could in theory have been filed in the opposition proceedings, as argued by the opponent, it is apparent that this new request was filed in direct reaction to the new objections of lack of novelty and inventive step based on A7 which were themselves filed for the first time in the appeal proceedings.

The Board considers that it would, in the present case, go against the principles of procedural fairness and

equal treatment of the parties to admit a new document into the proceedings and to consider new objections based on that document while at the same time disregarding an auxiliary request filed in reaction to those objections.

Thus, the Board admitted auxiliary request 3 into the proceedings (Article 12(4) RPBA 2007).

8. Remittal to the opposition division

Under Article 11 RPBA 2020 the Board may remit the case to the department whose decision was appealed if there are special reasons for doing so.

Neither document A7 nor auxiliary request 3 were discussed in the opposition proceedings. Hence, the case now differs fundamentally from the case which was considered and decided upon by the opposition division. Both parties requested accordingly that the case be remitted to the opposition division.

Thus, there are special reasons for remitting the case within the meaning of Article 11 RPBA 2020.

Therefore, the Board decided to remit the case to the opposition division for further prosecution in accordance with Article 111(1) EPC.

**Order**

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

1. The decision under appeal is set aside.

2. The case is remitted to the opposition division for further prosecution.

The Registrar: The Chairman:

C. Spira G. Patton

Decision electronically authenticated