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**Datasheet for the decision
of 6 August 2014**

Case Number: T 1262/11 - 3.3.03

Application Number: 04445026.0

Publication Number: 1574549

IPC: C08L23/08

Language of the proceedings: EN

Title of invention:
LLDPE pressure pipe

Patent Proprietor:
Borealis Technology Oy

Opponent:
THE DOW CHEMICAL COMPANY

Headword:

Relevant legal provisions:
EPC Art. 83

Keyword:
Sufficiency of disclosure - (no)

Decisions cited:

Catchword:



**Beschwerdekammern
Boards of Appeal
Chambres de recours**

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Case Number: T 1262/11 - 3.3.03

**D E C I S I O N
of Technical Board of Appeal 3.3.03
of 6 August 2014**

Appellant: Borealis Technology Oy
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Representative: Kador & Partner
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Respondent: THE DOW CHEMICAL COMPANY
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Representative: Boulton Wade Tennant
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Decision under appeal: **Decision of the Opposition Division of the
European Patent Office posted on 1 April 2011
revoking European patent No. 1574549 pursuant to
Article 101(3)(b) EPC.**

Composition of the Board:

Chairman B. ter Laan
Members: M. C. Gordon
R. Cramer

Summary of Facts and Submissions

- I. The appeal lies from the decision of the opposition division announced on 16 March 2011 and posted on 1 April 2011 revoking European patent number EP-B1-1 574 549 (granted on European patent application number 04 445 026.0).
- II. The patent was granted with a set of 17 claims, whereby claims 1, 2, 4 and 14 read as follows:
- "1. A multimodal linear low density polyethylene composition for the preparation of a pressure pipe, **characterized in that** said composition is prepared in situ and has a density (ISO 1183) of 910-940 kg/m³, an E-modulus (ISO 527) in the range of <800 MPa, an abrasion resistance (ASTM D 4060) of <20 and an MFR₂ (ISO 1133) at 90°C/2 kg of <2 g/10 min.
2. A polyethylene composition according to claim 1, wherein said composition has a density of 910-932 kg/m³.
4. A polyethylene composition according to claim 1, wherein said composition has an MFR₂ of <1.0 g/10 min.
14. A pressure pipe produced from multimodal linear low density polyethylene composition according to any of claims 1-13."
- III. A notice of opposition against the patent was filed on 3 October 2007 in which revocation of the patent on the grounds of Art. 100(a) EPC (lack of novelty, lack of inventive step) and Art. 100(b) EPC (insufficiency of disclosure) was requested.

- IV. The decision of the opposition division was based on the claims of the patent as granted as the main request and 11 sets of claims forming a first to eleventh auxiliary request.

Claim 1 of the tenth auxiliary request read as follows:

"A pressure pipe produced from a multimodal linear low density polyethylene composition, characterized in that said composition is prepared in situ and has a density (ISO 1183) of 910-932 kg/m², an E-modulus (ISO 527) in the range of <800 MPa, an abrasion resistance (ASTM D 4060) of <20 and a MFR₂ (ISO 1133) at 190°C/2kg of <1g/10 min".

- V. According to the decision, the main request - patent as granted - and the first to eighth auxiliary requests did not meet the requirements of Art. 83 EPC because the details of the measurement methods were not disclosed. Furthermore the examples of the patent in suit could not be repeated due to the absence of detailed information. In particular, the nature of the catalyst was not specified, nor were the type and amount of monomer. Consequently the invention could not be reproduced in a predictable and reproducible manner without undue burden.

The ninth auxiliary request was held not to meet the requirements of Art. 54 EPC and the tenth and eleventh auxiliary requests were held not to meet the requirements of Art. 56 EPC.

Accordingly the patent was revoked.

- VI. On 27 May 2011 the patent proprietor lodged an appeal against the decision, the prescribed fee being paid on the same date.
- VII. The statement of grounds of appeal was received on 5 August 2011. The claims forming the basis of the decision of the opposition division were maintained (Main request, 1st-11th auxiliary requests). Further, two additional requests forming a 12th and 13th auxiliary request were submitted, the wording of which is not of relevance for this decision. In a letter dated 1 June 2012 the appellant/patent proprietor made further submissions with respect to Art. 83 EPC.
- VIII. The opponent - now the respondent - replied with a letter dated 19 December 2011.
- IX. On 24 March 2014 the Board issued a summons to attend oral proceedings.
- X. In a communication dated 19 May 2014 the Board set out its preliminary assessment of the case. In particular issues relating to Art. 83 EPC were pointed out.
- XI. With letters dated 23 June 2014 and 31 July 2014 the appellant made further submissions and submitted further documents, *inter alia*
- D26: Handbook of Polyethylene, Peacock, A.J., Marcel Dekker Inc., 2000, pages 195-200.
- XII. The respondent made a written submission with letter dated 27 June 2014.
- XIII. Oral proceedings were held before the Board on 6 August 2014.

The appellant pursued as the main request the set of claims filed as tenth auxiliary request with the statement of grounds of appeal. Following discussion, all other requests were withdrawn.

XIV. The arguments of the appellant with respect to Art. 83 EPC can be summarised as follows:

The specified properties of the multimodal composition defined in claim 1 could be easily determined and served as an "umbrella" which subsumed the molecular characteristics necessary for the composition to exhibit the required properties. Said features thus distinguished the multimodal composition from other compositions having different molecular characteristics.

The patent disclosed how to prepare the multimodal polymers. The patent was directed to the "skilled person", who in the case of the technical field of the patent would be constituted by a team of experts having knowledge of polyethylene production and pipe manufacture. Such a team of experts would understand from the patent, in combination with the general knowledge of the field, how to prepare the required compositions and how their characteristics influenced the properties of pipes produced therefrom.

In particular it was known that:

Increasing the comonomer content resulted in

- reduction of abrasion resistance
- reduction of density
- reduction of crystallinity
- reduction of E-modulus.

Although there was no direct correlation between density and E-modulus, they were influenced by the same underlying mechanism, namely the short chain branching which was affected by the amount of comonomer present.

Higher density resulted in higher abrasion resistance whereas increased long chain branching resulted in reduced abrasion resistance.

The melt flow rate (MFR) was a measure of molecular weight, i.e. increasing molecular weight reduced the MFR. From D26 it was known that abrasion resistance increased with increasing molecular weight.

Table 1 of the patent showed preparations and properties of a number of multimodal compositions, including the "split" between the fractions of differing molecular weight prepared in the various stages. In the preceding paragraphs details of the catalysts to use were given. Details of the process were provided by the reference to EP 517 868 in paragraph [0044] of the patent. Although the patent in suit did not disclose the type of comonomer used in the examples, in view of the general discussion of comonomers and the expressed preference for 1-butene the skilled person would employ this monomer, also on grounds of economy.

The skilled person was likewise aware how to obtain a product of the required density, this being a function of branch content, molecular weight characteristics and the preparation conditions. There existed a number of routes available to attain a given density, e.g. by changing the densities of the components of the multimodal polymer as produced in each or all of the polymerisation stages, meaning that a given density

could be attained in several ways. Consequently the properties of a composition of a given density could vary greatly with the result that two multimodal compositions of the same density might have differing properties e.g. abrasion resistance.

XV. The arguments of the respondent can be summarised as follows.

The claim was almost entirely devoid of technical features regarding the constitution of the claimed composition, relying on a process step, two technical features of the composition (density and MFR₂) and two parameters (E-modulus and abrasion resistance). The description provided only the most general and vague description of how the multimodal polymer compositions were to be prepared. There was no guidance how to prepare in a reproducible and reliable manner a multimodal composition having the property profile required by the claims.

According to the submissions of the appellant, higher density resulted in better abrasion resistance (desired), but also in increased E-modulus (not desired). The molecular weight was a factor that affected other parameters of the composition, e.g. MFR. The patent provided no discussion of the effect of the degree or nature of the multimodality or any analysis of the influence of each of the individual polymer fractions on the overall polymer properties.

It was possible to have two polymers with identical density but entirely different modality. Analogously, two polymers of identical MFR could have completely different compositions in terms of the distribution and ranges of molecular weight within their constituent

polymers. Consequently the correlations advanced by the appellant between e.g. density and multimodality did not take account of the reality of the polymer compositions and could not serve as reliable predictors to identify compositions exhibiting the required mechanical properties, notwithstanding the differing trends of influence e.g. of density on said properties. The examples of the patent could not be relied upon to resolve the lack of general teaching in the patent since these lacked essential details with the consequence that they could not be reproduced.

XVI. The appellant (patent proprietor) requested that the decision under appeal be set aside and that the patent be maintained on the basis of the main request, filed as auxiliary request 10 with the statement of grounds of appeal.

The respondent (opponent) requested that the appeal be dismissed.

Reasons for the Decision

1. The appeal is admissible.
2. *Article 83 EPC*
 - 2.1 Claim 1 is directed to a pressure pipe prepared from a multimodal linear low density polyethylene composition. The composition from which the pipe is prepared is defined in terms of two features relating to the composition itself, i.e. the density and the MFR₂, and two mechanical properties or parameters, namely the

abrasion resistance and the E-modulus.

2.2 The description of the patent in suit states in paragraph [0023] that "by properly selecting the different polymer fractions and the proportions thereof" for the multimodal polymer composition it is possible to obtain a pipe with good mechanical properties as well as good processability, good slow crack growth resistance and high design stress rating. The patent also discusses the individual requirements of the composition in terms of the required values:

- the modality of the composition and the nature of the individual fractions (paragraph [0024])
- the density (paragraph [0025])
- modulus of elasticity (paragraph [0026])
- abrasion resistance (paragraph [0027])
- melt flow rate (paragraphs [0028] and [0029]).

In paragraph [0039] of the patent it is stated that the multimodal polymer composition is characterised by the combination of features specified in claim 1, which statement, made in the context of the patent as granted, is interpreted as applying also to the amended claim of the present request, and it is further emphasised that the "unique" combination of parameters allows pipes having superior properties to be obtained.

However the patent is silent on how to adjust and adapt the composition in order to meet all the requirements set out in the claim simultaneously. There is no analysis of how the various product properties, e.g. multimodality, density and melt flow, interact with and influence each other. Nor is there any teaching as to how these properties influence the required mechanical properties.

- 2.3 The appellant argued that the specified properties were a form of "umbrella" serving as or providing a definition of the underlying molecular properties of the composition. However, by further submissions with respect to density that contention is demonstrated to be untenable to the extent that any information so provided is not unambiguous.
- 2.4 Density is identified in paragraph [0025] of the patent as a factor on the basis of which suitable compositions could be identified. However it was submitted by both parties that a given density did not provide unambiguous information about the underlying molecular structure, in particular the nature of the components in the multimodal composition. On the contrary, a particular density could be attained by a number of different compositional profiles (see sections XIV and XV, above). Thus the "density" is not a feature that relates directly and unequivocally to and provides unambiguous information about the constitution of the underlying composition, but is itself an "umbrella" term which subsumes a variety of possible compositional properties.
- 2.5 It is also apparent from the submissions of the appellant that the product properties influence the mechanical properties not only to different degrees but also in different directions. Thus according to the appellant, a reduction in density (desired) is associated with a reduction in abrasion resistance (not desired) and also with a reduction of the E-modulus (not desired). Similarly, increasing the molecular weight resulted in improved abrasion resistance (desired) but a reduction in MFR, leading to poorer processability (not desired).

This situation is however not reflected, even in a general manner, by the teaching of the patent in suit and no analysis thereof is provided.

It therefore emerges that the various mechanical properties required by the claims are affected to different degrees and in different directions by the properties of the multimodal polymer composition, which properties themselves, as in the case of the density, do not necessarily unambiguously correspond to a particular molecular constitution of the multimodal polymer composition.

- 2.6 The appellant considered that, despite these conflicting influences and ambiguities, it was nevertheless possible on the basis of the teaching of the patent to obtain pressure pipes having good mechanical properties at low density.

The patent is however silent on these interdependencies and provides no analysis thereof and no guidance as to how the skilled person should proceed in order to arrive in a structured, directed manner at compositions meeting the requirements of the claims. Reference to the common general knowledge, e.g. D26 which was submitted late and the admission of which to the procedure was objected to by the respondent, does not permit this lack of information to be resolved. On the contrary, the information of D26 serves to underline the contradictory and inconsistent requirements and relationships that have to be simultaneously satisfied in order to attain the compositional and mechanical properties specified.

The examples of the patent in suit can provide no assistance in addressing or overcoming the absence of

general information. Details of the processes carried out are lacking. Only very general indications are given of the catalyst employed (either of the class Ziegler-Natta or the class single site) and of the conditions in the various reactors (temperature, pressure, feed rate or concentrations of monomers). Even the nature of the comonomer is not disclosed. Consequently the examples cannot be reproduced and do not provide a route for the skilled person to understand how to reproduce the claimed subject matter or to understand the interactions between process features, product features and mechanical properties of the resulting products.

- 2.7 Therefore the patent does not provide the information necessary to obtain compositions from which the claimed pipes are made, and therefore does not provide the information necessary to prepare those pipes having the specified properties. That information has also not been demonstrated to be derivable from the common general knowledge of the skilled person or from the prior art.

It is therefore concluded that the requirements of Art. 83 EPC are not met.

3. *Art. 123(2) EPC*

The Board is aware that claim 1 has been amended compared to the granted patent. In particular the claim combines features of claims 1, 2, 4 and 14, whereby claims 2 and 4 were each dependent only on claim 1, whereas claim 14 was dependent on all preceding claims. Whilst the Board has some misgivings as to whether the resulting combination of features results in subject-matter extending beyond the content of the application

as filed, in view of the above noted deficiencies with respect to Art. 83 EPC, this question does not need to be answered.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:



E. Goergmaier

B. ter Laan

Decision electronically authenticated