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Datasheet for the decision of 10 December 2013

Case Number: T 1959/10 - 3.3.03

Application Number: 02801614.5

Publication Number: 1448702

IPC: C08L23/04

Language of the proceedings: EN

Title of invention:
PIPE FOR HOT FLUIDS

Patent Proprietor:
Borealis Technology Oy

Opponents:
Total Research & Technology Feluy
THE DOW CHEMICAL COMPANY

Headword:

Relevant legal provisions:
EPC Art. 83

Keyword:
Sufficiency of disclosure - (no)
(Main request, first to fifth auxiliary requests)

Decisions cited:
T 0681/01

Catchword:

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Case Number: T 1959/10 - 3.3.03

D E C I S I O N
of Technical Board of Appeal 3.3.03
of 10 December 2013

Appellant: (Patent Proprietor)	Borealis Technology Oy P.O. Box 330 06101 Porvoo (FI)
Representative:	Kador, Utz Ulrich Kador & Partner Corneliusstrasse 15 80469 München (DE)
Respondent: (Opponent 1)	Total Research & Technology Feluy Zone Industrielle C 7181 Seneffe (BE)
Representative:	Mellet, Valérie Martine Total Research and Technology Feluy Zone Industrielle Feluy C 7181 Seneffe (BE)
Respondent: (Opponent 2)	THE DOW CHEMICAL COMPANY 2030 Dow Center Midland, Michigan 48674 (US)
Representative:	Boult Wade Tennant Verulam Gardens 70 Gray's Inn Road London WC1X 8BT (GB)
Decision under appeal:	**Decision of the Opposition Division of the European Patent Office posted on 19 July 2010 revoking European patent No. 1448702 pursuant to Article 101(3)(b) EPC.**

Composition of the Board:

Chairwoman:	B. ter Laan
Members:	M. C. Gordon
	C. Brandt

Summary of Facts and Submissions

I. The appeal lies from the decision of the opposition division announced on 23 June 2010 and posted on 19 July 2010 revoking European patent number EP-B1-1 448 702 (granted on European patent application number 02 801 614.5, derived from international application number PCT/SE2002/001868, published under the number WO 2003/033586).

II. The patent was granted with a set of 9 claims, whereby claim 1 read as follows:

"A polymer pipe for hot fluids **characterised in that** it comprises a multimodal polyethylene with a high molecular weight (HMW) fraction and a low molecular weight (LMW) fraction where said HMW fraction has a density of at least 0.920 g/cm^3, and that the multimodal polyethylene has a density of 0.921-0.950 g/cm^3 and has a time to failure at 95°C and 3.6 MPa of at least 165 h determined according to DIN 16 833 and a modulus of elasticity of at most 900 MPa determined according to ISO 527-2/1B." (emphasis of the patent).

III. Two notices of opposition against the patent were filed 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.

During the opposition proceedings opponent O2 submitted by letter of 30 April 2010 an experimental report, designated F22.

IV. The decision of the opposition division was based on the claims of the patent as granted as the main request and five sets of claims forming first to fifth auxiliary requests. The precise wording of these claims is not of relevance for the present decision.

According to the contested decision the patent in suit did not meet the requirements of Art. 83 EPC since the skilled person was faced with an undue burden of experimentation to obtain a pipe within the terms of the claims. The guidance provided by the patent was insufficient both with regard to the preparation of the multimodal polymer itself and the manner in which the various properties thereof had to be adjusted with respect to each other in order to obtain the subject-matter claimed. The examples were silent on the preparation of the polymers, meaning that the examples were not reproducible.

This conclusion applied to all sets of claims under consideration, i.e. the main request and first to fifth auxiliary requests.

V. On 17 September 2010 the patent proprietor lodged an appeal against the decision, the prescribed fee being paid on the same date.

VI. The statement of grounds of appeal was submitted on 26 November 2010. The sets of claims underlying the decision under appeal were maintained as the main and first-fifth auxiliary requests.

VII. Opponent 2 - now respondent II - replied with a letter dated 16 June 2011.

VIII. On 27 March 2013 the Board issued a summons to attend oral proceedings, scheduled for 18 June 2010. The proceedings were rescheduled for 10 December 2010 by communication dated 11 April 2013.

On 15 April 2013 the Board issued a communication setting out its provisional view of the case.

IX. By letter of 8 November 2013 respondent II/opponent O2 made further written submissions and provided a further experimental report (designated F29).

X. By letter also of 8 November 2013 the appellant/patent proprietor made further written submissions. Further submissions were made by a letter of 2 December 2013.

XI. Respondent I/opponent O1 did not make any substantive written submissions.

XII. Oral proceedings were held before the Board on 10 December 2013.

XIII. The arguments of the appellant can be summarised as follows:

Main request

a) Interpretation of the claims

Claim 1 was directed to a polymer pipe characterised by the features that it comprised a multimodal polyethylene having the product properties as defined, i.e. the two fractions and the specified densities of the HMW fraction and of the multimodal polyethylene. The polyethylene was further defined in terms of two functional

features, i.e. the time to failure of a pipe prepared from the polyethylene determined according to DIN 16 833 and the modulus of elasticity of the polyethylene determined according to ISO 527-2/1B.

b) The significance of "multimodal"

It followed from the explanation of "multimodal" in the patent in suit that it was preferred that the polymer be prepared in a multistep reaction process (reactor blend) (following the Case Law according to which a document was its own dictionary). As a consequence the polymer was highly homogeneous. Polymers prepared by other processes did not fall under the claim.

c) Relationship between the structural and functional features of the claims.

The specified structural features (MFR, density) did not automatically result in polyethylenes also satisfying the functional features (specified pipe properties). The structural features were in the nature of "umbrella features" which subsumed a number of characteristics of the polymer as well as their interrelationships, for example:

- Melt flow rate (MFR) (of the final copolymer as well as of the LMW fraction under the specified load conditions);
- total comonomer content;
- comonomer distribution between the two phases;
- the density of the multimodal polymer;
- the balance of the densities of the two fractions;

- the homogenity of the polymer.

The interrelationships of the various structural features could not be expressed in a simple way, e.g. in the form of claim language, because it was not possible to deduce from general principles why compositions within the preferred ranges of the patent in suit gave the desired results or why compositions lying outside the preferred ranges did not necessarily do so.

Regarding density, it was necessary not only that the final polymer had the specified density but also that the densities of the two fractions be balanced against each other. To this end a central teaching of the patent in suit was that the density of the HMW fraction had to be above 0.920 g/cm^3 as emerged in particular from the examples. The final part of the description taught the need to balance the densities of the HMW and LMW fractions and explained how to do this in the case of the LMW fraction (adjusting the MFR_2).

If the skilled person prepared a multimodal polyethylene that met the structural requirements of the claim but which polyethylene did not satisfy the functional features, then it would be apparent that the multimodal polyethylene was not within the teaching of the patent, i.e. within the various preferred ranges of the structural features. In that case it would be necessary to modify the polyethylene to bring it more in line with the teaching of the patent.

d) The manner of manufacturing the polyethylene was not significant and was not part of the invention. It could be prepared by reactor blending or by mechanical blending of two separately prepared polymethylenes as long as the required degree of homogeneity was attained.

Once the required properties had been defined the skilled person would be in a position to prepare the required material. In any case the description and in particular the examples demonstrated how the required polyethylene could be prepared.

e) *The examples*

Although the examples could not be directly reproduced, they provided information regarding the nature of the process to produce the multimodal polyethylene, i.e. multistage (reactor blend). As the properties of the product of the first stage could be directly measured (e.g. the MFR) and the properties of the final product were known, it was possible to derive the properties of the product produced in the second stage. The comonomer employed was disclosed as well as the quantity thereof (as a range), although the amount of comonomer employed in each example and the resulting distribution between the two fractions was not disclosed and could not be derived from the information given. From the relationship between the MFR_2 and the density of the LMW fraction reported in the final paragraph of the patent it was possible to calculate the split (proportions of HMW and LMW fractions) albeit that the correlation indicated was valid only in the case of homopolymers, i.e. those polymers employed

in examples 4 and 8.

f) *Experimental reports F22 and F29*

The data of F22 and F29, both filed by respondent II, were of limited value since the respondent had not attempted to rework the examples of the patent or even adhere to the preferred embodiments of the patent. In particular the compositions of the reports were mechanical blends instead of reactor blends.

The reports merely demonstrated that in the case of deviations from the preferred teaching of the patent it might be, but was not necessarily, possible to obtain the required compositions.

Although the compositions of F22 complied with the claims, the MFR_5 and density of the HMW fraction were not in optimal balance, which accounted for the unsatisfactory results.

It was remarkable that one composition of F29 exhibited the required functional features even though it had not been prepared according to the preferred embodiments of the patent. Regarding the second composition of F29 it would appear that this had not been sufficiently homogenised/mixed leading to the poor results. The inadequate blending was probably due to the large difference in melt index (MI) and therefore the large difference in density of the two components since blending became more difficult with increasing difference in the MI values.

XIV. The arguments of the respondents can be summarised as follows.

a) *Interpretation of the claims*

The claim contained a mixture of features directed to the polymer itself (structural features, e.g. density) as well as functional features (E-modulus and time to failure). The claims required that the e-modulus and the time to failure be measured on different materials, namely polyethylene and pipe respectively. The consequence was that it would be necessary to carry out in effect two assessments of the compliance of the claimed subject-matter with Art. 83 EPC, once with respect to the polyethylene and once with respect to the pipes prepared therefrom.

b) *"Multimodal"*

Regarding the polyethylene, the reference to a multistep process in the description was only to illustrate what was meant by "multimodal" but it did not impose a requirement - expressed or implied - on the manner in which the polyethylene was to be made. Similarly there was no explicit requirement in the patent regarding the degree of homogeneity.

c) *Relationship between the structural and functional features of the claims*

The patent failed to provide any analysis or explanation of the relationship between the various types of features and how these interacted with each other to influence the final outcome as

expressed in the form of the functional features. The description provided nothing more than a list of possible influencing factors and preferred ranges for a number of the structural parameters. However no analysis or guidance was provided to instruct the practitioner how to balance the various parameters with respect to each other in order to obtain reliably the required functional features.

d) *The examples*

The examples were not reproducible due to a lack of information regarding reaction conditions, catalysts, proportions of (co)monomers employed beyond a very general statement covering a range. It was not possible to establish where in the multimodal polymer the comonomer was present. The correlations provided in order to determine the densities of the two fractions were only approximate and applied only to a subset of the examples, namely those employing homopolymers as the LMW fraction. Thus it was not possible with any certainty even to determine the split between the HMW and LMW fractions in the examples.

The examples thus provided insufficient information to derive any trends or correlation between properties of the polyethylene and the functionally defined features.

e) The experimental reports F22 and F29 demonstrated that polymers falling within the structural terms of claim 1 did not necessarily lead to the required functional features.

XV. The appellant (patent proprietor) requested that the decision under appeal be set aside and that the patent be maintained on the basis of the claims as granted, or alternatively on the basis of one of the sets of claims according to the first to fifth auxiliary requests as submitted with the statement of grounds of appeal.

XVI. The respondents (opponents) requested that the appeal be dismissed.

Respondent II (opponent 2) further requested that in the case that the Board finds that any request meets the requirements of Article 83 EPC the case be remitted to the opposition division for consideration of the remaining grounds of opposition.

Reasons for the Decision

1. The appeal is admissible.

2. Main Request

2.1 Interpretation of the claims

2.1.1 Claim 1 is directed to a polymer pipe for hot fluids. The pipe is characterised in that it comprises a multimodal polyethylene having two fractions (LMW, HMW). The density of the multimodal polyethylene and of the HMW fraction thereof are defined. It is not disputed that these features relate to the multimodal polyethylene itself.

The term "multimodal" is known in the art. In paragraph [0015] of the description the meaning of "multimodal" is explained in terms of the appearance of the molecular weight distribution curve. The nature of "multimodal" is further explained in respect of the situation "if" the polymer is produced in a multistep process.

The reference to a multistep process in the patent is, according to the language of the description, solely of illustrative nature but does not impose any restriction as to the manner of producing the polyethylene, i.e. the claim is not drafted in "product by process" format.

Consequently the claim does not require that the polyethylene have characteristics deriving from any particular method of preparation. In this connection it is recalled that it is not permissible to rely on the description for imposing a more restricted meaning to a claim that is in itself clear than would be justified by the explicit wording thereof (See e.g. decision T 0681/01 of 28 November 2006).

2.1.2 The final features of the claim, i.e. the time to failure and modulus of elasticity each according to the specified DIN/ISO norms, relate, according to the grammar of the claim, to the multimodal polyethylene. However, as follows from paragraphs [0050] to [0053] of the patent the indicated properties (time to failure and E-modulus) are both determined on the basis of the pipes prepared from the different polyethylenes as employed in the examples. Consistently with this, in paragraph [0054] no distinction is made between pipe and polyethylene properties: "Pipes nos. 4-8, however, which are made of bimodal polyethylene according to the

present invention, fulfil the requirement of DIN 16 833. These pipes are suitable for hot water pipes and in particular flexible hot water pipes." From that passage it can be concluded that the suitability of the pipes for hot fluids is measured by DIN 16 833 and that it is linked to the fail time of the polyethylene, measured according to the stated test. The conclusion is therefore that the time to failure as measured according to DIN 16 833 forms part of the definition of the polyethylene from which the pipe is formed and is also a part of the definition of the suitability of the pipe for hot liquids.

2.2 The relationship between the structural and functional features of the claim.

2.2.1 The appellant has explicitly acknowledged that the structural or compositional features of the multimodal polyethylene do not automatically result in polyethylenes having the required functional features.

The question that has to be asked for compliance with Art. 83 EPC is therefore whether the description and examples nevertheless provide enough information to enable the skilled person in a directed, structured manner to arrive at pipes within the scope of the claims, which, in view of the interpretation to be applied to the claims, means whether the patent contains sufficient information to enable the multimodal polyethylenes according to the claims to be obtained so that pipes for hot fluids can be produced.

2.2.2 Although the description provides an indication of various properties of the polyethylene that are of significance, there is no general discussion or analysis of how these properties, individually or by

their interaction, influence the properties of the pipe made out of it. As a consequence there is no guidance of a general nature in the description how to design a multimodal polyethylene or adjust the constitution of an existing material in order to achieve polymer pipes for hot fluids.

2.2.3 The examples provide no assistance in this respect since they do not explain either how the polyethylenes are made, beyond a very general indication that some kind of multistep process was used. There is no indication of catalyst, proportion and concentrations of monomers, amount of comonomer used in each step or of the reaction conditions employed. Nor is any information given regarding the ratio of the two components ("split") in the final product, the total amount of comonomer employed or the distribution thereof between the two fractions in the case where both polymers are copolymers.

Consequently it is not possible by study of the examples to gain any understanding of the influence of the compositional features of the multimodal polyethylene on the functionally defined features.

2.2.4 The patent itself offers no discussion or analysis of the results of the examples beyond the observation that polymers the composition of which fall outside the scope of the claim do not result in the required functional properties.

In particular the Board notes that, even in the case of examples that show a dramatic difference in the properties of compositions - all of which fall within the scope of the claims, the patent fails to provide any analysis or explanation of the underlying causes.

In this respect reference may be made in particular to examples of 4 and 5, neither of which relates to a composition at the very extremes of any of the claimed ranges. There is at least a 25 fold difference in the time to failure between these two examples. No explanation or analysis of the underlying causes of this result is provided.

The absence of disclosure regarding the features of the composition applies also, albeit to a lesser extent to the structural features of melt flow and density. The relationship as discussed in the final paragraph of the patent is not of general applicability but depends, as conceded by the appellant, on the constitution of the polymers (whether homopolymer or copolymer). The patent does not identify for which subset of polymers the indicated relationship applies. The information provided by the appellant in the course of the proceedings on this relationship is not contained in the patent and it has not been demonstrated that the skilled person would be aware of this from other sources.

Certain other matters discussed by the appellant during the proceedings, e.g. the need to ensure that the MFR_5 and density of the HMW fraction are in balance (discussed with respect to experimental report F22), or the need to ensure that the melt indices of the two polymers are matched in order to ensure a good degree of homogeneity is not reflected, even in general terms, in the patent and have not been demonstrated to be part of the established knowledge in the field.

Consequently it is not possible for the skilled person to obtain from the description and examples an understanding of how to design or modify polyethylenes

in order to obtain, in a directed and structured manner, pipes having the required suitability for hot fluids.

2.3 The experimental reports F22 and F29 confirm that complying with the structural requirements does not necessarily and inevitably result in polyethylenes exhibiting the required functional requirements.

2.3.1 In F22 two compositions were prepared from two different HMW polymers, the LMW polymer being the same in each case. The compositions were prepared by melt blending each of the HMW polymers with the LMW polymer. As explained above, the claim does not impose any restriction on the manner of preparing the multimodal polyethylene. The features of the individual fractions and the final polymer composition obtained (densities) were within the terms of the claims. The density of the LMW fraction was however not in the preferred range specified in the description. Neither of the compositions of F22 exhibited the required time to failure, although both exhibited a modulus of elasticity in the required range.

The appellant speculated that the density and MFR for the high molecular weight fraction were not in the correct balance which might have accounted for the poor results observed. However, as noted above, there is no indication - even implicitly - in the patent that such a relationship is of any relevance or significance.

2.3.2 F29 demonstrated two further multimodal polyethylene compositions wherein the LMW fraction, in contrast to that employed in the examples of F22, had a density within the preferred range (0.957 g/cm^3). Two different

HMW fractions were employed, one having a density of 0.922 g/cm^3 and an I_2 of 0.50 g/10 min, the other a density of 0.924 g/cm^3 and an I_2 of 0.26 g/10 min). The composition containing the first named HMW fraction met the compositional and functional requirements of the claim. However the composition containing the second named HMW fraction resulted in a pipe that failed immediately when subjected to the specified test.

The appellant offered as an explanation for this discrepancy the possibility that in the second case the multimodal polymer was not sufficiently homogeneous due to the difference in melt indices of the two components forming the blend. However the description does not provide any teaching in this respect.

2.3.3 The evidence of these data, in particular F29, is that even if attempting to comply not only with the compositional requirements of the claim but also with the preferred features as disclosed in the description, it is not inevitably the case that a material exhibiting the required (functional) properties will be obtained.

3. The absence of any form of discussion or general teaching in the patent in suit both in the description and the examples of the manner in which the various compositional features influence the functional features defined in the claims and the evidence - provided in the form of experimental reports F22 and F29 - that compositions not merely within the terms of the claims but in some cases even within the terms of preferred embodiments of the description, do not necessarily lead to polyethylenes or pipes having the required functional properties, leads to the conclusion

that the skilled person seeking to reproduce the teaching of the patent - even to the extent of that of the examples - is faced with a significant burden of experimentation whereby there is an almost total lack of guidance. The patent in suit therefore does not place the skilled person in a position to work in a systematic, structured manner to arrive at pipes having the required suitability for hot fluids.

This means that the patent fails to disclose sufficiently the invention with the consequence that the requirements of Art. 83 EPC are not met.

Since all requests rely on the same combination of compositional and functional features (albeit with differing numerical limits) as the main request, this conclusion applies to all sets of claims, i.e. the main request and first to fifth auxiliary requests.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairwoman:

E. Goergmaier B. ter Laan

Decision electronically authenticated