BESCHWERDEKAMMERN DES EUROPÄISCHEN PATENTAMTS

BOARDS OF APPEAL OF THE EUROPEAN PATENT OFFICE

CHAMBRES DE RECOURS DE L'OFFICE EUROPEEN DES BREVETS

Internal distribution code:
(A) [ ] Publication in OJ
(B) [ ] To Chairmen and Members
(C) [X] To Chairmen

D E C I S I O N
of 21 November 1996

Case Number: T 0286/95 - 3.2.3

Application Number: 90201862.1

Publication Number: 0465731

IPC: E21B 47/00, G01L 3/00

Language of the proceedings: EN

Title of invention:
Method and apparatus for determining the torque applied to a drillstring at the surface

Patentee:
SERVICES PETROLIERS SCHLUMBERGER

Opponent:
-

Headword:
-

Relevant legal provisions:
EPC Art. 56

Keyword:
"Inventive step - yes"

Decisions cited:
-

Catchword:
-

Case Number: T 0286/95 - 3.2.3

D E C I S I O N
of the Technical Board of Appeal 3.2.3
of 21 November 1996

Appellant: SERVICES PETROLIERS SCHLUMBERGER
42, rue Saint-Dominique
F - 75007 Paris (FR)

Representative: Dupont, Henri
c/o Schlumberger Cambridge Research Limited
Post Box 153
GB - Cambridge CB3 OHG (GB)

Decision under appeal: **Decision of the Examining Division of the European Patent Office posted 11 November 1994 refusing European patent application No. 90 201 862.1 pursuant to Article 97(1) EPC.**

Composition of the Board:

Chairman: C. T. Wilson
Members: J. B. F. Kollar
L. C. Mancini

Summary of Facts and Submissions

I. European patent application No. 90 201 862.1, filed on 10 July 1990 was refused by a decision of the Examining Division, dated 11 November 1994.

II. In its decision, the Examining Division held that the independent Claim 1 concerning a method of controlling torsional vibrations in a drillstring while drilling a borehole did not involve an inventive step within the meaning of Article 56 EPC in view of the following documents:

(D1) SPE paper numbered SPE 18 049 and entitled "Torque Feedback Used to Cure Slip-Stick Motion", presented at the 63rd Annual Technical Conference and Exhibition of the SPE, Houston, Texas, USA, 2-5 October 1988, pages 277 to 282, and

(D2) JP-A-63-144 781 (Patent Abstracts of Japan, vol. 12, No. 403, (E-674) [3250], 26 October 1988).

III. A Notice of Appeal was filed against this decision on 22 December 1994 and the appeal fee paid simultaneously. The Statement of Grounds was filed on 13 March 1995.

IV. In response to a communication issued by the Board the Appellant filed a set of Claims 1 to 10 and pages 2 and 2a adapted to said claims on 7 November 1996.

The independent Claims 1 and 8 read as follows:

"1. A method of controlling torsional vibrations in a drillstring while drilling a borehole, the drillstring being driven by an electrical motor whose output shaft is coupled to the drillstring by rotating driving elements having a gear ratio G, the method comprising the steps of:

- determining the drillstring torque $?_?$ at the surface; and

- controlling the electrical motor in response to variations $??_?$ in the drillstring torque about a mean value so as to damp torsional vibrations transmitted up the drillstring;

characterised in that said step of determining the drillstring torque comprises measuring the angular acceleration ? of the output shaft of the electrical motor, measuring the torque $?_m$ of the electrical motor, and calculating the drillstring torque from the relationship $?_?-?_m=?_t$ (?/G), where $?_t$ is the moment of inertia of the motor and the rotating driving elements."

"8. An apparatus for controlling torsional vibrations in a drillstring (10) while drilling a borehole, the drillstring (10) being driven by an electrical motor (24) whose output shaft (22) is coupled to the drillstring by rotating driving elements (20, 26 or 28), having a gear ratio G, said apparatus comprising:

- means for determining the drillstring torque $?_?$ at the surface; and

- means (40, 80) for controlling the electrical motor in response to variations $??_?$ in the drillstring torque about a mean value so as to damp torsional vibrations transmitted up the drillstring;

characterised in that said means for determining the drillstring torque comprises means (50, 56) for measuring the angular acceleration ? of the output shaft of the electrical motor, means (46, 48, 62) for measuring the torque $?_m$ of the electrical motor, and means for calculating the drillstring torque from the relationship $?_?-?_m=?_t(?/G)$, where $?_t$ is the moment of inertia of the motor and the rotating driving elements."

V. The Appellant requests grant of the patent on the basis of the following documents:

Claims: Claims 1 to 10 submitted on 7 November 1996;

Description: Pages 2 and 2a submitted on 7 November 1996 and pages 1, 3 -3rd paragraph to page 7 as originally filed;

Drawings: Figures 1 to 5 as originally filed.

Reasons for the Decision

1. The appeal is admissible.

2. *Closest prior art*

2.1 The Board considers document D1 as the closest state of the art. This citation discloses a method of controlling torsional vibrations in a drillstring while drilling a borehole, the drillstring being driven by an electrical motor the output shaft of which is coupled to the drillstring by rotating driving elements having a gear ratio G. The method comprises the steps of determining the drillstring torque $?_?$ at the surface and controlling the electrical motor in response to variations $??_?$ in the drillstring torque about a mean value so as to damp torsional vibrations transmitted up the drillstring.

2.2 Claim 1 presently on file is correctly delimited with respect to D1 and differs from the disclosure of this document in that the drillstring torque is not measured at the surface, as is the case with the method of D1, but is calculated from the relationship $?_?-?_m=?_t$ (?/G) as specified in the characterising portion of Claim 1.

3. *Novelty*

The issue of novelty has not been raised in the impugned decision and the Board takes the view that novelty can be acknowledged on the basis of the difference specified in point 2.2 above.

4. *Problem and Solution*

4.1 The application in suit concerns a method of controlling torsional vibrations in a drillstring and an apparatus for performing said method.

4.2 As stated above (point 2), such a method is disclosed in D1 considered to form the closest state of the art.

4.3 According to the introduction of the application in suit and in the light of the Appellant's submissions the technical problem underlying the application in suit may be seen in the difficulties involved in measuring the drillstring torque at the surface for the reasons specified at page 2, first paragraph of the description as originally filed.

4.4 According to the application in suit this problem is solved by controlling the drillstring torsional vibrations without the need of measuring the drillstring torque at the surface by means of the feature specified in point 2.2 above.

5. *Inventive step*

5.1 It remains to be considered whether this feature is obvious having regard to the prior art.

5.2 The basic idea behind the method of controlling torsional vibrations in a drillstring according to the present invention appears to be the same as mentioned in the torque feedback concept of document D1, namely to control the driving electrical motor in response to variations.??₂ in the drillstring torque about a mean value so as to damp torsional vibrations transmitted up

the drillstring.

5.3 A closer study of document D1 reveals that the method of D1 relating to curing or preventing "slip-stick motion" not only teaches measuring the drillstring torque at the surface but also indicates (cf. especially page 278, right column) the relevancy of certain parameters influencing the "slip-stick effect", e.g. parameters of the mechanical inertia of the rotating driving elements including the rotary table, gearworks and the driving electrical motor.

5.4 Being in possession of the aforementioned parameters (see point 5.3) relating to the inertia of the driving elements the skilled person could have simply derived from the basic laws of mechanics the equivalent moment of inertia $?_t$ of a rotating body across a transmission and, as already stated at page 4 of the description as originally filed, the further relationship $?_?-?_m=?_t$ (?/G) is simply Newton's second law applied to the driving elements of a drilling rig.

5.5 In view of the above, the Board must ask itself the question why the authors of document D1 (dated 1988), who must have been aware of the difficulties associated with direct measurements taken with torquemeters of the type disclosed in US-A-4 471 663, e.g. as discussed in the opening pages of the contested application, and who must also already clearly have been aware of the basic laws of mechanics, and of the relevant parameters to which these laws were to be applied (see page 278 of D1) if one wished to calculate the drillstring torque rather than measure it directly, chose instead to

accept all the disadvantages of measuring it directly. Under these circumstances the Board doubts whether something which appears at first face to be obvious can in fact have been so. The authors of D1 would surely have chosen the method of calculating, with all its attendant advantages, in preference to direct measurement if this had been obvious to them. But they did not. If it was not obvious to them, can it be said that it would have been obvious to the present applicants just two years later? The said authors must already have had the information on the problems with direct measurement, as well as knowing which parameters were important, and which laws of mechanics were to be applied. They therefore had all the required information, but failed to make the specific step of combining it all to arrive at the present invention. In the Board's view, they would have got no hint in this direction from document D2 either, since this citation has nothing to do with drilling boreholes and therefore provides no teaching at all that it might be a good idea to change from measuring drillstring torque at the top of a drillstring to measuring the torque and angular acceleration at the output shaft of the electrical motor connected via various drive elements to the top of the drillstring, and calculating the drillstring torque from these latter measurements. The teaching of D2 is hardly relevant at all, since the actual motor feedback control technique disclosed in D2 is concerned with maintaining constant torque at the load driven by the motor, rather than with damping torsional oscillations in a drillstring, especially as these two contrasting objectives require different feedback control strategies.

5.6 The Board therefore comes to the conclusion that Claim 1 presently on file is allowable. The independent apparatus Claim 8, closely parallel to the main claim, is thus also allowable.

6. Dependent Claims 2 to 7 and 9, 10 represent particular steps and embodiments of the invention defined in Claims 1 and 8, respectively. They are, therefore, likewise allowable.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the first instance with the order to grant a patent on the basis of the documents specified in point V above.

The Registrar: The Chairman:

N. Maslin C. T. Wilson