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D E C I S I O N
of 29 March 2006

Case Number: T 0969/03 - 3.2.03

Application Number: 98943878.3

Publication Number: 1000222

IPC: E21B 43/10, E21B 43/30

Language of the proceedings: EN

Title of invention:
Creating zonal isolation between the interior and exterior of a well system

Applicant:
SHELL INTERNATIONALE RESEARCH MAATSCHAPPIJ B.V.

Opponent:
-

Headword:
-

Relevant legal provisions:
EPC Art. 56

Keyword:
"Inventive step -no"

Decisions cited:
-

Catchword:
-

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Case Number: T 0969/03 - 3.2.03

D E C I S I O N
of the Technical Board of Appeal 3.2.03
of 29 March 2006

Appellant: SHELL INTERNATIONALE RESEARCH MAATSCHAPPIJ B.V.
Carel van Bylandtlaan 30
NL-2596 HR Den Haag (NL)

Representative: -

Decision under appeal: **Decision of the Examining Division of the European Patent Office posted 11 March 2003 refusing European application No. 98943878.3 pursuant to Article 97(1) EPC.**

Composition of the Board:

Chairman: U. Krause
Members: G. Ashley
K. Garnett

Summary of Facts and Submissions

I. European patent application 98 943 878.3 relates to the lining of boreholes with a steel casing. This appeal lies from the decision of the examining division, dispatched on 11 March 2003, to refuse the application for lack of inventive step with respect to WO-A-93/25799 (D1) and US-A-3901063 (D2).

Notice of appeal was filed on 21 May 2003, and the appeal fee was paid at the same time; a statement containing the grounds of appeal was filed on 2 July 2003.

II. During the examination procedure, the appellant filed, with a letter dated 19 October 2001, an amended set of claims, of which claim 1 formed the basis of the decision of the examining division and reads as follows:

"1. A method of creating zonal isolation between the exterior and interior of an uncased section (6, 18) of an underground well system (1) which is located adjacent to a well section in which a well casing (3, 10, 16) is present, the method comprising the steps of
- inserting an expandable steel tubular (5, 12, 21) through the existing well casing (3, 10, 16) into said uncased section (6, 18) of the underground well system such that one end of the expandable tubular protrudes beyond the well casing into the uncased section of the well system and another end of the expandable tubular is located inside the well casing (3, 10, 16); and
- expanding the expandable tubular (5, 12, 21) using an expansion mandrel (7, 22) having a conical surface by axially moving the expansion mandrel through the

tubular, characterised in that the expandable tubular (5, 12, 21) is made of a formable steel grade and is expanded by an expansion mandrel (7, 22) having a conical ceramic surface such that said one end is pressed towards the wall of the uncased section (6, 18) of the well system (1) and the outer surface of said other end is pressed against the inner surface of the well casing (3, 10, 16) thereby creating an interference fit capable of achieving a shear bond and a hydraulic seal between said surrounding surfaces."

Dependent claims 2 and 3 concern preferred embodiments of the method of claim 1.

III. The examining division viewed D1 as the closest prior art, and concluded that the method of claim 1 differs from that of D1 in that

(a) the expandable tubular is made of a formable steel grade, and

(b) the conical expansion mandrel comprises a conical ceramic surface.

Since D1 discloses that the casing must be made of a malleable material, and in particular mentions steel, the examining division concluded that a formable steel grade is an obvious choice in order to solve the problem of decreasing cracking during expansion. The examining division saw the problem solved by feature (b) as being how to reduce friction between the mandrel and the pipe. D2, which relates to tube-drawing, teaches that forces between the tube and the mandrel can be reduced by using a conical mandrel having a ceramic

outer surface. The skilled person working on the deformation of casing tubes in wells would be familiar with deformation of tubes in general above ground, and would apply the teaching of D2 to D1. The examining division concluded that the skilled person would find it obvious to implement both features, (a) and (b), and no inventive step could be seen in their combination.

IV. The appellant argued that frictional forces are generated between the die and the tube as well as between the mandrel and the tube. The expression "ceramic materials", in plural form at column 2, lines 16 to 22, indicates that the use of a ceramic material is not limited to the plug, but must include other ceramic components. D2 does not disclose how the low frictional forces are to be utilised, hence they could relate to the die/tube interface, rather than the mandrel/die interface. Since D2 neither explicitly nor implicitly discloses that friction forces between mandrel and the tube can be reduced by using a mandrel provided with a conical section having a ceramic surface, it would not be obvious for the skilled person to arrive at the subject-matter of claim 1 from the disclosures of D1 and D2.

V. Requests

No requests have been expressly stated, but it is evident that the appellant requests the decision to be set aside, and a patent to be granted on the basis of the claims 1 to 3 filed on 19 October 2001, as these were the claims upon which the contested decision was based; oral proceedings were not requested.

Reasons for the Decision

1. The appeal is admissible.

2. *Inventive Step - Article 56 EPC*

2.1 The application is directed to lining a bore hole with a steel casing, and in particular how the steel tubes in the borehole can be joined together to form the casing. According to the introduction to the application, a smaller diameter casing is normally inserted into an existing casing and cemented into place. This has the disadvantage that a wide annulus of concrete is required to fix the casing in place, resulting in a significant reduction in the bore of the well.

The method of claim 1 addresses this problem by inserting a second steel tube through a first steel tube that is already in position in the borehole; it is important that the two tubes overlap. A mandrel is then pulled/pushed through the tubes, which thereby expands the second tube to form a tight fit with the first tube and the wall of the borehole. A sealed joint can thus be created without the need for a large annulus filled with cement.

2.2 Document D1 describes the technique of lining a wellbore by means of a steel tube that is expanded using a mandrel (see page 2, lines 1 to 10 and figures 5 and 6). In addition, D1 discloses joining two tubes using this technique (see page 3, lines 1 to 3 and 13 to 22), which provides the advantage that cemented

annuli are no longer required to seal the casing (see page 2, lines 18 to 19). Since D1 concerns the same technical subject-matter and deals with the same problem as that underlying the present application, it is considered to be the closest prior art.

2.3 As already noted (see paragraph III above), the examining division concluded that the method of claim 1 differs from D1 in terms of two features, namely that:

(a) the expandable tubular is made of a formable steel grade, and

(b) the conical expansion mandrel comprises a conical ceramic surface.

D1 discloses that the casing is made of a malleable material, and refers to steel (see page 2, lines 24 to 28). The term "malleable" means capable of being worked, so the skilled person would understand the steel referred to in D1 to be of a "formable grade", thus feature (a) is disclosed in D1.

Claim 1 differs from D1 only in that the mandrel is specified as having a conical ceramic surface (feature (b)).

2.4 The application does not give reasons for choosing a ceramic mandrel, but the appellant indicates in the grounds of appeal (see page 2, penultimate paragraph) that frictional forces between the mandrel and the tube can be reduced by providing the mandrel with a conical section having a ceramic outer surface.

D1 does not indicate the type of material from which the hydraulic expansion tool 7 or 22 (the mandrel) is made. The objective problem to be solved is therefore seen as the selection of an appropriate material.

2.5 The method of claim 1 is in essence a tube-drawing technique, in which a tube is worked by drawing it over a mandrel; in such a process, frictional forces are generated between the surfaces of the mandrel and the tube. Generally in tube-drawing, the cross-sectional area is reduced by pulling the tube between the mandrel and a die, whereas according to the present application there is no die and cross-sectional area is increased by moving a mandrel through the tube. Nevertheless, the problem of friction between the mandrel and the tube applies equally in both situations.

Consequently, the skilled person would take into consideration the teachings of D2, which relates to tube-drawing operations, and in particular discloses the use of a ceramic mandrel (see column 1, lines 1 to 9). D2 teaches that by using ceramic materials low frictional forces are generated (see column 2, lines 14 to 22). It would thus be obvious to either construct the mandrel of D1 out of a ceramic material or provide it with a ceramic surface in order to reduce friction between the mandrel and the tube.

2.6 The appellant submits that D2 neither explicitly nor implicitly discloses that friction forces between mandrel and the tube can be reduced by using a mandrel having a ceramic surface. It is argued that, at column 2, line 19, the use of the term "ceramic materials" in the plural indicates that it is not

limited to the ceramic material of the plug or mandrel, but, for example, could include the die. Hence the low friction forces referred to in D2 could relate to the die/tube interface, rather than the mandrel/die interface.

The expression "ceramic materials" in the sentence at column 2, lines 16 to 22 is generic, and is used in a discussion of properties of ceramics in general. D2 refers to the fact that ceramics are usually weak under tension, hence the plug or mandrel is pre-stressed in compression in anticipation of tensile stresses applied during use, but ceramics have beneficial low friction properties. The sentence in which "ceramic materials" is mentioned concerns the plug, and indeed D2 as a whole is directed to mandrels. It might be that a die is made from a ceramic material, but nevertheless D2 clearly discloses ceramic mandrels, for the same purpose, namely the reduction of friction in a tube-drawing operation.

2.7 The Board therefore concurs with the decision and reasoning of the examining division, that the method of claim 1 lacks an inventive step in light of documents D1 and D2.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

A. Counillon U. Krause