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Datasheet for the decision of 12 September 2014

Case Number: T 0028/12 - 3.2.03

Application Number: 04766286.1

Publication Number: 1649136

IPC: E21B33/12

Language of the proceedings: EN

Title of invention:
SYSTEM FOR SEALING A SPACE IN A WELLBORE

Patent Proprietor:
Shell Internationale Research Maatschappij B.V.

Opponent:
Halliburton Energy Services, Inc.

Headword:

Relevant legal provisions:
EPC Art. 108, 123(2), 84, 54, 56
RPBA Art. 12(4)

Keyword:
Admissibility of appeal - (yes)
Admissibility of main request - (no)
Admissibility of auxiliary request - (yes)
Novelty - auxiliary request (yes)
Inventive step - auxiliary request (yes)

Decisions cited:
G 0001/95, T 0023/10, T 0936/09

Catchword:

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Case Number: T 0028/12 - 3.2.03

D E C I S I O N
of Technical Board of Appeal 3.2.03
of 12 September 2014

Appellant: (Patent Proprietor)	Shell Internationale Research Maatschappij B.V. Carel van Bylandtlaan 30 2596 HR Den Haag (NL)
Representative:	Shell Internationale Research Maatschappij B.V. Intellectual Property Division, P.O. Box 302 2501 CH Den Haag (NL)
Respondent: (Opponent)	Halliburton Energy Services, Inc. 2601 Beltline Road Carrollton TX 75006 (US)
Representative:	Cottrill, Emily Elizabeth Helen A.A. Thornton & Co. 10 Old Bailey London EC4M 7NG (GB)
Decision under appeal:	**Decision of the Opposition Division of the European Patent Office posted on 16 November 2011 revoking European patent No. 1649136 pursuant to Article 101(2) EPC.**

Composition of the Board:

Chairman	G. Ashley
Members:	V. Bouyssy
	M. Blasi

Summary of Facts and Submissions

I. European patent No. 1 649 136 (in the following: "the patent") concerns a system and a method for sealing a space in a wellbore formed in an earth formation containing formation water susceptible of flowing into the wellbore.

II. The patent as a whole was opposed on the grounds of Article 100(a) EPC for lack of novelty and inventive step. The Opposition Division revoked the patent for lack of inventive step (Article 101(2) EPC).

III. This decision has been appealed by the patent proprietor (here appellant).

IV. With the summons to oral proceedings, the Board sent a communication pursuant to Articles 15(1) and 17(2) of the Rules of Procedure of the Boards of Appeal (RPBA) indicating to the parties its preliminary, non-binding opinion of the case.

V. Oral proceedings before the Board were held on 12 September 2014.

VI. Requests

The appellant (proprietor) requested that the appealed decision be set aside and the patent be maintained as granted (main request), or alternatively on the basis of the set of claims filed as auxiliary request 2 with letter dated 22 March 2012.

The respondent (opponent) requested that the appeal be rejected as inadmissible, or alternatively that the appeal be dismissed.

VII. Claims

a) Main request

The claims of the main request correspond to the claims as granted.

b) Auxiliary request

Independent claim 1 is directed to the following subject-matter (the feature numbering has been introduced by the appellant and has been used by the respondent; compared with claim 1 as granted, added features are in indicated bold):

i) A system for sealing a space (7) in a wellbore (1) formed in an earth formation (2), comprising
ii) a swelleable body (12) arranged in the wellbore in a manner so as to seal said space upon swelling of the swelleable body, the swelleable body being susceptible of being in contact with formation water (4) flowing into the wellbore,
iii) the swelleable body including a polymer matrix material provided with a compound soluble in said formation water,
iv) wherein the matrix material substantially prevents or restricts migration of the compound out of the swelleable body and allows migration of said formation water into the swelleable body by osmosis so as to induce swelling of the swelleable body upon migration of said formation water into the swelleable body,

characterized in that

v) the polymer matrix material is obtained or obtainable by mixing the compound in a mass of

polymer material and thereafter vulcanizing the mass of polymer material to form said polymer matrix material,

2) **wherein the polymer matrix material is an elastomer matrix material,**

3) **wherein the compound is formed by salt particles.**

Dependent claims 2 to 14 define preferred embodiments of the sealing system of claim 1.

Independent claim 15 is directed to a method of sealing a space in a wellbore formed in an earth formation, comprising the step of arranging a swelleable body having features (ii) to (v), (2) and (3).

VIII. Cited evidence

The parties relied on the following documents which are cited in the appealed decision:

D1: WO 03/008756
D2: US 5290844
D3: US 4590227
D4: US 4137970
D5: US 3502149
D6: US 3385367
D7: US 3306870
D9: McGraw-Hill Dictionary of Engineering, 1994, page 549 (definition of "vulcanization")

With the statement of grounds of appeal and the reply thereto, the parties filed the following documents:

D10: BINAS, Wolters-Noordhoff, 1986, pages 106 to 107 (solubility of salts in water)

D11: CRC Handbook of Chemistry and Physics, 63rd edition, 1982-1983, pages B-87 and B-147 (solubility of salts in water)
D12: Affidavit of Ms N. Dijkstra
D13: Reid G.W. et al.:"Brine Disposal Treatment Practices Relating to the Oil Production Industry", 1974, pages 44 to 46
D14: Murray R.M. and Thompson D.C.: "The Neoprenes", International Edition, E.I. Du Pont de Nemours & Co. Inc., 1963, pages 74 and 75
D15: Data sheet for Hypalon®, a product by DuPont Dow Elastomers

IX. The arguments of the parties in the written and oral proceedings, insofar as relevant for the present decision, can be summarised as follows:

a) Admissibility of the appellant's main request

Respondent's case:

The appellant's main request was not admissible because the appellant did not indicate any specific reason why the Opposition Division's decision was wrong.

Appellant's case:

In the statement of grounds of appeal, reference was made to the arguments as presented during the opposition proceedings. It could be inferred from these arguments why the appellant considered the Opposition Division's decision to be wrong and thus should be set aside. Consequently, the main request should be considered in the appeal proceedings.

b) Admissibility of the appellant's auxiliary request

Respondent's case:

The auxiliary request should not be admitted into the proceedings because it was late-filed and complex; it gave rise to new issues, since claim 1 was *prima facie* objectionable to under Articles 123(2) and 84 EPC; it could have been filed in the opposition proceedings; filing it at this stage was not in line with the purpose of the appeal procedure. Such a filing was an attempt to start the opposition proceedings anew and amounted to a clear abuse of procedure, as ruled in T 23/10 and T 936/09. Thus the auxiliary request should not be considered pursuant to Article 12(4) RPBA.

Appellant's case:

In the opposition proceedings, the proprietor had not requested oral proceedings, and thus had been surprised by the Opposition Division's decision, which was the first and last office action. The present auxiliary request was an appropriate reaction to this decision. In addition the amendments did not raise any new complex issue as they only concerned the introduction in the independent claims of features taken from dependent claims 3, 5 and 8 as granted. Consequently, the auxiliary request should be taken in consideration.

c) Admissibility of the appeal

Respondent's case:

Since the main request and the auxiliary request of the appellant were not admissible, the appeal should be rejected as inadmissible.

Appellant's case:

Even if appeal proceedings are in general mainly concerned with the review of the appealed decision, it was established case law that an appeal could be substantiated by filing amended claims which deprive the appealed decision of its basis. Since the auxiliary request was adequately substantiated, the appeal was admissible.

d) Auxiliary request - Article 123(2) EPC

Respondent's case:

Claim 1 contravened Article 123(2) EPC because the introduction of feature (3) ("wherein the compound is formed by salt particles") amounted to a non-allowable intermediate generalisation of the teaching in claim 7 and on page 5, lines 18 to 23 of the application as originally filed. In particular, claim 1 lacked the further feature that the salt particles are "dispersed" or "embedded" in the matrix material.

Appellant's case:

Claim 1 as amended was essentially based on claims 1, 3, 4, 6, 7 and 10 as originally filed.

e) Auxiliary request - Article 84 EPC

Respondent's case:

Feature (3) of claim 1 lacked clarity because the wording "formed by" could describe a process step and thus it was not clear whether the salt was present as

solid "salt particles" or derived from salt particles, such as dissolved salt in the elastomer matrix material.

Appellant's case:

It was clear from the wording "the compound is formed by salt particles" that the compound consists and is in the form of salt particles in the elastomer matrix material.

f) Auxiliary request - Novelty

Respondent's case:

The subject-matter of claim 1 lacked novelty over D1 incorporating either D2 or D3, which were cited in D1. D2 disclosed a water-swelleable elastomer vulcanised from a composition comprising calcium carbonate hydroxide, magnesium carbonate hydroxide, calcium carbonate or zinc oxide as filler. D3 disclosed a water-swelleable elastomer vulcanised from a mixture comprising zinc oxide or magnesium oxide as filler (see examples 1 and 8). These fillers are salts soluble in formation water and implicitly able to cause swelling by osmosis (see D13, D14, D15).

The subject-matter of claim 1 lacked novelty over D4 incorporating D5, which was cited in D4. In particular, example 12 of D5 disclosed a water-swelleable gelled sealant formed from a polymer composition comprising zinc acetate. Since the gelled sealant was obtained by curing and cross-linking a polymer material, it was obtained/obtainable by "vulcanizing" a polymer mixture. The gelled sealant had rubber-like properties and thus was an "elastomer" matrix material. Zinc acetate is a

soluble metal salt which would inevitably cause swelling by osmosis.

The subject-matter of claim 1 lacked novelty over D6, which disclosed an elastomer open-pore sleeve impregnated with an AM-9 gel incorporating a salt, such as NaCl. D6 teaches that additional swelling results if the salt solution concentration is made higher than that of the underground saline water. Hence water swelling by osmosis as defined in the claim is disclosed. Since the gel was obtained by curing a mixture of acrylamide, methylene bisacrylamide, water and dissolved salt, it was obtained/obtainable by vulcanising a mixture of polymer material and salt particles. The gel inherently had rubber-like properties and thus formed an elastomer matrix material.

Appellant's case:

The claimed subject-matter was novel over D1, D4 and D6, because these documents failed to disclose the combination of features (iii), (iv), (v), (2) and (3) of claim 1.

Even though D1 expressly referred to D2 and D3, it did not directly and unambiguously hint to each of the vulcanised elastomers disclosed in D2 and D3. Moreover, neither D2 nor D3 disclosed features (iii), (iv) and (3): D2 taught that calcium carbonate could be used as a filler but this compound is hardly soluble in water and is unable to cause swelling of the vulcanised elastomer by osmosis in formation water (see D10, D11, D12); D3 lacked any suggestion to include solid water-soluble salt particles in the vulcanised elastomers to cause their swelling by osmosis in formation water.

D4 did not directly and unambiguously hint to the elastomer composition in example 12 of D5. Thus, this composition could not be incorporated in the teaching of D5. Moreover, example 12 of D5 disclosed an hydrogel which lacked the combination of features (iii), (iv), (v), (2) and (3).

g) Auxiliary Request – Inventive step

Respondent's case:

The claimed subject-matter differed from either D6 or the obvious combination of D4 and D5 only in that, when vulcanising the gel forming aqueous solution, the salt was in the form of solid salt particles and not dissolved in water. This difference did not provide any technical effect. The objective problem could thus be seen as providing an alternative way of incorporating salt in the gel. The claimed solution was an obvious solution in view of common general knowledge, as documented in paragraph [0038] of the patent and in D2. Thus, the subject-matter of claim 1 lacked an inventive step with respect to D6, or alternatively D4 in combination with D5.

The subject-matter of claim 1 also lacked an inventive against D1 in combination with either D2 or D3. First, the reference to D2 and D3 in D1 provided a motivation for the skilled person to combine these teachings. Second, D2 and D3 disclosed water-swelleable elastomers vulcanised from mixtures comprising calcium carbonate hydroxide, magnesium carbonate hydroxide, calcium carbonate, magnesium oxide or zinc oxide as filler and all these salts were soluble compounds in the sense of claim 1, inevitably able to cause swelling by osmosis

in formation water. Thus, by combining D1 with D2 or D3, the skilled person would arrive at the claimed subject-matter.

D7 also disclosed a resilient water-swelleable polyacrylamide gel formed from an aqueous solution. The difference between claim 1 and D7 was simply the inclusion of a salt in the gel composition of D7 to cause swelling by osmosis. As reasoned above, this was common practice in the relevant technical field. Thus, the subject-matter of claim 1 lacked an inventive step in the light of D7.

Appellant's case:

Claim 1 differed from D6 and D4 at least in that the polymer matrix material is a vulcanised elastomer embedding solid salt particles capable of causing swelling by osmosis. These distinguishing features had the effect of improving the swelling performance, as demonstrated in Figures 2a and 2b of the patent specification; they also facilitated the preparation of the swelleable body. The objective problem could be seen as how to achieve these effects. The claimed solution was not part of common general knowledge and was not hinted by D2. Hence, the claimed subject-matter involved an inventive step over the teaching of either D4 or D6.

The same held for true when starting from D7 because it lacked the features distinguishing claim 1 from D4 or D6 and also the feature of the elastomer matrix material comprising solid salt particles able to cause swelling by osmosis.

The vulcanised elastomers of D2 and D3 did not comprise solid salt particles soluble in formation water and able to cause swelling of the elastomers by osmosis. Hence, even if the skilled person were to use the elastomer compositions of D2 and D3 to prepare the seal element of D1, he would not arrive at the combination of features (iii), (iv) and (3) of claim 1. Hence, the claimed subject-matter involved an inventive step over D1.

Reasons for the Decision

1. Admissibility of the appeal

1.1 The appeal is admissible.

1.2 The only admissibility requirement which needed to be assessed in more detail was whether the statement of grounds of appeal met the requirements of Article 108, third sentence, EPC and Rule 99(2) EPC, i.e. whether the appellant's submissions of 22 March 2012 can be considered as sufficiently substantiated.

1.3 In Article 108 EPC, the term "grounds" in "grounds of appeal" is to be interpreted as including both the legal reasons, i.e. the legal basis, and the factual reasons, i.e. the facts, arguments and evidence relied upon to give to the board all the elements needed to decide whether or not the appealed decision has to be set aside (G 1/95, OJ EPO 1996, 615, point 3.1 of the reasons). In accordance with the established case law, the appellant has to present the arguments clearly and concisely to enable the board and the other party or parties to understand immediately why the decision was alleged to be incorrect, and on what facts the appellant based its arguments, without first having to

make investigations of their own (see also Case Law of the Boards of Appeal, 7th edition, September 2013, in the following "CL", IV.E.2.6.3 a)). This interpretation is in line with Article 12(2) RPBA requiring that the statement of grounds of appeal has to set out the totality of the party's case.

1.4 In the present case, even though the appeal was not sufficiently substantiated with respect to the main request which was therefore not further considered during the appeal proceedings (see point 2.1 below) sufficient substantiation was provided with respect to the auxiliary requests 1 to 6. The Opposition Division had revoked the patent for lack of inventive step. With the statement of grounds of appeal, the appellant filed auxiliary requests 1 to 6 and explained in detail why it considered their subject-matter to be novel and inventive. In light of this, the Board is satisfied that the submissions with regard to the auxiliary requests 1 to 6 provided in the statement of grounds of appeal meet the requirements of Article 108, third sentence, EPC and Rule 99(2) EPC. In this context, the Board refers to the established case law, according to which the appeal can be based on amended requests to the extent that they provide a reaction to the decision under appeal (see also CL, IV.E.2.6.5 b)), and notes that the respondent also had not raised any objection in this regard. As the admissibility of the appeal can only be assessed as a whole, the lack of substantiation with respect to the main request is immaterial for the purpose of the admissibility of the appeal in view of the sufficient substantiation of the auxiliary requests.

1.5 The respondent's objection concerning the admissibility of the appeal was based on the argument that, since the

main request was insufficiently substantiated and the auxiliary requests should not be admitted to the proceedings in accordance with Article 12(4) RPBA, the appeal was filed with no admissible request and, hence, was inadmissible.

Apart from the fact that the Board did not come to the conclusion that the operative auxiliary request 2 was inadmissible under Article 12(4) RPBA (see point 2.2 below), the question of whether the Board may hold facts, evidence or requests as inadmissible within the meaning of Article 12(4) RPBA is to be distinguished from the question of the admissibility of the appeal. The requests filed with the statement of grounds of appeal serve to define the legal and factual framework of the appeal and the very filing of such requests together with sufficient substantiation, as in the present case for the auxiliary requests (see point above), is sufficient to render the appeal admissible. The respondent's objection raised in the context of the presentation of the appellant's auxiliary requests relates to the question whether these requests could have been presented during the opposition proceedings pursuant to Article 12(4) RPBA and is, accordingly, further discussed below for auxiliary request 2 (point 2.2), which was the sole remaining auxiliary request at the end of the oral proceedings before the Board.

2. Consideration of the appellant's requests

2.1 Consideration of the appellant's main request (Article 108 EPC and Article 12(2) RPBA)

2.1.1 In the statement of grounds of appeal, the appellant limited its arguments concerning its main request

(maintenance of the patent as granted) to the sentence "Referring to the arguments as presented during opposition proceedings, the proprietor is of the opinion that the main request is allowable".

2.1.2 In its communication pursuant to Articles 15(1) and 17(2) RPBA the Board indicated that the admissibility of the appellant's main request was questionable because in support of it the appellant referred in the statement of grounds of appeal only to the arguments presented during the opposition proceedings; there was no indication of any reason why the Opposition Division was wrong in deciding that the subject-matter of claim 1 as granted lacked an inventive step against D1 combined with D3.

2.1.3 In response the appellant argued that the grounds underlying the appealed decision had been adequately addressed by the arguments put forward in the opposition proceedings. Since there was clear reference to those in the statement of grounds of appeal, the main request should be deemed to be admissible.

2.1.4 The Opposition Division, however, has dealt with these arguments in its decision. In particular, it has explained why it considered that an osmosis effect as defined in feature (iv) of claim 1 was implicitly disclosed in D3 and that D1 in combination with D3 would work in the presence of saturated water (see point 2.2 of the reasons). The appellant has not addressed this reasoning and has provided no indication as to why it is wrong and the decision should thus be set aside.

2.1.5 Hence, the appellant's main request has not been sufficiently substantiated to satisfy the requirements

of Article 108, third sentence, EPC and Rule 99(2) EPC and Article 12(2) RPBA, neither in the statement of appeal grounds nor at a later stage of the appeal proceedings.

2.1.6 The Board thus arrives at the conclusion that the main request was not to be considered during the appeal proceedings.

2.2 Consideration of the appellant's auxiliary request (Article 12(4) RPBA)

2.2.1 The auxiliary request was filed as auxiliary request 2 for the first time with the statement of grounds of appeal. In accordance with Article 114(2) EPC and Article 12(4) RPBA, it lies within the discretion of the Board whether or not to exclude this request from consideration.

2.2.2 The amended claims differ from the claims as granted only in that additional features of dependent claims 3, 5 and 8 as granted have been introduced into the independent claims. This amendment does not give rise to any new or complex issue: in the opposition proceedings, the respondent as opponent had already considered the subject-matter of the claim, as it had argued that claims 1, 3, 5 and 8 as granted lacked novelty over D1. Claim 1 is essentially based on claims 1, 3, 4, 6, 7 and 10 of the application as originally filed and its wording seems to be clear. There are therefore no *prima facie* objections arising from Articles 123 and 84 EPC.

2.2.3 The respondent submitted that the appellant as proprietor had not taken the opportunity to carry out amendments and/or to request oral proceedings during

the opposition proceedings and thus had not exercised all due care to avoid direct revocation of the patent. The appellant could and should have filed the auxiliary request in opposition, so that it should not be admitted into the appeal proceedings, pursuant to Article 12(4) RPBA. The respondent insisted that the conduct of the proprietor in the opposition proceedings might have been a deliberate strategy to prolong the procedure: this was clearly an abuse of procedure.

The Board does not agree for the following reasons.

The decision of the Opposition Division was the first and last office action in the opposition proceedings, it having neither informed the parties of its preliminary opinion nor appointed oral proceedings. The proprietor apparently relied on its two written submissions to convince the Opposition Division that the claimed subject-matter was both novel and inventive. As explained by the appellant's representative, the proprietor saw no objective reason to file amendments to the claims at that point of time. The proprietor had a right, but no obligation, to request oral proceedings; in fact, the appellant's representative explained that the proprietor had simply forgotten to request oral proceedings. In the Board's view, such a conduct does not amount to a deliberate abuse of procedure.

The Opposition Division revoked the patent for lack of inventive step. The amendments relate to the introduction of limiting features in the claims with the aim of overcoming the Opposition Division's objection.

In the opposition proceedings, the parties had focused on the objection of lack of novelty; the objection of lack inventive step had been substantiated only briefly and in general terms in the notice of opposition and was no longer mentioned in the later written submission of the opponent. As explained by the appellant's representative, it was only upon receipt of the Opposition Division's decision that the proprietor realised that the objection of lack of inventive step was deemed to be relevant.

Thus, the filing of the auxiliary request in appeal rather than in opposition proceedings does not amount to an abuse of procedure for these reasons.

2.2.4 The respondent cited T 23/10 and T 936/09 as comparable cases where an abuse of procedure had been identified.

2.2.5 The present case differs from T 23/10 in that the appealed decision was the first and last office action. In T 23/10 the patent proprietor had deliberately chosen not to file any amendment after the Opposition Division had informed the parties of its intention to revoke the patent.

2.2.6 The present case is also not comparable with T 936/09, in which the patent proprietor made a considered and deliberate choice not to submit any arguments or amended claims, or any further requests in the opposition proceedings in writing or orally, despite being given the opportunity to do so.

2.2.7 Thus, the Board decided to consider the appellant's auxiliary request under Article 114(2) EPC and Article 12(4) RPBA.

3. Consideration of D10 to D15 (Article 12(4) RPBA)

3.1 D10 to D15 have been filed for the first time in the appeal proceedings by the appellant in its statement of grounds of appeal (D10 to D12) and by the respondent in its reply (D13 to D15).

3.2 The Board takes the view that these documents are *prima facie* more relevant than the other documents already on file with respect to the solubility of the salts disclosed in D2 and D3, and thus decided to take these documents into consideration, pursuant to Article 114(2) EPC and Article 12(4) RPBA.

4. Auxiliary request - Articles 123(2) and 84 EPC

4.1 The amended claims differ from the claims as granted in that additional features of claims 3, 5 and 8 as granted have been introduced into the independent claims. The dependent claims have been renumbered accordingly.

4.2 Claim 1 corresponds essentially to a combination of claims 1, 3, 4, 6, 7 and 10 as originally filed. There is no need to require that the salt particles are "dispersed" or "embedded" in the elastomer matrix material, because this is already implicit from the wording of the claim: feature (v) of the claim requires that the compound is mixed in a mass of polymer material. Consequently, there is no intermediate generalisation, as alleged by the respondent. The Board thus considers that the amendments meet the requirements of Article 123(2) EPC.

4.3 The Board is also satisfied that the amendments made in claims 1 and 15 meet the requirements of Article 84

EPC. In particular, a skilled reader would readily understand from the wording "the compound is formed by salt particles" in feature (3) that the compound consists of, and is in the form of, solid salt particles embedded in the elastomer matrix material. It is not reasonable to interpret this feature as defining a process step allowing the compound to form a salt that is dissolved upon preparation of the polymer matrix material.

5. Auxiliary request - Novelty

5.1 Novelty with respect to D6

5.1.1 D6 discloses a sealing element for wells in which a casing is installed. The sealing element comprises a water-swelleable elastomer sleeve arranged in the wellbore in a manner so as to seal a space upon swelling of the swelleable body (e.g. Figure 10). The elastomer sleeve is susceptible of being in contact with saline formation water flowing into the wellbore (column 9, lines 5 to 16). The elastomer sleeve is preferably composed of a polyurethane open-spore sponge material impregnated with a AM-9 gel formed from an aqueous solution containing acrylamide, methylene bisacrylamide and a dissolved salt, namely NaCl (see test 5 in column 7). It is undisputed among the parties that the elastomer sleeve, the AM-9 gel and NaCl respectively form a "swelleable body", a "polymer matrix material" and a water-soluble "compound".

5.1.2 The parties have disputed whether or not features (iv), (v), (2) and (3) distinguish claim 1 from D1.

(a) Feature (iv)

It follows directly from the teaching at column 9, lines 12 to 16 and column 7, lines 35 to 57 of D6 that the AM-9 gel material restricts migration of the salt (ions) out of the gel and thus out of the sleeve; however, it allows migration of saline formation water through the elastomer sleeve and into the gel so as to induce swelling of the gel and the sleeve. This migration of saline formation water is due to the difference in salt concentration inside the gel and outside of the sleeve; this is clearly swelling by osmosis as defined in feature (iv).

The appellant submits that the AM-9 gel is permeable to saline formation water but not impermeable to the salt (ions), so that the gel does not form a semi-permeable membrane as implicitly required by feature (iv). However, feature (iv) only requires that the polymer matrix material "substantially prevents or restricts migration of the compound out of the swelleable body" and this is achieved by the AM-9 gel of D6 (in test 5 migration was restricted for at least 6 hours, see column 7, line 50). Moreover, the feature that the polymer matrix material is impermeable to the salt (ions) is an optional feature, which is present in dependent claim 2.

(b) Features (v) and (2)

In the context of claim 1, features (v) and (2) are to be read in combination, not in isolation. Feature (v) requires that the "polymer matrix material" is obtained/obtainable by "vulcanizing" a mass of polymer material.

Vulcanisation is generally known as a chemical process for converting elastomer polymers into more durable materials by adding sulfur or other equivalent curing agents, which form cross-links between the individual polymer chains (see e.g. D9). Vulcanisation is thus a particular type of cross-linking. Feature (2) makes clear that the polymer matrix material is an "elastomer matrix material", which requires vulcanisation for cross-linking. This interpretation is confirmed by the teaching in the patent specification (paragraphs [0015] to [0018]). Although the patent specification mentions matrix material of thermoplastic elastomer materials not requiring vulcanisation (see paragraphs [0014], [0036]), these lie outside the scope of present claim 1.

Contrary to the respondent's view, the expression "cross-linking (vulcanization)" as used in the patent specification (paragraph [0015]) does not provide a basis for a broad reading of the term "vulcanising" in the sense of "cross-linking". As explained above, the skilled reader knows that vulcanisation is a specific type of cross-linking. Similarly, the terms "vulcanising" and "curing" are not synonymous.

The AM-9 gel of D6 is a well known cross-linked polyacrylamide hydrogel obtained by copolymerisation of acrylamide and methylene bisacrylamide in water, whereby methylene bisacrylamide works as the cross-linking agent (see e.g. D6, column 8, line 75 to column 9, line 4). Thus, the modified AM-9 gel as described in column 9, lines 6 to 19 und used in test 5 of D6, which is formed from an aqueous solution containing dissolved NaCl, is obtained by cross-linking a mass of polymer material, but not by "vulcanizing" a mass of polymer material. Moreover, even though the

AM-9 gel of D6 certainly has rubber-like or elastomeric properties (see e.g. D4, column 5, line 8; D5, example 12, column 11, line 11), it is not an elastomer matrix material obtained/obtainable by vulcanising a mass of elastomer material. The same is true for the elastomer open-spore sleeve impregnated with AM-9 gel in test 5 of D6: this elastomer sleeve is formed before being impregnated with the gel; the gel is not, and cannot be, formed by vulcanisation. Consequently, D6 fails to disclose the combination of features (v) and (2).

(c) Feature (3)

As indicated in point 4.3 above, feature (3) means that the compound consists of, and is in the form of, solid salt particles. A normal reading feature (3) in the context of claim 1, i.e. in combination with features (iii) and (v), requires that solid salt particles that are soluble in formation water are embedded in the elastomer matrix material. This feature is not disclosed in D6. In particular, the modified AM-9 gel described in column 9, lines 6 to 19 and used in test 5 of D6 is formed from an aqueous solution containing dissolved NaCl.

5.1.3 In conclusion, the subject-matter of claim 1 differs from D6 by the features that the polymer matrix material is a vulcanised elastomer embedding solid salt particles soluble in formation water.

5.2 Novelty with respect to D4

5.2.1 D4 discloses a well packer comprising a packer ring/ sleeve which swells upon contact with formation fluid, e.g. brines, to form a fluid restricting seal in the

annulus between casing and wellbore. D4 mentions a number of patents describing set compositions to form chemical seal rings, and teaches that the packer ring could be made of "any of the set compositions disclosed in the (aforementioned) chemical seal ring patents", preferably of the gel compositions of D5 (in D4, see column 3, lines 56 to 62 and column 2, lines 49 to 53). D4 also discloses a specific example of a packer ring made of a polyacrylamide hydrogel containing no salt (column 4, line 65 to column 5, line 20).

5.2.2 The parties have disputed whether or not features (iii), (iv), (v), (2) and (3) distinguish claim 1 from D4. More precisely, they have disputed whether or not a skilled reader of D4 would incorporate example 12 of D5 into D4 and, in doing so, whether D4 would then anticipate the features of claim 1.

5.2.3 In assessing novelty, the disclosure of one document may be read together with another if there is a specific reference to a particular piece of information. In the present case, D4 merely makes a general reference to the compositions of D5 with no special mention of example 12. Consequently, this example is not regarded as being incorporated into the disclosure of D4.

5.2.4 Notwithstanding the above, example 12 of D5 does not disclose at least features (iii), (v), (2) and (3) of claim 1 for the following reasons:

5.2.5 Example 12 concerns a rubber-like gelled sealant consisting of a polyacrylamide hydrogel formed from an aqueous solution. As explained for the AM-9 gel of D6 (point 5.1.2 b) above), this hydrogel is not an elastomer matrix material obtained by vulcanising a

mass of elastomer material, as required by features (v) and (2), even though the gel is obtained by curing and cross-linking a polymer material and shows rubber-like properties (see D5, column 5, lines 62 to 68 and column 11, line 11).

5.2.6 The hydrogel of example 12 is formed from an aqueous solution comprising a dissolved salt, namely zinc acetate, but it does not comprise a water-soluble compound in the form of solid salt particles, as required by features (iii) and (3).

5.2.7 Thus, even if a skilled reader of D4 were to incorporate the disclosure of D5 that the packer ring is made from an hydrogel according to example 12 of D5, the packer ring would, as in the case for D6, lack at least the features of claim 1 that the polymer matrix material is a vulcanised elastomer embedding solid salt particles soluble in formation water.

5.3 Novelty with respect to D1

5.3.1 For the reasons set out above (point 5.2.3), the Board agrees with the conclusion of the Opposition Division. In particular, there is no clear indication of the specific features to be read into D1.

5.3.2 The claimed subject-matter is thus novel over D1.

6. Auxiliary request - Inventive step

6.1 The auxiliary request was filed for the first time in opposition proceedings and hence the Opposition Division has not had opportunity to examine inventive step. Nevertheless, in accordance with

Article 111(1) EPC, the Board, in agreement with both parties, has decided to deal with this issue.

6.2 Inventive step with respect to D6

6.2.1 It is undisputed that the disclosure of D6 is an appropriate starting point for the assessment of inventive step.

6.2.2 As set out in point 5.1.3, the subject-matter of claim 1 differs from that of D6 in that the polymer matrix material is a vulcanised elastomer embedding solid salt particles soluble in formation water. The technical effect of this distinguishing feature is that the polymer matrix material is easier to prepare and that its swelling performance is improved, in particular in saline formation water. Indeed, the vulcanised elastomer matrix material containing salt is prepared in fewer steps than the SAP gel of D6, which is formed from an aqueous solution containing a dissolved salt. Moreover, as shown in the patent specification, the swelling performance of an elastomer comprising solid salt particles is better than that of a SAP containing salt or a SAP without salt (see paragraphs [0028] to [0031] and Figures 2a and 2b of the patent). Hence, starting from D6, the objective technical problem to be solved can be seen as how to improve the swelling performance and the preparation of the polymer matrix material.

6.2.3 The claimed solution to this objective problem is not rendered obvious by common general knowledge, nor by the teaching of D2.

6.2.4 The respondent submitted that the inclusion of solid salt particles in the SAP gel of D6 would be an obvious

alternative to the provision of dissolved salt in the gel forming aqueous solution. In support of this argument, reference was made to common general knowledge as documented in paragraph [0038] of the patent and to the use of solid particles of calcium carbonate in D2. However, paragraph [0038] of the patent only refers to well known techniques for mixing particles into a rubber matrix material prior to vulcanisation: it does not teach that the claimed solution is well-known or obvious. In D2 calcium carbonate is neither used nor able to cause swelling of the vulcanised elastomer by osmosis (see points 6.4.6 and 6.4.7 below). Consequently, the Board does not agree with the respondent's submission.

6.2.5 Thus, starting from D6, the claimed invention involves an inventive step in the sense of Article 56 EPC.

6.3 Inventive step with respect to D4

6.3.1 As reasoned in point 5.2 above, even if a skilled reader of D4 were to incorporate example 12 of D5 into the disclosure of D4, claim 1 would differ at least by the features that distinguish claim 1 from D6.

6.3.2 As in D6, the polyacrylamide gel composition in example 12 of D5 is a SAP gel formed from an aqueous solution containing a dissolved salt, namely zinc acetate. Thus, starting from D4 incorporating example 12 of D5, the objective problem to be solved can also be formulated as when starting from D6, i.e. to improve the swelling performance and the preparation of the polymer matrix material.

6.3.3 The claimed solution to this problem was not part of common general knowledge and is neither disclosed nor

suggested in D2. The reasoning in point 6.2.4 above applies *mutatis mutandis*.

6.3.4 Thus, starting from D4, the claimed invention involves an inventive step in the sense of Article 56 EPC.

6.4 Inventive step with respect to D1

6.4.1 D1 discloses a swelleable seal material for sealing the annulus between casing and wellbore. D1 teaches that suitable material compositions are for instance the compositions disclosed in D2 and D3 (paragraph bridging pages 4 and 5).

6.4.2 As argued by the respondent, this reference to D2 and D3 in D1 provides a clear motivation for the skilled person to combine the teaching of D1 with that of either D2 and D3.

6.4.3 D2 discloses a water-swelleable adhesive water stop which is a vulcanised body of a composition comprising butyl rubber (A), a highly water-absorptive resin (B), an inorganic water-absorbent (C), preferably having basicity, optionally a basic filler (G), such as calcium carbonate hydroxide or magnesium carbonate hydroxide; and optionally a filler such as calcium carbonate or zinc oxide (column 2, lines 21 to 38; column 5, lines 19 to 48).

6.4.4 D3 discloses a water-swelleable elastomer composition obtained by vulcanising a compound comprising, *inter alia*, an elastomer and zinc and magnesium oxides (ZnO and MgO in example 1) or magnesium oxide (MgO in example 8).

6.4.5 Contrary to the submission of the respondent, it cannot be derived from either D2 or D3 that magnesium carbonate hydroxide, calcium carbonate hydroxide, calcium carbonate, magnesium oxide and zinc oxide constitute water-soluble salts in the sense of features (iii) and (3) of claim 1. Zinc and magnesium oxides are known vulcanising activators and, even though water-soluble zinc and/or magnesium chlorides may be formed during the vulcanisation of examples 1 and 8 of D3 (see D14, D15), zinc and magnesium oxides *per se* are practically insoluble in water. Calcium carbonate as used in D2 also is practically insoluble in formation water (see D11, D12), even though its solubility increases with decreasing pH or increasing carbon dioxide partial pressure (see D13). The same is true for calcium carbonate hydroxide and magnesium carbonate hydroxide.

6.4.6 In view of the poor solubility of these salts and of the small amount thereof contained in the vulcanised elastomers of D2 and D3, it is unlikely that these salts could cause the vulcanised elastomers to swell by osmosis in formation water.

6.4.7 In examples 1 and 8 of D3, the elastomer composition swells in water because it comprises a large amount of water-absorbent resin ("Aquakeep 4S"). In D2, the swelling of the elastomer composition is due to the large amount of highly water-absorptive resin (B) and inorganic water-absorbent (C). D2 does teach that compounding of a basic filler (G), such as calcium carbonate hydroxide or magnesium carbonate hydroxide, "has an effect to accelerate water absorption and swelling of the water stop when it is contacted with water so that the initial water-stopping effect can be rapidly exhibited" (column 5, lines 28 to 31). This

passage, however, does not necessarily imply that the rapid initial swelling is attained by osmosis due to a gradient in the concentration of dissolved basic filler, as argued by the respondent. Instead, when this passage is read in combination with the teachings at column 3, lines 50 to 68 and column 5, lines 19 to 27 of D2, it appears that this rapid initial swelling is due to the basicity of the basic filler.

6.4.8 Hence, even if the skilled person were to use the specific elastomer compositions of D2 and D3 cited above to prepare the seal element of D1, he would not arrive at the combination of features (iii), (iv) and (3) of claim 1.

6.4.9 Thus, the claimed invention involves an inventive step against D1.

6.5 Inventive step with respect to D7

6.5.1 D7 discloses an aqueous-base sealant composition which can be pumped into a wellbore and thereafter gels to form a fluid-tight seal between casing and wellbore. The composition contains an acrylamide polymer in an aqueous solution of water-soluble salt(s) (claim 1). The function of the water-soluble salt(s) is to decrease the aqueous tension to a sufficiently low value and thereby lengthen the gel time as required (column 4, line 71 to column 5, line 9; column 5, lines 47 to 49). The resulting gelled composition is resilient and swells when contacted with water or natural brines of the type commonly encountered underground (column 2, lines 39 to 45). As agreed by the parties, the sealant gel of D7 is a resilient SAP gel formed from an aqueous solution containing dissolved salt. Thus, the resilient gel of D7 is not a

vulcanised elastomer matrix material comprising solid salt particles, for the reasons set out above with respect to the SAP gel of D6 (point 5.1.2 b)).

6.5.2 Hence, claim 1 differs from D7 at least in the features distinguishing claim 1 from D6.

6.5.3 Thus, for the reasons set out above with respect to D6 (point 6.2), the claimed invention involves an inventive step against D7.

6.6 No other prior art was relied on by the respondent in its objection on inventive step.

7. Other independent claims and dependent claims

7.1 Independent claim 15, as well as the dependent claims, have been adapted to claim 1.

7.2 The above reasoning with respect to the novelty and inventive step of claim 1 applies *mutatis mutandis* to independent claim 15 and the dependent claims.

Order

For these reasons it is decided that:

1. The appeal is admissible.

2. The decision under appeal is set aside.

3. The case is remitted to the opposition division with the order to maintain the patent on the basis of the set of claims filed as auxiliary request 2 with letter dated 22 March 2012 and a description and drawings to be adapted thereto.

The Registrar: The Chairman:

C. Spira G. Ashley

Decision electronically authenticated