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Datasheet for the decision of 19 September 2017

Case Number: T 2244/14 - 3.3.09

Application Number: 04762857.3

Publication Number: 1663637

IPC: B32B1/08, B32B27/08, F16L9/12

Language of the proceedings: EN

Title of invention:
A flexible unbonded pipe and a method for producing such pipe

Patent Proprietor:
National Oilwell Varco Denmark I/S

Opponent:
Technip France SA

Headword:

Relevant legal provisions:
EPC R. 99(1)(a)
EPC Art. 56

Keyword:
Admissibility of appeal - (yes)
Inventive step - (yes)

Decisions cited:
T 0920/97, T 1911/09, T 2237/10

Catchword:

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Case Number: T 2244/14 - 3.3.09

D E C I S I O N
of Technical Board of Appeal 3.3.09
of 19 September 2017

Appellant: (Patent Proprietor)	National Oilwell Varco Denmark I/S Priorparken 480 2605 Brøndby (DK)
Representative:	Hegner & Partners A/S Symbion Science Park Fruebjergvej 3 2100 Copenhagen Ø (DK)
Respondent: (Opponent)	Technip France SA 6-8, Allée de l'Arche, Faubourg de l'Arche, ZAC Danton 92400 Courbevoie (FR)
Representative:	Lavoix 2, place d'Estienne d'Orves 75441 Paris Cedex 09 (FR)
Decision under appeal:	**Decision of the Opposition Division of the European Patent Office posted on 3 October 2014 revoking European patent No. 1663637 pursuant to Article 101(3)(b) EPC.**

Composition of the Board:

Chairman	W. Sieber
Members:	J. Jardón Álvarez
	F. Blumer

Summary of Facts and Submissions

I. This decision concerns the second appeal relating to European patent No. 1 663 637.

II. Notice of opposition was filed against the patent, requesting revocation of the patent in its entirety on the basis of Article 100(a) EPC (lack of novelty and inventive step) and Article 100(b) and (c) EPC.

The documents submitted included:

D5: WO 86/07432 A1;

D6: GB 2 385 399 A;

D7: EP 1 321 702 A1;

D9: GB 2 336 885 A;

D10: WO 99/49254 A1; and

D12: US 4 614 208 A.

III. By a first decision the opposition division had revoked the patent because the claims of the then pending requests did not meet the requirements of Article 123(2), Article 83, Article 54 and/or Article 84 EPC.

IV. In the subsequent appeal proceedings, T 2237/10, this board, albeit in a different composition, decided that:

- the subject-matter of the claims of the then pending sixth auxiliary request did not extend beyond the content of the application as filed;

- the invention as defined in the claims was sufficiently disclosed, and

- the subject-matter of claim 1 was novel over the disclosures of D5 and D6.

Since the opposition division had not dealt with the issue of inventive step, the board remitted the case to it for further prosecution on the basis of claims 1 to 45 according to the sixth auxiliary request.

Claim 1 of this request read as follows:

"1. A flexible unbonded pipe comprising at least one polymer layer having a thickness of 4 mm or more and one film layer having a thickness of 1 mm or less, said polymer layer being at least 10 times as thick as the film, said film layer provides a fluid permeation barrier against one or more of the fluids methane, hydrogen sulphides, carbon dioxide and water, which is higher than the fluid permeation barrier provided by the polymer layer determined at 50°C and a pressure difference of 50 bars, and said polymer layer being bonded to said film layer with interfacial bonding between the polymer layer and the film layer which is sufficiently strong to prevent creation of gas pockets between the layers when subjected to an increased carbon dioxides pressure on the film side of the pipe, the increased carbon dioxides pressure being 1 bar."

Claims 2 to 37 were dependent on claim 1, and claims 38 to 45 were directed to a method of producing the flexible unbonded pipe of claims 1 to 37.

V. In the continued opposition proceedings the documents filed included:

D21:"Bending of PE/film - FLEX-PA0302EP-EP1663637" National Oilwell Varco, 3 pages, 24 April 2014.

The opposition division revoked the patent again, on the basis of a main request (claims as remitted by the board) and thirteen auxiliary requests filed with letter of 11 August 2014.

The opposition division held that the subject-matter of claim 1 of the main request and of auxiliary requests 1 to 5 and 8 to 13 lacked inventive step, and that the subject-matter of claim 1 of auxiliary requests 6 and 7 lacked novelty.

Concerning the main request, the opposition division agreed with the parties that D5 represented the closest prior art. It considered that the tests on file did not convincingly show any technical effect and defined the problem to be solved by the patent as providing a flexible unbonded pipe with reduced gas permeability, so that gas pockets would not form between the layers. The solution as claimed in claim 1 lacked inventive step because the skilled person would have found an incentive to solve the above problem by the claimed means at least in D6 and D7.

VI. On 28 November 2014, this decision was appealed by the patent proprietor (in the following: the appellant).

VII. In a communication dated 10 December 2014, the registrar of the board noted that the name and address of the appellant were missing and invited it to remedy

this deficiency within two months of notification of the communication (Rule 101(2) EPC).

VIII. By letter of 15 December 2014, it was indicated that the name and address of the appellant were as follows:

National Oilwell Varco Denmark I/S
Priorparken 480
DK-2605 Brøndby
Denmark

IX. The statement setting out the grounds of appeal was filed on 9 February 2015, including the requests before the opposition division, namely the main request and auxiliary requests 1 to 13. The appellant requested that the decision under appeal be set aside and that the patent be maintained on the basis of the claims of the main request or any of auxiliary requests 1 to 13.

The appellant also filed the following experimental report:

D22:"Bending of unbonded flexible pipe with metallic barrier layer. Doc. n. 8000-DEV-10366", National Oilwell Varco, 6 pages, undated.

X. With its reply dated 23 June 2015 the opponent (in the following: the respondent) requested that the appeal be rejected as inadmissible and, if it were admissible, that it be dismissed. It also filed the following experimental evidence (a corrected version thereof with letter of 25 June 2015):

D23:"Annexe 1: Essais de cintrage réalisés par l'Opposante", 15 pages, undated.

XI. On 14 January 2016 the appellant commented on the respondent's submission.

XII. In a communication dated 13 April 2017 the board gave its preliminary view that the appeal was admissible and indicated the points to be discussed during the oral proceedings.

XIII. Further submissions were filed

- by the respondent on 18 August 2017 and on 18 September 2017, and

- by the appellant on 11 September 2017. The appellant's reply included the following document:

D24: T. Li *et al.*, "Ductility of thin metal films on polymer substrates modulated by interfacial adhesion", International Journal of Solids and Structures 44 (2007), pages 1696 to 1705.

XIV. On 19 September 2017 oral proceedings were held before the board. The appellant maintained all its requests. The only claims relevant for the present decision are the claims of the main request, which are identical to the claims remitted by the board in T 2237/10 for further prosecution and the claims of the main request underlying the decision which is the subject of the present appeal (see points IV and V above).

XV. The arguments of the appellant, insofar as they are relevant for the present decision, may be summarised as follows:

- The appeal had not been filed in the name of the professional representative or its firm. In the

absence of any clear indication to the contrary, a professional representative who was authorised to act for a party adversely affected by a decision and then filed an appeal against that decision had to be presumed to be acting on behalf of the very same party that he had acted for in the first-instance proceedings.

- The claimed subject-matter involved an inventive step starting from D5 as the closest prior art. The experimental evidence already in the proceedings and the newly filed test reports and calculations filed by the appellant showed that a great improvement was achieved. The problem underlying the patent in suit in view of D5 was to provide a flexible pipe with low tendency for corrosion of the armouring while simultaneously reducing the risk of collapse and maintaining a high flexibility of the pipe.

- This problem was credibly solved by the technical features given in claim 1 and was not hinted at in the prior art cited by the respondent. Indeed, the combinations of D5 with the other documents cited by the respondent were not possible because, unlike D5, none of D6, D7, D9, D10 and/or D12 related to unbonded flexible pipes. The combinations suggested by the respondent were clearly made in the knowledge of the invention, and even went against the teaching of D5, which regarded the existence of play between turns as an essential feature of the unbonded flexible pipes disclosed therein.

XVI. The relevant arguments of the respondent may be summarised as follows:

- The appeal had to be rejected as inadmissible since it had been filed by the patent attorney in the name of its firm and not by the party adversely affected by the decision. This was clear from the notice of appeal, in which it was stated that "we hereby file our Notice of Appeal" (emphasis by the respondent). There was no room for a different interpretation of this sentence. Moreover, the correction filed by the appellant had been filed after expiry of the time limit for appeal and had to be disregarded as late-filed.

- D5 represented the closest prior art. The pipe of claim 1 differed from the pipe of D5 in that the polymer layer was bonded to the film layer with interfacial bonding sufficiently strong to prevent the creation of gas pockets between the layers when subject to increased carbon dioxide pressure.

- This total bonding of the two layers affected the flexibility of the pipe as shown by the experimental report D23, and thus no improvement over D5 had been achieved. As a consequence, the problem underlying the patent had to be seen merely as providing a pipe having reduced gas permeability.

- The use of total bonding between the polymer layer and the film layer to avoid gas permeability could not justify an inventive step. This measure was indeed known from any of D6, D7, D9, D10 and D12 to solve exactly the same problem in closely related pipes. Consequently, it would have been obvious for the skilled person to apply this feature to the pipes of D5.

XVII. The appellant requested that the decision under appeal be set aside and that the patent be maintained on the basis of the claims of the main request or any of auxiliary requests 1 to 13, all requests filed on 9 February 2015 with the statement setting out the grounds of appeal.

The respondent requested that the appeal be rejected as inadmissible, and auxiliarily that the appeal be dismissed.

Reasons for the Decision

1. Admissibility of the appeal

1.1 The respondent argued that the appeal was not admissible because the notice of opposition had been filed in the name of the professional representative's firm, but not in the name of the party adversely affected by the opposition division's decision. Moreover, the remedy filed with letter of 15 December 2014 was immaterial, because the time limit for filing an appeal had already expired at that date.

1.2 The board does not accept these arguments for the following reasons:

1.2.1 Although it is correct that the notice of appeal does indeed bear the name of the professional representative and/or its firm, this representative had already acted as professional representative for the patent proprietor in the opposition proceedings leading to the present appeal case. Normally, in the absence of any clear indication to the contrary, a professional representative who was authorised to act for a party

adversely affected by a decision and then filed an appeal against that decision has to be presumed to be acting on behalf of the same party, and not in its own name or on behalf of someone else not entitled to appeal (see Case Law of the Boards of Appeal of the EPO, 8th edition 2016, Section IV.E.2.4.1 b); see also T 920/97, Reasons 1, and T 1911/09, Reasons 2.2.2).

1.2.2 Furthermore, in the present case the board has noted that the name and address of the appellant were missing in the notice of appeal. In a communication dated 10 December 2014, the appellant was informed accordingly and invited to remedy this deficiency within two months of notification of the communication (Rule 101(2) EPC). The appellant immediately provided the missing data, i.e. well within the time limit set by the board.

The fact that the appellant's answer was received after expiry of the time limit for filing an appeal is irrelevant, since the relevant time limit is the one set by the board in its communication of 10 December 2014.

1.3 Consequently, the requirements of Article 108, first sentence, and Rule 99(1)(a) EPC are met and the appeal is admissible.

MAIN REQUEST

2. Inventive step

2.1 The patent relates to a flexible unbonded pipe which is particularly useful in aggressive environments, due to its ability to withstand the diffusion of gases from a fluid in the pipe, and to a process for its preparation

(see paragraph [0001] of the patent specification). Prior-art flexible pipes for transportation of aggressive gases, raw oils and similar fluids are said to present some drawbacks due to diffusion of corrosive gases and liquids through the inner liner into the outer armouring layers (see paragraph [0007]). The invention aims to provide a flexible, unbonded pipe which does not present these drawbacks (see paragraph [0012]).

2.2 Claim 1 is directed to a flexible unbonded pipe comprising:

- at least one polymer layer having a thickness of 4 mm or more, and
- one film layer having a thickness of 1 mm or less,
- the polymer layer being at least 10 times as thick as the film layer,
- whereby the film layer provides a fluid permeation barrier against one or more of the fluids methane, hydrogen sulphides, carbon dioxide and water, which is higher than the fluid permeation barrier provided by the polymer layer determined at 50°C and a pressure difference of 50 bars, and
- the polymer layer being bonded to the film layer with interfacial bonding sufficiently strong to prevent creation of gas pockets between the layers when subjected to an increased carbon dioxides pressure on the film side of the pipe of 1 bar.

2.3 Closest prior art

2.3.1 D5 was agreed to represent the closest prior-art document. In the embodiment of figure 5 showing a flexible pipe, an inner sheath (1) made of Rilsan® and having a thickness of 4 mm is extruded. This layer

corresponds to the at least one polymer layer referred to in present claim 1. A band (3) of an alloy of amorphous metals is spiral-wound around sheath (1), thereby forming a film layer as mentioned in present claim 1. The width of the overlap zones of the adjacent turns represents about 20% of the width of these turns, and the band is applied such that only edge (5) of the band is bonded to inner sheath (1) (see D5, page 9, lines 19 to 22). Thus, the polymer layer (1) and the film layer (3) are only partially bonded.

2.3.2 By contrast, the subject-matter of claim 1 differs from the embodiment of figure 5 in that the polymer layer and the film layer are fully bonded to each other to prevent the creation of gas pockets between the layers when subjected to an increased carbon dioxides pressure of 1 bar. This was acknowledged in T 2237/10 as the distinguishing feature over D5 (Reasons 6.2).

2.4 Problem to be solved and its solution

2.4.1 According to the appellant, the pipe of D5 would be at risk of collapsing due to the formation of gas pockets between the multiple barrier layers. The pipe of D5, when in service, would allow the gas to permeate through the polymer layer (1) but not through the metal layer (3), and a gas pocket would build up over time between these two layers.

Using Fick's law of diffusion, which states that the rate of transfer of a gas through a layer of permeable material is proportional to the gas partial pressure between the two sides, the appellant calculated that after about 1.1 days the carbon dioxide pressure in a gas pocket would have reached the carbon dioxide pressure in the bore (see figure on page 4 of the

statement of grounds of appeal). Under these conditions, shutting down production after such time would result in a very high risk of collapse and irreversible damage of the pipe.

2.4.2 Taking these drawbacks into account, the appellant saw the technical problem to be solved by the invention over D5 in the provision of a flexible unbonded pipe for transporting corrosive gases, crude oils and other corrosive fluids at high pressure, with low tendency for corrosion of the armouring wires, while simultaneously reducing the risk of collapse and maintaining a high flexibility of the flexible pipe.

2.4.3 The respondent strongly disagreed with the appellant's calculations and pointed out that they had been based on false assumptions. In particular, it pointed out that the appellant itself had argued in the first-instance proceedings that the construction of D5 would allow the gas to freely pass the spiral-wound metal band in view of the plays existing between the turns. Moreover, the calculations were based on an oversimplified pattern, using only one gas pocket uniformly distributed along the conduit, while the pipe of D5 would develop several gas pockets of very small size. Lastly, they had been made using a carbon dioxide pressure of 100 bar, while claim 1 embraced the use of a carbon dioxide overpressure as low as 1 bar.

2.4.4 The parties also had different views on whether or not the unbonded pipes according to claim 1 still had high flexibility. The respective views were supported by contradicting experimental evidence: D21 and D22 from the appellant and D23 from the respondent.

2.4.5 The respondent then concluded that there would be no risk of collapse in the pipes of D5 and that the problem underlying the invention was merely to provide a pipe having reduced gas permeability and without constraints of flexibility.

2.4.6 The board agrees to a certain extent with the respondent's criticism regarding the appellant's calculations. Furthermore, it sees no reason to rate one set of experimental data more credible than the other. Thus, in view of the experimental evidence of the respondent, D23, the maintenance of high flexibility cannot be seen to be achieved over the whole scope of the claim.

2.4.7 Taking all submissions into account, the objective technical problem has to be formulated in a less ambitious manner in line with the respondent and to the disadvantage of the appellant, namely as the provision of flexible (at least to a certain degree) unbonded pipes having reduced gas permeability.

2.5 Obviousness

2.5.1 It remains to be decided whether, in view of the available prior art, it would have been obvious for the skilled person to solve said technical problem by the means claimed.

2.5.2 The opposition division concluded that it would indeed have been obvious in view of D6 or D7. The respondent also relied on D6 and D7 and further on any of D9, D10 and D12. In essence, the opposition division and the respondent held that the cited prior art suggested applying a metal layer to a polymer layer to avoid permeation and/or to prevent formation of gas pockets

and that the application of this measure to a flexible pipe would be obvious for the skilled person.

2.5.3 The board disagrees for the following reasons:

A key feature of the flexible **unbonded** pipes such as those of D5 or those claimed is that the individual layers of the pipe must be able to slide with respect to each other when the pipe is subjected to a change of pressure. The flexible unbonded pipe is thereby capable of operating under very high pressurisation without material damage. The layers of the different materials and construction react differently to the influence of pressure, but, since they can slide with respect to each other, the materials are not damaged. All prior-art flexible unbonded pipes are composed of layers which can all slide with respect to each other.

A person skilled in the art would not look into prior-art teachings concerning **bonded** pipes to solve problems of a flexible unbonded pipe; he would simply not consider bonding layers in an unbonded pipe and apply the teaching of the different field relating to bonded pipes.

2.5.4 Document D6

D6 relates to a conduit for transporting fluids, notably chemicals with small molecular size, such as methanol, ethanol and hydrocarbon fluids, and particularly to a multi-conduit umbilical for the transportation of such fluids over very long lengths, typically in excess of 50 km (see page 1, lines 3 to 7). It also relates to so-called "High Collapse Resistant Hoses" of the type used in deep sea applications, which, in use, must be able to resist

collapsing due to the very large pressures exerted on them (page 1, lines 21 to 24).

D6 aims to avoid cross-contamination between adjacent hoses (page 2, lines 21 to 25) and to reduce the risk of permeation of hazardous/flammable fluids (page 3, lines 5 to 14). This is achieved by providing a fluid conduit comprising a generally flexible fluid hose encapsulated by at least one metallised layer formed and arranged to minimise permeation of the fluid being transported (page 4, lines 4 to 11). In the example the conduit 10 comprises a flexible fluid hose liner 12 encapsulated by a layer of electro-plated metal 14 (see page 12, lines 10 to 14; see also figure 2).

2.5.5 Document D7

D7 discloses in claim 1 a reinforced pipe for transporting a fluid comprising aggressive gases and/or liquids, such as wet natural gas, comprising a plastic inner pipe and, surrounding the inner pipe, a reinforcing layer with fibres which have a high tensile strength, with a barrier layer which is impermeable or of low permeability to the fluid and is located between the inner pipe and the reinforcing layer and which is stuck so that it rests completely against the inner pipe.

2.5.6 The pipe of D7, like that of D6, is not a flexible unbonded pipe, but a polymer pipe with a reinforcement layer and an additional barrier layer. In fact, the pipe of D7 is a collapsible pipe for use in onshore applications. D7 actually aims to ensure that the pipe can fully collapse (see paragraph [0006]) and that aggressive substances are not passed into the soil in which the pipe is laid (see paragraph [0004]).

2.5.7 The board agrees with the appellant that the skilled person working with unbonded flexible pipes would not seek for a solution to the above-defined objective technical problem in documents D6 or D7, which do not relate to unbonded flexible pipes. Moreover, even if he did, he would not be motivated to combine these teachings with the disclosure of D5, because D5 clearly teaches that it is essential that there is play between the turns of the wrapped sheath (D5, page 4, lines 18 to 22). Total bonding would destroy this play.

In other words, the skilled person would not be motivated by anything in D6 or D7 to modify the pipes of D5 in order to arrive at the claimed subject-matter, because such a combination would go against the teaching of D5.

2.5.8 Documents D9, D10 and D12

The same reasoning applies to the combination of D5 with any of D9, D10 and D12, none of these documents relating to an unbonded flexible pipe. The respondent's objections based on the disclosure of bonded pipes are clearly made *ex post facto* in the knowledge of the invention.

2.5.9 For these reasons, the board concludes that the person skilled in the art, starting from D5 as the closest prior art and faced with the objective technical problem as defined above, would not have arrived in an obvious manner at the subject-matter of claim 1. This conclusion also applies to the method for the production of a flexible unbonded pipe according to independent claim 38 and, for the same reasons, to the

preferred embodiments defined in dependent claims 2 to 37 and 39 to 45.

AUXILIARY REQUESTS 1 TO 13

3. Since the main request is allowable, there is no need for the board to deal with these requests.

4. During the oral proceedings the appellant filed a description adapted to the claims of the main request. The amendments were discussed with the respondent, which in the end had no objections to them.

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 on the basis of the following documents:

   - Claims 1 to 45, filed as main request on 9 February 2015 with the statement setting out the grounds of appeal; and

   - Description pages 2 to 7 as filed during the oral proceedings before the board on 19 September 2017.

The Registrar: The Chairman:

M. Cañueto Carbajo W. Sieber

Decision electronically authenticated