

Internal distribution code:

- (A) [-] Publication in OJ
- (B) [-] To Chairmen and Members
- (C) [-] To Chairmen
- (D) [X] No distribution

**Datasheet for the decision
of 9 December 2020**

Case Number: T 1833/17 - 3.2.03

Application Number: 05817486.3

Publication Number: 1825099

IPC: E21B33/14, E21B33/127

Language of the proceedings: EN

Title of invention:

A METHOD AND A DEVICE FOR SEALING A VOID INCOMPLETELY FILLED
WITH A CAST MATERIAL

Patent Proprietor:

Halliburton Energy Services, Inc.

Headword:

Relevant legal provisions:

EPC 1973 Art. 54(2), 56
RPBA 2020 Art. 13

Keyword:

Late-filed request - admitted (yes)
Novelty - (yes)
Inventive step - (yes)

Decisions cited:

G 0003/14

Catchword:



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 1833/17 - 3.2.03

D E C I S I O N
of Technical Board of Appeal 3.2.03
of 9 December 2020

Appellant: Halliburton Energy Services, Inc.
(Patent Proprietor) 2601 E. Beltline Road
Carrollton, TX 75006 (US)

Representative: King, Lawrence
A.A. Thornton & Co.
15 Old Bailey
London EC4M 7EF (GB)

Decision under appeal: **Decision of the opposition division of the
European Patent Office posted on 30 May 2017
revoking European patent No. 1825099 pursuant to
Article 101(3)(b) EPC.**

Composition of the Board:

Chairman G. Ashley
Members: V. Bouyssy
E. Kossonakou

Summary of Facts and Submissions

- I. European patent No. 1 825 099 (in the following: "the patent") concerns a method for sealing a void incompletely filled with a cast material, in particular for sealing openings in an annulus round a cast-in casing as it is known from the recovery of petroleum.
- II. The patent as a whole was opposed on the grounds that its subject-matter extended beyond the content of the application as filed (Article 100(c) EPC 1973), that it was insufficiently disclosed (Article 100(b) EPC 1973) and that it lacked novelty and inventive step (Article 100(a) EPC 1973).
- III. The opposition division decided to revoke the patent because
- objections under Article 100(c) EPC 1973 prejudiced the maintenance of the patent as granted,
 - objections of lack of novelty under Article 100(a) EPC 1973 prejudiced the maintenance of the patent in amended form according to the first, second and third auxiliary requests before it, and
 - objections of lack of inventive step under Article 100(a) EPC 1973 prejudiced the maintenance of the patent in amended form according to the fourth, fifth and sixth auxiliary requests before it.
- IV. This decision has been appealed by the patent proprietor (in the following "the appellant").
- V. In the statement setting out the grounds of appeal (letter dated 9 October 2017), the appellant requested that the decision under appeal be set aside and the patent be maintained in amended form on the basis of

the set of claims filed as the main request ,
alternatively on the basis of one of the sets of claims
filed as the first to sixth auxiliary requests
therewith.

- VI. In reply to the statement of grounds of appeal, by letter dated 13 February 2018, the opponent withdrew its opposition. They did not file any substantive submissions.
- VII. In a communication pursuant to Rule 100(2) EPC dated 30 April 2020 the Board indicated its preliminary opinion of the case. In particular, the Board indicated that it would be inclined to confirm the opposition division's decision with respect to the main, the first and the second auxiliary requests. The claims of the third auxiliary request could however form the basis of an allowable request.
- VIII. In response to the Board's communication (letter dated 26 August 2020), the appellant filed amended claims and amended description pages as the seventh auxiliary request. In addition, the appellant made clear that, should the Board consider the amended claims and description of the seventh auxiliary request to form the basis for maintenance of the patent in amended form, they would request that this new auxiliary request replaces the main request such that the patent be maintained in amended form on the basis of this request without oral proceedings being held.
- IX. With a further communication pursuant to Rule 100(2) EPC dated 29.9.2020, the Board informed the appellant that, should the seventh auxiliary request be the appellant's sole request, the Board would be minded to set aside the appealed decision and remit the case to

the opposition division with the order to maintain the patent in amended form on the basis of this request. The appellant was invited to clarify its requests accordingly.

X. In response, with letter dated 29 November 2020, the appellant unconditionally requested that the Seventh auxiliary Request replace the Main Request so that the matter may be remitted to the Opposition Division on this basis.

XI. Claims of the appellant's request

(a) Independent claim 1 as amended reads as follows (compared to claim 1 as granted, the added passages are indicated in bold, and the deleted passages in strike-through):

A well system comprising:

a device **for sealing a void (12) incompletely filled with a cast material (10) and** for expanding into a space (16) in a **horizontal** borehole (2); **said void (12) being in the form of an annulus between the outer surface of a tubular element which is a pipe (1) and the borehole (2) wall,**
said space (16) being formed along the lower portion of the annulus and not being filled with the cast material (10) such that the a space (16) **is** at least partly defined by ~~a~~ **the** ~~existing~~ cast material (10) disposed radially between and in contact with the borehole (2) and the device;

wherein the device comprises an annular ~~element~~ **sleeve (6)** disposed on ~~a tubular element~~ **the pipe (1)** in the borehole (2), **wherein the sleeve (6) encircles the pipe (1);**

and ~~comprising~~ **wherein the sleeve (6) is made of** an expandable material **and is** capable of **swelling and** extending from a retracted state to an expanded state in response to contact with a fluid in the well system, **wherein the contact is with a fluid present in the space (16) or by diffusion of the fluid present in the space (16) into openings in the expandable material, the expandable material being arranged to expand into the space (16) which is not filled with cast material (10), wherein the expandable material (6) is arranged to be placed in the void (12) before casting.**

(b) Independent method claim 3 as amended reads as follows (compared to independent method claim 7 as granted, the added passages are indicated in bold, and the deleted passages in strike-through):

A method **for sealing a void (12) incompletely filled with a cast material (10) and** for providing a barrier in a space (16) in a **horizontal** borehole (2), **said void (12) being in the form of an annulus between the outer surface of a tubular element which is a pipe (1) and the borehole (2) wall,** said space (16) being **formed along the lower portion of the annulus and not being filled with the cast material (10) such that the space is** at least partly defined by ~~a~~ **the casting cast** material (10) disposed in the borehole (2),

the method characterized by the steps of:

- on ~~a tubular element~~ **the pipe** (1), disposing one or more annular elements **sleeves** (6) ~~comprising~~ **made of** an expandable material capable of extending from a retracted state to an expanded state **due to swelling on contact with a fluid present in the space (16) or by diffusion of the fluid present in the space (16) into openings in the expandable material, wherein the**

sleeves (6) are connected in an encircling manner to the pipe (1) before the pipe (1) is run into the borehole (2);

- extending the ~~tubular element~~ **pipe (1)** into the borehole (2);

- **placing the expandable material (6) in the void (12);**

- providing a ~~casting~~ **cast material (10)** into a ~~first volume defined by the borehole (2) wall and the outer surface of said tubular element (1)~~ **the void (12) defined by the annulus, wherein the space (16) is created by incomplete filling of the void (12) with the cast material (10) and wherein the expandable material (6) after casting is partly embedded in the cast material (10);**

whereby the expandable material (16) **expands and may extend extends** into said space (16) **after the cast material (10) has cured.**

XII. Prior art

(a) In the statement setting out the grounds of appeal, the appellant relied among others on the following prior art documents which were filed in the opposition proceedings and are cited in the decision under appeal:

D3: US 4,137,970

D4: WO 2004/074621 A2

D5: US 3,918,523

D6: US 4,919,989

(b) In the decision under appeal, reference is also made to the following prior art document which was filed in the opposition proceedings:

D12: WO 2002/20941 A1

XIII. The arguments of the appellant, insofar as relevant for the present decision, can be summarised as follows:

(a) Amendments to the claims

Compared to the claims of the third auxiliary request filed with the statement of appeal grounds, claims 1 and 3 have been further amended to overcome the objection of lack of clarity raised by the Board in the communication pursuant to Rule 100(2) EPC dated 30 April 2020. In fact, occurrences of the text "the or each space" have been amended to refer to "the space (16)" to ensure consistency throughout the claims.

(b) Novelty

The opposition division erred in deciding that the subject-matter of claim 1 as amended lacked novelty in light of D4.

It was the understanding of the opposition division of the disclosure of D4 "that the cast material (431) is placed into the borehole by conventional cementation techniques (page 21, lines 1 and 2), that is cement fluid is poured into the borehole from the surface and flowing down along the annulus" (in the decision under appeal, see point 13.2 of reasons). This statement displays a complete misunderstanding of what constitutes "conventional cementation techniques" and can thus be disregarded in its entirety. Indeed, conventional cementing - otherwise known as primary cementing (whereby a pipe is cast into a wellbore) - is achieved by pumping cement down through the casing, and then up through the annulus. Cement is not simply poured down the outside of the pipe in conventional

cementing methods - this method is known instead as "reverse circulation cementing", a technique used only in certain exceptional circumstances.

The opposition division then wrongly concluded that "in the real casting process, cement or concrete will not be placed only below and above the annular sleeve (43) as shown in an idealised schematic manner in Figure 4B but will inevitably also arrive to a certain degree at a position radially between the borehole wall and the radially outer end of the annular sleeve (43)" and that "due to the mere principle of the conventional cementation technique a space is formed that is at least partly defined by the cast material disposed radially between and in contact with the borehole and the device" (point 13.2 of reasons). There is no basis in D4 for the opposition division to have reached this conclusion. D4 is directed to systems and methods for creating zonal isolation in a wellbore, where a sealing element is kept under compression after completion of its placement (claim 1 of D4). In other words, D4 is directed to conventional packers, not a system and device according to the present invention. D4 comprises many embodiments, which are alleged to work in a number of ways. As such, aspects of separate embodiments cannot be cherry-picked to create new embodiments to arrive at a hindsight-derived conclusion that the present invention lacks novelty.

Figure 4B and the discussion on pages 18 and 19 are relevant in that they disclose a sealing ring which seals the area between a pipe and borehole wall and may include swellable material. The swellable material can either be placed onto a pipe before insertion into a wellbore, can be fed into place subsequent to placing the pipe via a feed line, or introduced using a

technique called "plug flow", where a resin is passed behind the pipe along with another fluid and then subsequently activated. However, what is not explained in relation to the embodiments of Figure 4B is how the cement is placed. Thus, the disclosure is not enabling. There is a clue in relation to Figure 4A where it states that expanding cement is placed "above and below" the sealing ring. This means that a two stage process is implemented of first using conventional cementing to place cement below the ring (in complete contrast to the opposition division's belief of how conventional cementing takes place) followed by a second step of "reverse cementing" to then place the cement above the ring once the cement below had hardened. The expansion of the cement above could then be sufficient to maintain the ring under pressure.

It would not be practical to conventionally cement the sealing ring of D4 so that cement passes the ring on its way up the annulus, the weight of the cement above the ring eventually being sufficient to compress the ring and cause a seal. The ring must be fairly close to the borehole wall before it is compressed, or at the very least will approach the borehole wall just prior to sealing. The pressure needed to force a viscous material such as cement down a pipe, up an annulus, then past a small gap between ring and wall is high. To then force enough cement so that the weight of cement above the ring is enough to seal the gap would be so great it would almost certainly damage the borehole. Even taking the opposition division's conclusion that the cement is reverse cemented, sufficient weight of cement to hydrostatically seal the gap would be present once the top of the pipe is filled with cement, so cement would not pass the ring and end up beneath the ring as shown in Figure 4B.

In any case, the net result of a compression ring creating a seal against the wall of the borehole will not be that the claimed feature that "cast material (10) is disposed radially between and in contact with the borehole (2) wall and the expandable material (6)" is present. This is not an inevitable result as wrongly surmised by the opposition division. It therefore must be concluded that claim 1 is novel.

Moreover, claim 1 as amended specifies that the borehole is horizontal. In D4, horizontal well bores are only discussed in relation to open hole completion using prior art inflatable packers (page 3, lines 15 to 17). The embodiments of D4 shown in Figures 4A and 4B would not work in a horizontal wellbore because it would not be possible to position cement sheaths either side of the expandable ring. Therefore, the present claims are further differentiated from D4.

The opposition division argued that the device of D4 was suitable to be arranged in a horizontal wellbore. However, the device of D4 maintains zonal isolation by being held in a state of compression and this would not be possible if the device of D4 were placed into a horizontal wellbore, since at the very least hydrostatic pressure under gravity from cement above the device is required. This will not occur in a horizontal wellbore.

The opposition division asserted that, if the device of D4 were arranged in horizontal boreholes, a space would or might be formed, depending on the boundary conditions, along a lower portion of the annulus, which would be sealed by the annular sleeve 43. However, there is absolutely no basis in D4 for this assertion.

It is not disclosed in D4 that the ring passively absorbs liquid from the surrounding area to the extent that it will swell and seal a space.

(c) Inventive step

The subject-matter of claims 1 and 3 involves an inventive step.

When assessing the inventive step of the fourth auxiliary request starting from D4 as closest prior art, the opposition division held that the claimed subject-matter differed from D4 only in that the borehole is horizontal (point 20.3 of the reasons), that the technical problem to be solved was that of providing a new method of use for the device of D4 (point 20.4 of the reasons) and that the claimed solution to this problem was rendered obvious to the skilled person by the statement on page 3, line 13 to 25 of D4 regarding horizontal wells and the problems thereof with using conventional packers (point 20.5 of reasons).

However, contrary to the opposition division's view, the embodiments shown in Figures 4A and B of D4 are not suitable for use in a horizontal wellbore, and so the objective technical problem to be solved is rather that of providing a passive device/method for providing a barrier in a space formed in a horizontal borehole.

Moreover, the cited statement on page 3, line 13 to 25 of D4 is of no relevance to the objective technical problem as defined above, and relates to issues with the packers themselves when used in uncemented boreholes.

There are several embodiments of D4 that could possibly solve the problem of use in a horizontal wellbore where compression from hydrostatic pressure above is not required and these include using expandable cement and an expandable pipe. This teaches away from the claimed invention. Alternatively, the skilled person could inflate the device using expandable material supplied from above, but again this is an active method that teaches away from the present invention. The skilled person is not taught that devices according to any embodiment of D4 would be suitable to solve the present technical problem. Furthermore, even if the devices of Figure 4B solve the problem of conventional packers in a horizontal environment, they still do not solve the present technical problem of incomplete casting in a horizontal wellbore.

These arguments apply equally to method claim 3.

Reasons for the Decision

1. Applicable provisions of the EPC
 - 1.1 The patent is based on an International application which was filed under the PCT on 12 July 2005, and was still pending at the time of entry into force of the revised EPC (EPC 2000) on 13 December 2007.
 - 1.2 According to Articles 1(1) and 6, first sentence of the Decision of the Administrative Council of 28 June 2001 on the transitional provisions under Article 7 of the Act revising the EPC of 29 November 2000 (Special edition No. 4, OJ EPO 2007, 217), Articles 54(1)(2), 56, 84 and 100 EPC 1973 as well as Article 123 EPC (2000) apply.

2.

3. Withdrawal of the opposition

3.1 The withdrawal of the opposition means that the opponent ceased to be party to the proceedings in respect of the substantive issues, but it has no direct procedural consequences for the appeal proceedings since the opponent was the respondent and the contested patent was revoked by the appealed decision (see e.g. Case Law of the Boards of Appeal of the EPO, 2019, III.Q.3.3).

3.2 In the context of the patent proprietor's appeal, the Board can take into account the facts, arguments and evidence submitted by the opponent prior to the withdrawal of the opposition, when examining the correctness of the decision under appeal.

4. Admissibility of the appellant's request

4.1 The appellant filed its present request for the first time in response to the Board communication pursuant to Rule 100(2) EPC dated 30 April 2020.

4.2 Claims 1 and 3 differ from claims 1 and 3 of the third auxiliary request filed with the statement of grounds of appeal only in that the text "the or each space" has been amended to refer to "the space (16)".

4.3 These amendments were filed in direct reaction to the objection of lack of clarity (Article 84 EPC 1973), which was raised for the first time by the Board in this first communication pursuant to Rule 100(2) EPC (point 13.2). They clearly overcome all outstanding objections without introducing new issues. The Board

thus sees no reason to disregard this request (Article 13(1) and (2) RPBA 2020).

4.4 The claims of the third auxiliary request filed with the statement of grounds of appeal differ from those of the third auxiliary request filed with letter dated 10 February 2017 in that dependent claim 4 has been deleted and the subsequent dependent claims have been renumbered accordingly. It can be inferred from the file that the appellant had already made these amendments in the oral proceedings before the opposition division (see decision under appeal, point 12 of the reasons; minutes of the oral proceedings, page 2). Therefore, the third auxiliary request filed with the statement of grounds of appeal corresponds to the third auxiliary request on which the appealed decision was based and thus they had to be considered in the appeal proceedings (Article 12(4) RPBA 2007).

5. Amendments to the claims

5.1 The Board shares the view of the opposition division that the amendments to the claims meet the requirements of Article 123(2) and (3) EPC (see decision under appeal, point 16 of the reasons).

5.2 The Board is also satisfied that the amendments do not introduce a lack of clarity (Article 84 EPC 1973).

6. Claim construction

6.1 Before turning to the objections of lack of novelty and lack of inventive step it is necessary to construe claim 1. In particular, the appellant disputes how the opposition division interpreted the terms "device" and "space" of claim 1.

6.2 Claim 1 is directed to a well system comprising, among others, a device for expanding into a space in a horizontal borehole, and a space at least partly defined by a cast material disposed radially between and in contact with the borehole and the device.

In the claim, the device is defined in terms of structural features as well as functional features specifying how the device expands into the space. The skilled person reading claim 1 may thus recognise that it defines a device intended for use in a well, or borehole, in which a space may eventually be formed after casting. In this respect, the skilled person knows that there is a large degree of chance that determines whether or not such a space will be formed in practice.

However, since claim 1 further requires that the well system comprises the space formed in the cast material and that this space has specific properties, the skilled person is left in doubt as to how these further features are to be construed in the context of the claim. This introduces an ambiguity as to the definition of the claimed subject-matter.

The skilled person would try to resolve this ambiguity by using the description of the patent. In doing so they would understand that claim 1 is not directed to the device per se, but rather to the well system comprising the borehole, the space formed in the cast material after casting, and the device expanded into the space. Thus, in the context of claim 1, the functional features characterising the device must be construed as "product-by-process" features describing the process of sealing the incompletely cemented

annulus. In a nutshell, the subject-matter of claim 1 is essentially the product obtained directly by the process defined in claim 3.

The Board notes that the ambiguity mentioned above was already present in claim 1 as granted and thus it cannot give rise to an objection of lack of clarity under Article 84 EPC 1973 (see decision G 3/14, OJ 2015, A102).

6.3 "Device"

The opposition division based its decision on the argument that, in the context of claim 1, the "device" could and indeed should be understood as comprising the "sleeve" as well as the "pipe" defined in the claim.

The Board shares the appellant's view that this argument is not persuasive. Claim 1 requires that "the device comprises an annular sleeve disposed on the pipe in the borehole". When reading this feature in the context of the claim, it is apparent that the device comprises the sleeve, but not the pipe (see e.g. the wording "a device for sealing a void ... said void being in the form of an annulus between the outer surface of a tubular element which is a pipe and the borehole wall").

6.4 "Space"

6.4.1 Claim 1 requires that the device be adapted "for expanding into a space in a horizontal borehole, ... said space not being filled with the cast material such that the space is at least partly defined by the cast material disposed radially between and in contact with the borehole and the device", and that "the sleeve is

made of an expandable material and is capable of swelling and extending from a retracted state to an expanded state in response to contact with a fluid in the well system, wherein the contact is with a fluid present in the or each space or by diffusion of the fluid present in the or each space into openings in the expandable material, the expandable material being arranged to expand into the space which is not filled with cast material".

6.4.2 Based on the above interpretation of the subject-matter of claim 1 and the term "device", these features imply among others that, after cast material has been filled into the annulus between the pipe and the borehole wall and then allowed to cure,

- the cast material is disposed radially between the device and the borehole wall,
- the cast material contacts the device,
- due to incomplete filling of the annulus with the cast material, a space not filled with cast material is at least partly defined by the cast material placed in the annulus,
- the device and its sleeve of expandable material expand into this space, and
- the sleeve has swelled and extended from a retracted state to an expanded state on contact with a fluid present in the space, or by diffusion of this fluid into the sleeve.

6.4.3 For the sake of completeness, the Board notes that this understanding is confirmed by the teaching in the patent (see e.g. space in form of channel 16 in Figures 1 and 2, and fluid 14 in annulus 10 in Figure 3).

7. Novelty

- 7.1 The Board is satisfied that the subject-matter of claims 1 and 3 is new in the sense of Article 54(1) (2) EPC 1973 over the cited prior art documents, in particular D4, D3, D5 and D6.
- 7.2 Document D4
- 7.2.1 The opposition division decided that amended claim 1 of the third auxiliary request before it lacked novelty in light of D4 because the device disclosed in Figure 4B of D4 anticipated all the structural and functional features recited in the claim. In particular, the opposition division held that this specific device was suitable for arranging in a horizontal wellbore, as required by claim 1 (point 17 of reasons).
- 7.2.2 D4 discloses, in Figure 4B, a sealing ring 43 which is made of an elastic material in compression, and has been placed on the outside of a casing 42 prior to inserting it in the borehole 41 (page 18, line 30 to page 19, line 8). A cement sheath 431 is formed above and below the sealing ring 43 to confine the ring and maintain it under compression (page 18, lines 10 to 13). To obtain compression, the sealing material may include swellable material which is continuously fed to the ring down a line 421 at the back of the casing 42. The cement sheaths 431 form a cast material in the sense of claim 1. Based on the above interpretation of the feature "device", the sealing ring 43 can be seen as a device in the sense of claim 1. As shown in Figure 4B, the sealing ring 43 expands into a space which is not filled with cement, as required by claim 1. This space is defined by the cement sheaths above and below the ring. However, this drawing fails to show that cement is disposed radially between the ring 43 and the borehole and in contact with the ring.

- 7.2.3 The opposition division argued that casing 42 was cemented by using a conventional cementation technique, as mentioned on page 21, lines 1 and 2 of D4, that this technique involved pouring cement slurry down the annulus and that it was thus inevitable that cement was "disposed radially between and in contact with the borehole and the device" and that it "at least partly defined" a space not filled by cement.
- 7.2.4 The Board agrees with the appellant that these arguments are not persuasive:
- 7.2.5 Conventional cementing operations normally involve pumping cement slurry down the casing and then up the annulus, but not pumping cement down the annulus. This latter technique is known as "reverse-circulation cementing" and is normally used only for critical formations.
- 7.2.6 As submitted by the appellant, it cannot be derived from D4 that the casing 42 shown in Figure 4B is cemented by reverse-circulation cementing to form the cement sheaths 431. However, the Board is not convinced by the appellant's argument that the lower cement sheath 431 is formed by conventional cementing, while the upper cement sheath 431 is formed by reverse cementing, because D4 lacks any hint or incentive to use this latter technique and it is normally used only in certain exceptional circumstances. Rather, it is apparent that the casing 42 is cemented by the conventional cementing technique illustrated in Figures 6A and 6B of D4 and that, once the cement slurry has been placed in the annulus, the sealing ring 43 is expanded, via line 421, to displace the slurry and thus seal the annulus (page 21, lines 1 to 7). As explained

by the appellant, it would not be practical to form the cement sheaths 431 by conventional cementing after expanding the sealing ring.

7.2.7 Notwithstanding the above, the Board is of the opinion that it can be derived from D4 that, due to changing conditions in the borehole or events such as completion operations, the sealing ring 43 may expand in an uncemented space of the cemented annulus, as required in claim 1.

7.2.8 Indeed, it is the general aim of D4 to provide systems and methods for maintaining zonal isolation in a wellbore, whereby a sealing element is kept under compression after completion of its placement (see e.g. claims 1 and 36), to accommodate any likely conformational, pressure or temperature changes of the surrounding wellbore portion by contracting or expanding in response to these changes (page 5, lines 13 to 16). It is expressly stated in D4 that, if a fluid pathway were to be created by cement fractures or micro-annuli formed at at the cement/casing interface and/or at the cement/formation interface, the sealing element would deform and block this pathway hence preventing any fluid migration along the wellbore (page 5, lines 16 to 21).

7.2.9 This general teaching of D4 must hold true for the preferred embodiment of the sealing element shown in Figure 4B. The Board thus considers that D4 discloses that, after casting, a cement fracture or micro-annulus may develop at the cement/formation interface with the inevitable consequence that the ring 43 will expand in this space unfilled with cement to re-seal the annulus.

- 7.2.10 Finally, since the sealing ring 43 is preferably made of water absorbent gels such as cross-linked polyacrylate or polyacrylamide, or organic swellable material such as high swell neoprene or nitrile, it is inherently capable of swelling on contact with a fluid present in this uncemented space, as required by claim 1.
- 7.2.11 Be that as it may, as explained above, claim 1 is not directed to a sealing device per se, but rather to a well comprising a casing cemented in a borehole and a sealing device. The amendment according to the appellant's sole request results in that the claimed well comprises a cemented horizontal borehole. For this reason, the well with a vertical borehole as shown in Figure 4B of D4 cannot anticipate the claimed subject-matter.
- 7.2.12 In addition to this well with a vertical borehole, D4 discloses wells with horizontal boreholes, but they are in open-hole completion, wherein the production tubing is not cemented in place and zonal isolation is achieved by using packers (page 3, lines 13 to 17 and Figures 2A and 2B).
- 7.2.13 Notwithstanding the above, the Board shares the appellant's opinion that it cannot be derived from D4 that the sealing ring 43 can be adapted for use in the claimed manner. In fact, it is indispensable for the proper functioning of the sealing ring 43 that it is effectively confined between two cement sheaths 431, and it is unclear how such cement sheaths could be formed on either side of the ring 43 in a horizontal borehole.

- 7.3 Document D3 does not disclose a well with a vertical borehole. It discloses a drain pipe 11 which is cemented in a vertical borehole 12 and a deformable packer for sealing off the annulus between the drain pipe and the borehole, wherein the packer consists of a jacket 16 of a chemically expandable material which expands on contact with water and naturally occurring brines. D3 fails to disclose that the cast material is disposed radially between the device and the borehole, and that the device is in contact with the cast material.
- 7.4 Document D5 does not concern a well with a vertical borehole. It discloses, in Figures 4 and 5, a vertical borehole 16 and a casing 10 carrying a lower bracelet 12 including expandable material 24, e.g. sponge, rubber or bentonite, and an upper bracelet 12 including expandable material 24, preferably dry cement which - after dissolution of a bracelet coating - mixes with drilling fluid 26 to produce a cement slurry 28 in the annulus. The two bracelets are wrapped in a compressed state around the casing 10 before running it in the borehole 16. The lower bracelet 12 is allowed to expand against the borehole wall to support the cement slurry 28 (column 3, line 29 to column 4, line 8, in particular column 3, lines 55 to 62). As shown in Figure 5, the lower bracelet 12 expands into a space which is not filled with cement 28 and is partly defined by the cement placed above the bracelet. However, this space does not form a space in the sense of claim 1. In fact, no cement is disposed radially between the borehole and the lower bracelet 12 because it abuts the borehole wall about its entire circumference to prevent any cement slurry from flowing past.

7.5 Document D6 does not disclose a well with a vertical borehole. It discloses, in Figure 6, a vertical borehole 12 having a capped-off well casing 10 therein which is used to monitor and measure the level of ground water or a water table level 30 which changes from time to time. To seal the annulus 21 between the casing 10 and the borehole wall 23 and thus prevent water seepage from openings 16 in the strata above the water table level 30, annular sealing elements or disks 20 of liquid-swellable material are deposited to move down the borehole guided on the casing 10 to fill the annulus. The disks 20 are adapted to absorb water leaking into the borehole and then expand radially outwardly and inwardly to tightly clamp around the casing 10 and against the borehole wall 23 (column 8, lines 3 to 46). At ground level the upper end of the casing 10 is surrounded by a concrete cap 32, which can be seen as a cast material in the broad sense of claim 1. The uppermost disk 20 expands into a space which is not filled with concrete and is at least partly defined by the concrete. However, this space does not anticipate the space of claim 1. In fact, no concrete is disposed radially between the disk and the borehole, and no concrete is in contact with the disk.

8. Inventive step

8.1 The appellant shares the view of the opposition division that Figure 4B of D4 forms a realistic starting point for the assessment of the inventive step of the subject-matter of claim 1.

8.2 However, it is unrealistic to start from Figure 4B of D4 for a development towards the claimed invention. Indeed, contrary to the claimed well with a horizontal borehole, Figure 4B of D4 concerns a well with a

vertical borehole. The skilled person could further develop that well but at the end of that development the well would still be a well with a vertical borehole. In general, although the skilled person is essentially free in choosing a (realistic) starting point for a development towards the claimed invention, that choice defines the framework for further development.

- 8.3 The Board is of the opinion that a promising and realistic starting point for the assessment of inventive step is a well with a horizontal borehole, a casing cemented therein and an uncemented space in the form of a fluid channel along a lower portion of the cemented annulus. Such a well is generally known in the art and described in the opening paragraphs of the patent, but not disclosed in the cited prior art documents. In particular, the horizontal boreholes disclosed in D4 and D12 are in open-hole completion.
- 8.4 The subject-matter of claim 1 differs from this generally known prior art essentially in that it comprises a device which has expanded into the space for sealing the annulus, the device comprising an annular sleeve of expandable material which has been disposed on the casing and arranged in the annulus before cementing to eventually expand into the space not filled with cement, and has swelled on contact with a fluid present in the space, or by diffusion of this fluid into the sleeve.
- 8.5 The problem objectively solved by these distinguishing features can be seen as how to prevent or reduce uncontrollable fluid transport in the cemented annulus (see page 2 of the application).

- 8.6 The Board is not persuaded that in light of the cited prior art documents the skilled person, in the expectation of solving this problem, could and indeed would dispose a sleeve of expandable material on the casing to properly position the sleeve before cementing, i.e. before the uncemented space is formed, so as to arrive at the claimed invention. As explained above there is a large degree of chance that determines whether or not such a space not filled with cement will be formed in practice.
- 8.7 In conclusion, with regard to the prior art cited by the opponent, the Board is of the opinion that the subject-matter of claim 1 involves an inventive step in the sense of Article 56 EPC 1973.
- 8.8 The above reasoning applies *mutatis mutandis* to the subject-matter of method claim 3.
9. The description has been brought into conformity with the amended claims.
10. The Board comes to the conclusion that the patent documents according to the (sole) request meet the requirements of the 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 with the order to maintain the patent as amended in the following version:

- claims 1 to 3 filed as the seventh auxiliary request with letter dated 26 August 2020;
- description pages 1 to 7 filed with letter dated 26 August 2020; and
- drawing sheets 1/3 to 3/3 of the patent specification.

The Registrar:

The Chairman:



C. Spira

G. Ashley

Decision electronically authenticated