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**Datasheet for the decision
of 29 July 2014**

Case Number: T 0491/11 - 3.3.09

Application Number: 01978419.8

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IPC: B32B27/32, F16L9/12, F16L9/133

Language of the proceedings: EN

Title of invention:
POLYETHYLENE PIPE

Patent Proprietor:
INEOS Manufacturing Belgium NV

Opponent:
Borealis Technology OY

Headword:

Relevant legal provisions:
EPC Art. 54(3), 56, 83, 84, 123(2)

Keyword:
Claims - clarity - auxiliary request (yes)
Sufficiency of disclosure - (yes)
Novelty - (yes)
Inventive step - auxiliary request (no)

Decisions cited:

Catchword:



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Case Number: T 0491/11 - 3.3.09

**D E C I S I O N
of Technical Board of Appeal 3.3.09
of 29 July 2014**

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Decision under appeal: **Decision of the Opposition Division of the
European Patent Office posted on 27 December
2010 revoking European patent No. 1328401
pursuant to Article 101(3)(b) EPC.**

Composition of the Board:

Chairman W. Sieber
Members: W. Ehrenreich
K. Garnett

Summary of Facts and Submissions

- I. This decision concerns the appeal of the patent proprietor INEOS Manufacturing Belgium NV against the decision of the opposition division to revoke European patent No. 1 328 401.
- II. An opposition against the patent had been filed by Borealis Technology OY, requesting revocation of the patent in its entirety on the grounds of Article 100(a) EPC (lack of novelty and lack of inventive step), Article 100(b) EPC and Article 100(c) EPC.

The documents cited during the opposition proceedings included:

D1 EP 1 152 181 A1
D3 EP 0 897 934 A1
D12 WO 97/33116 A1
D16 WO 01/94112 A1.

- III. The decision of the opposition division, announced orally on 14 December 2010 and issued in writing on 27 December 2010 was based on a main request (patent as granted), and a second auxiliary request filed on 9 December 2010 which was then renumbered to be a first auxiliary request after withdrawal of a previous first auxiliary request.

Claim 1 of the (renumbered) first auxiliary request reads as follows [difference over claim 1 as granted underlined by the board]:

"1. Multi-layered pipe comprising: a main layer of a polyethylene compound having a resistance to stress cracking measured by the notched pipe test according to

ISO 13479 standard (NPT) of less than 8000 hours; an internal layer of polyethylene compound which comprises at least 95% by weight of a polyethylene resin comprising from 30 to 70% by weight of an ethylene polymer having a density of at least 960 kg/m^3 and a melt index MI_2 of at least 100 g/10min, and from 30 to 70% by weight of an ethylene-hexene copolymer comprising from 0.4 to 10 weight% of hexene and having a density between 910 and 938 kg/m^3 and a melt index MI_5 of between 0.01 to 2 g/10min, the polyethylene compound having a resistance to stress cracking NPT of higher than 8000 hours; and at least one external layer comprising a polyethylene compound having a resistance to stress cracking NPT measured according to ISO 13479 standard of higher than 8000 hours, the thickness of the internal layer being between 1 and 25% of the total pipe thickness but not less than 0.3 mm."

The opposition division's view can be summarized as follows:

- The invention claimed in the main request and the first auxiliary request is sufficiently disclosed and the subject-matter of both requests does not extend beyond the content of the application as filed.
- The subject-matter of both requests is novel over the disclosure in each of the documents D1 and D16.
- The subject-matter of claim 1 of both requests is, however, not based on an inventive step in view of a combination of D12 with D3.

IV. The appeal of the proprietor (hereinafter: appellant) against the decision was filed on 14 February 2011. The appeal fee was paid on the same day.

With the grounds of appeal, which were received on 3 May 2011, sets of claims for a new main request, and first and second auxiliary requests were filed.

V. The opponent (hereinafter: respondent) responded to the grounds of appeal with its letter dated 9 September 2011 and made reference *inter alia* to the following documents:

D20 International standard ISO 13479 (First edition 1997): Polyolefin pipes for the conveyance of fluids - Determination of resistance to crack propagation - Test method for slow crack growth on notched pipes (notch test);

D21 International standard ISO/FDIS 13479 (Final draft 1996).

Objections against the main request and the first and second auxiliary requests were raised under Articles 100(a), 100(b), 100(c) and 84 EPC.

VI. With its letter dated 13 November 2012 the appellant reverted to the claims as granted as its main request, and submitted a declaration of Mr. Paul Rugraff dated 12 November 2012. The appellant also stated that "Three auxiliary requests are filed herewith". These requests were however not enclosed but filed later with the letter dated 23 May 2014.

VII. By letter dated 10 June 2014 the respondent requested that the main, first and third auxiliary requests be

not admitted into the proceedings. Further objections under Articles 100(a), 100(b) and 100(c) EPC were raised.

The respondent further presented the following document:

D25 I. Uhl et al., "Punktbelastung an Kunststoffrohren", Wasser, Abwasser, 141 (2000) no. 3, pages 142-144.

VIII. Enclosed with the appellant's letter dated 17 June 2014 was a new set of claims for a main request and first and second auxiliary requests. The appellant pointed out that these requests were a return to those requests filed with the grounds of appeal, except for some minor changes. One change was the reinstatement of claim 5 as granted, relating to a pipe according to claims 1 to 4 comprising "an external layer having an improved scratch resistance".

IX. In preparation of the oral proceedings, the board issued a communication dated 27 June 2014 and, as a preliminary and non-binding opinion, *inter alia* raised the following points:

- The introduction of the feature "at least one external layer" into claim 1 of all requests did not contravene Article 123(3) EPC but needed to be discussed under Article 84 EPC.
- The change of claim category from product to use claims in the second auxiliary request possibly contravened Article 123(2) EPC.

- Sufficiency of disclosure had to be discussed in the light of the international standard D20. In this context, the discrepancy between the values for the stress cracking resistance given in claim 1 for the polyethylene compound of the main and internal layer and the requirement in D20 to determine this parameter on a pipe had to be clarified.
 - Doubts existed as to whether the disclosure in D16 anticipated the claimed subject-matter.
 - It seemed that D12 represented the closest prior art for the assessment of an inventive step. In particular the pipe characterised in Run 12 of Table 2 was of importance. The objective problem to be solved had to be identified and it had to be discussed whether the solution to the problem was obvious by combining D12 with D3.
- X. With its letter dated 30 June 2014 the appellant provided further arguments with respect to the issues under Articles 123(2), 83, 54 and 56 EPC.
- XI. At the beginning of the oral proceedings, held on 29 July 2014, the respondent requested that the appellant's requests filed with the letter dated 17 June 2014 be not admitted into the proceedings. The appellant then withdrew certain requests and filed new requests. The situation then developed as follows:
- The main request filed with the letter dated 17 June 2014 was not admitted by the board into the proceedings. This request was then withdrawn by the appellant and replaced by a new main

request. The (new) main request was not admitted into the proceedings.

- Following a clarity objection having regard to the feature "at least one external layer" in the first auxiliary request filed with the letter dated 17 June 2014, the appellant filed an amended first auxiliary request during the oral proceedings and withdrew its previous first auxiliary request. The amended request was admitted into the proceedings.
- The second auxiliary request filed with the letter dated 17 June 2014 was discussed on the basis that the appellant was prepared to amend the reference in claim 1 from "at least one external layer" to "an external layer". The respondent no longer objected to the admittance of this request.
- The appellant filed a third auxiliary request during the oral proceedings. This request was not admitted into the proceedings.

XII. The arguments of the parties, as far as they are relevant to this decision and relate to requests which were maintained by the appellant, are summarized in sections XIII and XIV.

XIII. Arguments of the respondent

Admissibility of the appellant's requests

- a) Main request as submitted in the oral proceedings

This main request could have been filed earlier and was therefore late-filed. Furthermore, this request introduced for the first time new matter

into the appeal proceedings. Reference was also made to the warning given in point 1.2 of the board's communication dated 27 June 2014 that admissibility of the request had to be considered with respect to Article 12(4) RPBA.

- b) First auxiliary request submitted in the oral proceedings

The request should not be admitted because the amendment in claim 1 that the pipe comprises "an external layer" without the indication that this layer has improved scratch resistance, contravened Article 123(2) EPC. It was disclosed on page 5, line 32 to 35 of the application as filed that, if an external layer is present, this layer should have an improved scratch resistance.

- c) Second auxiliary request dated 17 June 2014

The respondent did not object to the admittance of this request with the proviso that the reference in claim 1 from "at least one external layer" was amended to "an external layer".

- d) Third auxiliary request submitted in the oral proceedings

This request was submitted at a very late stage of the appeal proceedings and introduced matter which had never been discussed before. For this reason alone, the request should not be admitted.

Sufficiency of disclosure

According to paragraph [0008] of the patent specification the resistance to stress cracking was tested by a notch pipe test (NPT) in accordance with ISO 13479 (1996). This version of ISO 13479 did not, however, exist as official norm. As could be seen from D20/D21, the official ISO standard 13479 was available for the first time in 1997.

As is evident from point 6.1 of D20/21, the notched pipe test (NPT) is carried out on monolayer pipes and not on the polyethylene compound as required by claim 1.

No conditions for preparing the pipe are given in the patent specification. According to point 9 of the ISO 13479:1997 the notch pipe test includes a test report which should *inter alia* contain all details necessary to complete identification of the pipe (e.g. manufacturer, type of pipe etc.) The skilled person lacking information about these details is therefore not able to reliably determine the values for the stress crack resistance.

Novelty - first auxiliary request submitted in the oral proceedings

D16 discloses in claim 1 a three-layer pipe wherein the first and third layer have an NPT value which is at least 3 times higher than the second layer. The first and third layers correspond to the external and internal layer and the second layer corresponds to the main layer of the claimed pipe.

D16 teaches on page 4, second paragraph, that a bimodal ethylene-hexene copolymers having an NPT-value up to 7500 h forms the external and internal layers of the three-layer pipe. Because the ESCR measurement method (NPT) referred to in D16 is less accurate than the NPT method according to ISO 13479:1997 as required by the patent, no difference exists between the stress crack resistance of 7500 h according to D16 and the stress crack resistance of more than 8000 h according to claim 1. Thus, D16 discloses a multilayer pipe having all features of the pipe according to claim 1 of the first auxiliary request.

Inventive step - first auxiliary request submitted in the oral proceedings

The closest prior art is represented by the disclosure in D12. The document refers to a multilayer pipe showing good stress crack resistance, i.e. a good resistance against rapid crack propagation, which comprises a layer of a cheap polymer material having a relatively low crack resistance, expressed by a high T_{crit} , and a layer with a higher crack resistance expressed by a low T_{crit} . Claim 8 of D12 characterises a pipe having at least three layers wherein the layers having the lowest T_{crit} (i.e. having the highest stress crack resistance) are arranged at the outside and the inside of the pipe. A polyethylene pipe of this kind with the layer sequence "A-F-A" is described in run 12 of example 1 (cf. Table 2) wherein the internal layer has the lowest thickness of the pipe layers.

The claimed subject-matter differs therefrom essentially in that the internal layer of the pipe consists of a specific polyethylene compound as defined in claim 1. The objective problem to be solved by this

distinguishing feature is the improvement of slow crack resistance combined with an improved resistance to rapid crack propagation (paragraphs [0003] and [0011] of the patent specification).

A skilled person seeking to solve this problem is, however, lead by the disclosure in D3 to place at the inside of a pipe a layer of a polyethylene material having the properties as claimed in claim 1 of all requests. D3 indicates in paragraphs [0038/39] that pipes prepared by using a bimodal ethylene-hexene copolymer composition show a good compromise between the resistance against slow crack propagation and rapid crack propagation. A combination of D12 with D3 thus renders the claimed subject-matter obvious.

Added subject-matter - second auxiliary request dated 17 June 2014

In this request, the claim category was changed from product claims to use claims. Claim 1 now relates to the use of a specific polyethylene compound as an internal layer in a multilayer pipe in order to improve the resistance to stress cracking of said pipe. Thus, this claim suggests that exclusively the internal layer of the pipe is responsible for the improved properties of the three-layered pipe. Such a direct relationship was not disclosed in the application as filed.

XIV. Arguments of the appellant

Admissibility of the requests

- a) Main request submitted in the oral proceedings

Because this request did not introduce matter which had not been discussed earlier it should be admitted into the proceedings.

- b) First auxiliary request submitted in the oral proceedings

The request should be admitted because the amended feature that the pipe comprises "an external layer" removed an objection raised by the respondent under Article 84 EPC with respect to the previous feature "at least one external layer". Moreover, this amended feature had a clear basis, namely, the disclosure at page 5, lines 32/33 of the application as filed that the pipes of the invention preferably comprise "at least one external layer". Article 123(2) EPC was thus complied with.

- c) Third auxiliary request submitted in the oral proceedings

This request was a reaction to the respondent's objection that the change in claim category from product claims to use claims in auxiliary request 2 contravened Article 123(2) EPC and the announcement of the board to agree with this objection.

Sufficiency of disclosure

It was evident from a comparison of the contents of D21 and D20 that the provisional 1996 version of ISO 13479 (D21) was a final draft and became the official version in 1997 (D20).

In paragraph [0008] of the patent specification the skilled person is instructed to carry out the notched pipe test (NPT) according to ISO 13479 (1996) under a stress of 4.6 MPa at 80°C, using pipes made of the compound, of 110 mm diameter and a thickness of 10 mm (SDR value of 11). The skilled person therefore knows that he has to determine the stress cracking of the polyethylene materials forming the layers of the claimed pipe by making a monolayer pipe with an SDR of 11 of each of the materials and performing the NPT on such a pipe under 4.6 MPa stress at 80°C according to ISO 13479.

Novelty - first auxiliary request submitted in the oral proceedings

The respondent had not provided any evidence that the NPT value of up to 7500 h measured by the ESCR method for the first and third layers of the pipe disclosed in D16 unambiguously corresponded to the NPT value of higher than 8000 h for the internal layer of the claimed pipe determined according to IO 13479.

Inventive step - first auxiliary request submitted in the oral proceedings

The claimed invention aimed at improving the stress crack resistance, also known as slow crack growth resistance (ESCR), of multilayer pipes. The test reported in the declaration by Mr. Rugraff clearly showed a dramatically improved slow crack resistance of the pipe according to the invention when a layer of a polyethylene composition having a stress crack resistance of greater than 8000 h was added as internal layer to the pipe.

D12 was completely unrelated to the improvement of slow crack growth resistance. Furthermore, D12 did not disclose a layer of a polymer material having a resistance to stress cracking of greater than 8000 h. Instead, D12 dealt with the problem of improving the resistance of multilayer pipes against rapid crack propagation (RCP), which is a phenomenon that is fundamentally different from slow crack growth. According to page 7, lines 25 to 28 of D12 it was disclosed that the material having a lower T_{crit} was arranged at least on the outside of the pipe. D12 lacked explicit information that it is beneficial to arrange the layer with a good RCP resistance, i.e. having the lowest T_{crit} , at the inside of the pipe.

Therefore, a skilled person starting from D12 was not led to place a layer of a bimodal polyethylene compound including an ethylene-hexene copolymer as described in D3 at the inside of the pipe in order to substantially improve the resistance against slow crack propagation.

XV. The appellant requested that the decision under appeal be set aside and the patent be maintained on the basis of the main, alternatively the first auxiliary request both as filed during the oral proceedings of 29 July 2014, alternatively on the basis of the second auxiliary request filed with its letter dated 17 June 2014 as amended to change the reference in claim 1 from "at least one external layer" to "an external layer", alternatively on the basis of the third auxiliary request filed during the oral proceedings of 29 July 2014.

XVI. The respondent requested that the appeal be dismissed.

Reasons for the Decision

1. The appeal is admissible.
2. Admittance of the appellant's requests
 - 2.1 Main request as filed during the oral proceedings

This request is an amended version of the main request filed with the appellant's letter dated 17 June 2014. In particular, the feature of previous claim 7 ("... external layer comprising a polyethylene compound having a resistance to stress cracking NPT measured according to ISO 13479 standard of higher than 8000 hours") was introduced. Although this amended main request now fully corresponds to the (renumbered) first auxiliary request as discussed in the decision of the opposition division, it had not until the oral proceedings before the board been pursued in the appeal proceedings. Thus, such a request could have been filed at a much earlier stage of the appeal proceedings and not at the very last moment during the oral proceedings. Such a later change in the appellant's case was not caused by anything which had happened at the oral proceedings and was not consistent with procedural economy. The board therefore exercised its discretion and did not admit the new main request into the proceedings (Articles 13(1) and (13(3) RPBA).

- 2.2 Amended first auxiliary request presented in the oral proceedings

Apart from amending the reference in claim 1 from "at least one external layer" to "an external layer", claim 1 of this request corresponds to claim 1 of the first auxiliary request filed with the grounds of

appeal. The amendment removes a discrepancy between claim 1 and claim 5 and thus overcomes an objection of lack of clarity (Article 84 EPC) raised for the first time by the respondent in the oral proceedings against the previous first auxiliary request.

In view of the above, the board admitted the amended first auxiliary request into the proceedings.

2.3 Second auxiliary request

Claim 1 of the second auxiliary request filed with the letter dated 17 June 2014 corresponds to claim 1 of the second auxiliary request which was filed with the grounds of appeal. The appellant's proposal to amend the reference in claim 1 from "at least one external layer" to "an external layer" removes a discrepancy between claim 1 and claim 5 and thus overcomes an objection under Article 84 EPC. This request was therefore admitted into the proceedings subject to this proviso.

2.4 Third auxiliary request filed during in the oral proceedings

2.4.1 The claims of the third auxiliary request are formulated as use claims which, however, differ from the use claims of the second auxiliary request as regards the "Use of a polyethylene compound ..." by the new formulation "Use in a multi-layered pipe of ...". This request therefore introduced matter which had not been discussed before in the appeal proceedings and thus raised issues which the board and the respondent could not reasonably be expected to deal with without adjournment of the oral proceedings.

2.4.2 The board therefore exercised its discretion according to Articles 13(1) and 13(3) RPBA and did not admit this request into the proceedings.

2.5 From the above it follows that the first auxiliary request as amended in the oral proceedings and the second auxiliary request with the amendment as proposed by the appellant are the only requests which were admitted in the appeal proceedings. Thus, only these requests are discussed in the following.

3. First auxiliary request

Claim 1 of the first auxiliary request reads as follows:

"1. Multi-layered pipe comprising: a main layer of a polyethylene compound having a resistance to stress cracking measured by the notched pipe test according to ISO 13479 standard (NPT) of less than 8000 hours; an internal layer of polyethylene compound which comprises at least 95% by weight of a polyethylene resin comprising from 30 to 70% by weight of an ethylene polymer having a density of at least 960 kg/m^3 and a melt index MI_2 of at least 100 g/10min, and from 30 to 70% by weight of an ethylene-hexene copolymer comprising from 0.4 to 10 weight% of hexene and having a density between 910 and 938 kg/m^3 and a melt index MI_5 of between 0.01 to 2 g/10min, the polyethylene compound having a resistance to stress cracking NPT of higher than 8000 hours; and an external layer, the thickness of the internal layer being between 1 and 15% of the total pipe thickness but not less than 0.3 mm."

3.1 Amendments - Articles 123(2), 84 EPC

- 3.1.1 The first auxiliary request was filed during the oral proceedings, with the modification that the reference in claim 1 from "at least one external layer" was amended to "an external layer" without a further specification of this layer. An objection under Article 123(2) EPC against this amendment was raised by the respondent.
- 3.1.2 Claim 1 as originally filed relates to a multilayer pipe comprising a main layer and an internal layer. This open definition by using of the word "comprising" allows the presence of any other layer in the pipe. Further layers are defined in the last two paragraphs on page 5 of the application as filed. Thus in lines 28 to 31 it is mentioned that, besides the internal and the main layer, other layers can be present which can be disposed *inter alia* at "the external side of the pipe". This clearly implies that no specific limitations as regards the chemical and physical properties of the external layer, if present, are required. This is corroborated by the next sentence in the last paragraph which discloses that the pipes according to the invention preferably comprise "at least one external layer". When considering this disclosure in its context it is immediately evident that "an external layer having a good scratch resistance" as disclosed in lines 33 to 35 on page 5 of the application as filed is only a preferred embodiment of an external layer.
- 3.1.3 The amendment to claim 1 (see point 3.1.1) thus complies with Article 123(2) EPC.
- 3.1.4 No objections under Article 84 were raised against this amendment by the respondent. In the board's judgment

the claims of the first auxiliary request are not objectionable under Article 84 EPC.

3.2 Sufficiency of disclosure

3.2.1 According to paragraph [0008] of the patent specification the NPT for the determination of the resistance to stress-cracking of the polyethylene material for the main and the internal layer is carried out according to ISO 13479:1996. It emerges from a comparison of D21 with D20 that the ISO 13479:1996 (D21) is a final draft of ISO 13479 and is literally identical with the official version ISO 13479:1997 (D20). Thus, a skilled person using the official version of 1997 for the NPT-test would automatically work under the conditions of ISO 13479:1996.

3.2.2 Paragraph [0008] of the patent specification indicates that the stress cracking of the polyethylene compound in accordance with ISO 13479:1996 is carried out "using pipes made of the compound...". This is a clear indication to the skilled person that he first has to prepare a monolayer pipe from the respective polymer material. This paragraph further instructs the skilled person:

- to prepare a pipe with a length of 110 mm and a thickness of 10 mm, corresponding to an SDR value of 11; and
- to carry out the NPT test under a stress of 4.6 MPa at 80°C.

These conditions correspond to the test conditions for a pipe with an SDR value of 11, which can be calculated by the two equations given in the lower part of Table A.1 of Annex A of ISO 13479:1996/1997.

3.2.3 The skilled person is thus able to carry out the NPT test for the polymer material pipe without undue burden.

3.3 Novelty

3.3.1 The document which is particularly relevant for the assessment of novelty is D16, which represents a document according to Article 54(3) EPC.

3.3.2 In its communication the board expressed its view that one point at issue was the question as to whether the NPT value of up to 7500 h for the bimodal ethylene-hexene copolymer disclosed in D16 corresponds to the NPT value of higher than 8000 h required for the polyethylene material of the internal layer of the claimed pipe. In this context the board noted that the respondent had not provided evidence for its allegation that the ESCR measurement method mentioned in D16 is less accurate than the method according to ISO 13479 required by the patent and that therefore no difference could be seen between 7500 h disclosed in D16 and higher than 8000 h required by claim 1.

3.3.3 No new facts emerged thereafter and the board therefore does not see any reason to change its view that D16 lacks an implicit and unambiguous disclosure which anticipates the NPT value of higher than 8000 h as required by claim 1. For this reason alone D16 is not novelty-destroying.

3.3.4 In the board's judgment, the other cited documents also do not anticipate the claimed subject-matter. This was not contested by the respondent. The subject-matter of

the first auxiliary request is therefore novel over the cited prior art.

3.4 Inventive step

3.4.1 The invention concerns multi-layered polyethylene pipes having an improved resistance against slow crack growth, which improves resistance to point loading, while maintaining other properties of the pipes of the prior art such as good resistance to stress cracking and creep rupture strength (patent specification, paragraphs [0001], [0003], [0005] and [0006]).

3.4.2 As agreed by the parties, document D12 represents the closest prior art.

D12 relates to multilayer pipes with improved resistance to rapid crack propagation (page 1, lines 1 to 4). According to page 1, lines 19 to 25, it is an aim of the pipe to overcome the drawback of rapid propagation of cracks when the pipes are subjected to stress at low temperatures. In order to overcome this deficiency, it is proposed to make pipes with several layers of different polyolefin plastic material which differ sufficiently in their resistance to rapid crack propagation (RCP), i.e. which have different critical temperatures T_{crit} . Preferably the pipes are built up of more than two layers, for example three layers, i.e. an inner layer, an intermediate layer and an outer layer (page 6, lines 12 to 31).

On page 7, lines 25 to 28 it is pointed out that if polymer materials having a different T_{crit} are used, it is preferred to arrange the material with the lower T_{crit} (i.e. the higher resistance to RCP) at least on the outside of the pipe. In claim 8 a preferred

embodiment of the pipe is proposed wherein the polymer material with the lowest T_{crit} is arranged on the outside and the inside of the pipe. The layer arrangement according to claim 8 is realised in several runs (i.e. runs 1, 3 to 5, 10, 12 to 14) of example 1 of D12 (Table 2).

Run 12 with the arrangement "A-F-A" relates to a three-layer pipe wherein the inner and outer layers "A" are made of a high density polyethylene (Table 1) with a T_{crit} of -15°C (Table 2, continued at page 12), which means that the inner and outer layers have the highest resistance against RCP. The inner layer has the lowest thickness of the pipe layers. The layer "F" is a high density polyethylene with a T_{crit} of $+15^{\circ}\text{C}$. This arrangement principally corresponds to a layer sequence embraced by claim 1 of the first auxiliary request, wherein the inner layer has a higher resistance to stress cracking than the main layer and has the lowest thickness of the pipe layers, and wherein the outer layer can be identical with the inner layer.

3.4.3 The appellant saw the problem to be solved in the light of D12 as being the provision of a multi-layer pipe having an improved slow crack propagation.

3.4.4 As a solution to this problem, claim 1 of the first auxiliary request proposes a multi-layer pipe which in contrast to the pipe of D12:

- has an inner layer of a specifically defined bimodal polyethylene compound including an ethylene-hexene copolymer, which has a high resistance to stress cracking NPT of >8000 h; and wherein

- the inner layer has a thickness of between 1 and 15% of the total pipe thickness but not less than 0.3mm.

3.4.5 The example and comparative example (paragraphs [0038] to [0042] of the patent specification show that a three-layer pipe according to the claimed invention shows a good resistance to stress cracking in combination with good resistance to point loading (slow crack propagation) when compared with a pipe wherein the polyethylene material of the inner layer does not meet the structural and rheological specifications defined in claim 1 (cf. the Table in paragraph [0041]) and which thus has low point loading resistance. The problem is thus credibly solved.

3.4.6 It remains to be examined as to whether or not the person skilled in the art would have modified the closest prior art in order to solve the above identified technical problem and would have arrived at something falling within the scope of claim 1.

D3 discloses compositions of ethylene polymers comprising 30 to 70% by weight of an ethylene polymer having a density of at least 960 kg/m^3 and a melt index MI_2 of at least $1000\text{g}/10\text{min}$ and from 30 to 70% by weight of an ethylene-hexene copolymer having a density of 910 to 940 kg/m^3 and a melt index MI_5 of between 0.01 and $2\text{g}/10\text{min}$ (claim 10 in context with paragraph [0034]). The hexene content in the ethylene-hexene copolymer is from 0.4 to 10% by weight (claim 2). This composition thus corresponds structurally to the polyethylene composition forming the internal layer of the pipe according to claim 1 of the first auxiliary request 1.

Although the stress cracking NPT of higher than 8000 h, as required by claim 1, is not expressly mentioned for the ethylene polymer composition in D3 it must be assumed that the composition of D3, owing to its structural similarity, also possesses a required high resistance to stress cracking. This all the more so as D3 points to the suitability of the bimodal ethylene polymer composition for the extrusion of pressure pipes, which then possess a high resistance against slow crack propagation, which is higher than 2000 h and is measured according to ISO 13479(1996) on a pipe with an SDR of 11 at 80°C and a stress of 4.6 MPa (D3, paragraph [0038]).

Furthermore, paragraph [0038] mentions an improved resistance against rapid crack propagation in pipes made from the bimodal ethylene polymer composition. This property was measured on a pipe with an SDR of 11 according to the method S4 referred to in ISO 13479 (1996). Lastly, in paragraph [0039] it is expressly pointed out that the corresponding pipes show a good compromise between the resistance against slow crack propagation and rapid crack propagation.

A skilled person intending to improve the resistance against slow crack propagation of a pipe according to D12, additionally to the improvement of its resistance against rapid crack propagation, would thus be led to replace the polymer material with the lower T_{crit} used in D12 at least on the outside (D12, page 7, lines 25 to 28), and in the preferred embodiment according to claim 8 and run 12 also on the inside of the pipe, by the polymer composition of D3. Because the inner layer of the pipe with the layer sequence "A-F-A" according to Run 12 of D12 and also the other runs representing three-layer pipes has the lowest layer thickness the

skilled person would also select a reduced thickness for the inner layer formed by the of polymer material according to D3.

The disclosure of D12 (cf. runs 12, 13 and 14) shows that the inner layer can be thinner than the layer made of the cheaper composition. According to this disclosure the internal layer has a thickness of between 17 to 21% of the total pipe thickness. As pointed out by the respondent, the opposed patent does not show that the required thickness of the internal layer shows any effect (page 30 of the letter dated 9 September 2009). In fact, the appellant did not rely on this feature at the oral proceedings. Therefore, the board agrees with the respondent that this feature is only an arbitrary selection from a possible thickness range, and thus, cannot contribute to inventive step.

In summary, by combining the preferred embodiment of D12 (three-layer pipe "A-F-A") with the teaching of D3, the skilled person would arrive at an embodiment falling within the scope of claim 1.

- 3.4.7 The appellant argued that the declaration of Mr. Rugraff shows an improved resistance to point loading by placing the polyethylene material with an NPT value of greater than 8000 h as a layer on the inside of the pipe. This argument is, however, not convincing because, as mentioned above, placement of the layers with low T_{crit} on the outside and the inside of a three-layer pipe is a preferred embodiment in D12 and would thus principally be taken into account by a skilled person, unless a specific unexpected technical effect is linked to the arrangement specifically at the inside of the pipe.

Furthermore, the report in the declaration of Mr. Rugraff concerns the comparison of a one-layer with a two-layer pipe and thus cannot show a specific effect which occurs when a layer with an NPT value of greater than 8000 h is arranged on the inside of the pipe, in addition to the arrangement of such a layer on the outside of the pipe.

3.4.8 For the above reasons, the subject-matter of claim 1 of the first auxiliary request does not involve an inventive step. The request is therefore not allowable.

4. Second auxiliary request

4.1 Claim 1 of this request was amended in that it now relates to the use of a specifically defined polyethylene compound...

- "as the internal layer in a multi-layered pipe comprising a main layer ... an internal layer ... and at least one external layer,
- in order to improve the resistance to stress cracking of said multi-layered pipe".

Claim 1 thus suggests that only the internal layer of the pipe is linked to the desired technical effect "to improve resistance to stress cracking of said multi-layered pipe".

4.2 In the passage on page 2, lines 5 to 12 of the application as filed, which relates to disadvantages of pipes of the prior art, it is mentioned that the "two-layered pipes of the prior art still have the need to increase their resistance to stress cracking, in particular to increase their resistance to point loading." Other disadvantages such as the absence of

good creep resistance and the absence of MRS classification are also mentioned.

In the subsequent passages, the aim of the invention "to overcome the disadvantages of the prior art" is defined (lines 13/14) and the way of achieving this aim by providing a multi-layered pipe comprising a specific main and internal layer is given (lines 15 to 20).

- 4.3 Although it is stated in the application as filed (and in fact in the claim itself) that the polyethylene compound used for the internal layer of the pipes exhibits good resistance to stress cracking (e.g. page 2, lines 26 to 28), there is no statement in the application as filed that it is this specific polyethylene compound of the internal layer which is responsible for the resistance to stress cracking of **the multi-layer pipe**. Quite the opposite is the case. Thus, the presentation of the invention set out in the passage on page 2, lines 5 to 20 suggests that it is a specific multi-layer arrangement having a specific main layer in combination with a specific inner layer which overcomes the disadvantages of the prior art, in particular with regard to improved resistance to stress cracking. In other words, it appears that the interaction of the different layers is responsible for improvement.
- 4.4 The amendments to claim 1 of the second auxiliary request and in particular the change of the claim category thus violate Article 123(2) EPC.
- 4.5 The second auxiliary request is therefore not allowable.

5. From points 3 and 4 above it follows that the first and second auxiliary requests do not meet the requirements of the EPC.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:



D. Hampe

W. Sieber

Decision electronically authenticated