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**Datasheet for the decision
of 26 July 2011**

Case Number: T 0642/09 - 3.2.05

Application Number: 01202289.3

Publication Number: 1266738

IPC: B29B7/00

Language of the proceedings: EN

Title of invention:

Method of compounding a multimodal polyethylene composition

Patent Proprietor:

INEOS Manufacturing Belgium NV

Opponents:

TOTAL PETROCHEMICALS RESEARCH FELUY S.A.
Coperion GmbH
Borealis Technology OY

Headword:

Relevant legal provisions:

EPC Art. 84, 114(2)
RPBA 13(1)

Keyword:

Admissibility (main request - yes, first auxiliary request - no)
Clarity of amendments (main request and second to fifth auxiliary requests - no)

Decisions cited:

Catchword:



Case Number: T0642/09 - 3.2.05

D E C I S I O N
of the Technical Board of Appeal 3.2.05
of 26 July 2011

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Decision under appeal: **Decision of the Opposition Division of the
European Patent Office posted 19 January 2009
revoking European patent No. 1266738 pursuant to
Article 101(3) (b) EPC.**

Composition of the Board:

Chairman: W. Zellhuber
Members: S. Bridge
M.J. Vogel

Summary of Facts and Submissions

- I. The appellant (patent proprietor) lodged an appeal against the decision of the Opposition Division revoking European patent No. 1 266 738 for lack of inventive step (Articles 100(a) and 56 EPC).
- II. Oral proceedings were held before the Board of Appeal on 26 July 2011
- III. The appellant requested that the decision under appeal be set aside and that the patent be maintained on the basis of the following documents:
Main request: claims 1 to 10, filed on 21 July 2011 as main request, or
first auxiliary request: claims 1 to 10, filed as first auxiliary request during the oral proceedings, or
second to fifth auxiliary requests: the sets of claims, filed as first to fourth auxiliary requests respectively, on 24 June 2011.

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

- IV. Independent claim 1 according to the main request reads as follows:

"1. Method of continuously compounding a multimodal polyethylene composition in a compounding device which is a tandem assembly of a melting equipment and homogenising equipment and comprises a melting zone preceding a homogenising zone, wherein
a) the total residence time of the polyethylene composition in the compounding device is at least 3 minutes

- b) the total drive specific energy (SEC) applied on the polyethylene composition is from 0.240 to 0.450 kWh/kg,
 - c) a specific cooling energy (SCC) of at most 0.200 kWh/kg is applied on the polyethylene composition
 - d) the total specific energy, which is the difference between the total drive specific energy SEC and the specific cooling energy SCC, applied on the polyethylene composition is from 0.220 to 0.330 kWh/kg,
 - e) the residence time of the polyethylene composition in the homogenising zone is at least 1.5 minutes, and the average shear rate applied in the homogenising zone does not exceed 100 s^{-1} ."
- V. Claim 1 according to the first auxiliary request differs from claim 1 according to the main request in that the expression *"a compounding device which is a tandem assembly of a melting equipment and homogenising equipment and comprises a melting zone preceding a homogenising zone"* is replaced by *"a compounding device which comprises a single melting zone preceding a single homogenising zone and which is a tandem assembly of a melting equipment and homogenising equipment"*.
- VI. Claim 1 according to the second auxiliary request differs from claim 1 according to the main request in that the expression *"a melting equipment and homogenising equipment"* is replaced by *"a melting equipment which is a continuous mixer or an extruder and homogenising equipment which is an extruder"*.
- VII. Claim 1 according to the third auxiliary request differs from claim 1 of the second auxiliary request in that the following text is added at the end of feature

- e): *"and the temperature of the composition coming out of the homogenising zone is from 265 to 295°C"*.
- VIII. Claim 1 according to the fourth auxiliary request differs from claim 1 according to the main request in that the expression *"a melting equipment and homogenising equipment"* is replaced by *"a melting equipment which is a continuous mixer and homogenising equipment which is an extruder"*.
- IX. Claim 1 according to the fifth auxiliary request differs from claim 1 of the fourth auxiliary request in that the following text is added at the end of feature e): *"and the temperature of the composition coming out of the homogenising zone is from 265 to 295°C"*.
- X. The following documents are referred to in the present decision:
- D6 : WO-00/24821
D15: US-A-6,031,027
- XI. The arguments of the appellant in the written and oral proceedings can be summarised as follows:

Admissibility of the main request

The subject-matter of claim 1 was only amended in response to the annex to the summons to oral proceedings. The changes made are self evident. The main request is thus to be admitted.

Clarity of the amendments

The wording of claim 1 (main request) ensures that the melting zone and the homogenising zone are associated

with separate pieces of equipment. The various references to these zones in the patent in suit gradually converge on this definition which also corresponds to the arrangement of the zones in the preferred embodiment (paragraphs [0009], [0016], [0021], [0027], patent in suit): Thus, the term "*tandem*" implies two separate things one behind the other and the labels "*melting*" and "*homogenising*" clearly imply that melting, i.e. the melting zone, occurs in the melting equipment and that homogenising, i.e. the homogenising zone, occurs in the homogenising equipment. The embodiment of example 1 correspondingly involves a 24D length extruder as melting zone and a 36D length extruder as homogenising zone (paragraph [0048], patent in suit). There is no other reasonable interpretation.

In this context the melting process described in document D15 (column 4, lines 18 to 67) only concerns the particular combined melting and compounding process at 125°C to 155°C disclosed therein and differs from the conventional process which "*strives to melt the composition as quickly as possible and compound it at a high temperature*" (document D15, column 5, lines 6 to 9 and 19 to 23). According to paragraph [0019] of the patent in suit, melting takes place at 210°C to 240°C. Document D15 is thus not relevant.

Therefore, the amendments made to claim 1 according to the main request are clear. This argumentation also carries over to claim 1 respectively according to the second to fifth auxiliary requests.

Admissibility of the first auxiliary request

The first auxiliary request is filed in response to the discussions during the oral proceedings before the Board, because the clarity issue arising from multiple homogenising zones was neither set out in detail in the annex to the summons to oral proceedings nor raised in writing by the respondents.

Paragraph [0015] of the application as filed (published version) discloses that "*the compounding device comprises at least one melting zone preceding at least one homogenising zone*" and forms a basis for the further limitation to "*a single melting zone preceding a single homogenising zone*". Thus, the requirements of Article 123(2) EPC are satisfied.

When interpreted according to the description, the demarcation between the melting zone and the homogenising zone is that the single melting zone occurs in the melting equipment and the single homogenising zone occurs in the homogenising equipment. Furthermore, paragraph [0017] of the patent in suit clearly defines the melting zone as "*a zone wherein the specific energy applied on the polyethylene composition is kept as low as possible to strictly melt the polymer composition*". Thus the ambiguity concerning which of several homogenising zones should be considered for the limits specified in feature e) of claim 1 (first auxiliary request) no longer arises.

The first auxiliary request is thus to be admitted into the proceedings.

XII. The arguments of the respondents in the written and oral proceedings can be summarised as follows:

Admissibility of the main request

Removing the feature concerning the melt flow rates of the polyethylenes from claim 1 (main request) shifts the focus of the invention from the nature of the polymers to the apparatus used in the claimed compounding method and thus places an undue burden on the respondents.

As the prior art documents (such as, amongst others, document D6) discussed in the contested decision concern continuous compounding, the introduction of the term "continuously" before "compounding" in the first line of claim 1 of the main request is not motivated by a ground of opposition and thus contravenes Rule 80 EPC.

Finally, the absence of explanations on the part of the appellant concerning the late filing, the nature of the changes or the support in the description, constitutes an abuse of procedure and therefore the main request should not be admitted.

Clarity of the amendments

Claim 1 (main request) as amended refers to a melting zone and to a homogenising zone. However, the wording is such that the melting zone and the homogenising zone are not necessarily limited to respectively occurring in the melting and homogenizing equipment of the tandem assembly.

Melting of a multimodal polyethylene necessarily implies some homogenising because of the effect of the different molecular weight components (document D15, column 4, lines 18 to 67). In such a case the homogenising zone cannot be clearly delimited. The patent in suit comprises such embodiments (e.g. figure 1).

Other embodiments of the patent in suit (figures 3 and 4) include more than one zone in which mixing i.e. homogenising takes place. In such a case it is again not clear how to determine "*the homogenising zone*" referred to in feature e) of claim 1.

Therefore, the amended subject-matter of claim 1 (main request) is not clear.

The second to fifth auxiliary requests exhibit the same lack of clarity as the main request.

Admissibility of the first auxiliary request

All of the clarity issues concerning the homogenising zone were already raised by the Board in the annex to the summons to oral proceedings (see points 6.2 and 6.3). The first auxiliary request is thus late filed.

There is no explicit basis for the term "*single*" in the application as published. The amendment to a "*single melting zone*" and a "*single homogenising zone*" thus involves a selection from several lists and results in a previously undisclosed combination, contrary to Article 123(2) EPC.

The wording of claim 1 according to the first auxiliary request does not rule out the possibility of further intermediate mixing zones, as shown in figure 3 of the patent in suit. There is no clear correspondence of the melting and homogenising zones to respective melting and homogenising equipments. Claim 1 (first auxiliary request) does not rule out the possibility of a single equipment being used for both melting and homogenising. Thus, claim 1 (first auxiliary request) does not solve the problem that a melting zone cannot be delimited from a homogenising zone when melting a multimodal polyethylene.

The first auxiliary request should not be admitted into the proceedings.

Reasons for the Decision

1. Admissibility of the main request

Claim 1 according to the main request was amended with respect to claim 1 of the sole request filed with the grounds of appeal in that the feature concerning the melt flow rates of the polyethylenes was removed. The annex to the summons to the oral proceedings issued by the Board included an indication that this feature appeared to be objectionable under Article 123(2) EPC. Thus, the amendment was made in reaction to the preliminary opinion of the Board. Such a reaction to a communication of the Board is a legitimate act and as such cannot be considered an abuse of procedure.

Although this amendment was not identified or discussed by the appellant on filing the main request, the Board is of the opinion that the respondents can easily see

that the feature concerning the melt flow rates of the polyethylenes has been removed from claim 1.

Furthermore, this does not place an undue burden on the respondents as they would have had to be prepared to discuss the remaining features anyway.

Thus on balance, the Board is of the opinion that in the present case it would be disproportionate to react to the uncommented late filing of this particular main request by not admitting it.

The term "*continuously*" in line one of claim 1 according to the main request was introduced into claim 1 of the sole request filed with the grounds of appeal. The objection under Rule 80 EPC therefore concerns the allowability and not the admissibility of the main request.

2. Main request - clarity of the amendments

2.1 Claim 1 was amended, amongst others, such that the tandem assembly of a melting equipment and a homogenising equipment now "*comprises a melting zone preceding a homogenising zone*" and by the addition of feature e) at the end of claim 1. The latter refers to "*the homogenising zone*" when specifying bounds on residence time and average shear rate. The extent of "*the homogenising zone*" thus has to be identifiable for these bounds to make sense.

2.2 The melting zone is defined in the patent in suit as "*a zone wherein the specific energy applied on the polyethylene composition is kept as low as possible to strictly melt the polymer composition without any or having as less (sic) as possible homogenising efficiency*" (patent as published, paragraph [0017],

page 3, lines 47 to 49). This definition relies on relative terms such as "*as low as possible*" and thereby implies that some homogenisation already takes place during melting. Similarly, the homogenising zone is defined in the patent in suit as "*a zone wherein intensive homogenisation of the multimodal polyethylene composition occurs*", (patent as published, paragraph [0021], page 4, lines 6 and 7). The use of the relative term "*intensive*" again implies that homogenisation may already occur during melting. These definitions therefore do not provide a basis for an objective delimitation of "*the homogenising zone*" which is required for feature e) of claim 1 (main request).

- 2.3 The skilled person also knows that the higher molecular weight component of a multimodal polyethylene will melt first and that, subsequently, as the lower molecular weight component also melts, it will get worked into the matrix of the already melted higher molecular weight component. Under these circumstances a clear distinction between a melting zone and a homogenising zone is not possible as melting inevitably overlaps with homogenising (document D15, column 4, lines 18 to 67).

This situation occurs in the embodiments of the invention in which the higher and lower molecular weight components of a multimodal polyethylene are melted together, as shown, for example, in figure 1 (paragraphs [0033] and [0034], patent in suit). In this case the extent of "*the homogenising zone*" cannot be unambiguously delimited, thereby leaving the extent of the zone where the bounds on residence time and average shear rate are to apply, unclear (feature e), claim 1, main request).

2.4 In addition, the amended wording "*comprises a melting zone preceding a homogenising zone*" does not exclude the possibility of several homogenising zones in accordance with the further embodiments of the invention shown, for example, in figures 3 and 4 (paragraphs [0036] and [0037], patent in suit).

According to the embodiment of figure 3, separately polymerised ethylene polymers S2 and S3 are molten in separate melting devices M2 and M3 and are subsequently "*mixed together before entering the homogenising zone*". An additional ethylene polymer S1 is melted in a further melting device M1 before addition to homogenising zone H in a differentiated stage (paragraph [0036], patent in suit). In this case it remains unclear whether or not the mixing of ethylene polymers S2 and S3 before entering the homogenising zone H forms part of "*the homogenising zone*" referred to in feature e) of claim 1. Therefore, it is again not clear to which zone the bounds on residence time and average shear rate should apply (feature e), claim 1, main request).

2.5 The appellant's argument that the homogenising zone is to be interpreted in terms of the homogenising equipment, does not help, because the extent of the homogenising equipment is not discussed in the context of the embodiments of figures 1 to 5 and the wording of claim 1, "*comprises a melting zone preceding a homogenising zone*" does not clearly and unambiguously relate the melting and homogenising zones respectively to the melting and homogenising equipment. Furthermore, such a definition does not address the problem that melting both higher and lower molecular weight components of a multimodal polyethylene together does

not permit homogenising to be objectively delimited from melting.

- 2.6 The appellant further argued that the teaching of document D15 concerning the processes which occur during melting of multimodal polyethylene should be disregarded, because they only relate to a particular process which takes place in the particular temperature range of 125°C to 155°C (document D15, column 5, lines 19 to 23) whereas in the patent in suit melting occurs at higher temperatures of 210 to 260°C (paragraph [0019]).

However, the subject-matter of claim 1 (main request) is not limited to a particular temperature range in the melting zone. Furthermore, paragraph [0019] of the patent in suit only refers to temperature ranges in the context of a general remark and it does not identify a particular melting temperature range as an essential feature of the invention. In addition, paragraph [0017] of the patent in suit, which defines the melting zone, only does so in terms of "*a zone wherein the specific energy applied on the polyethylene composition is kept as low as possible to strictly melt the polymer composition*". Therefore, there is no basis for excluding the teaching of document D15 concerning the processes which occur during melting which takes place at a relatively lower temperature range of 125°C to 155°C (document D15, column 5, lines 19 to 23).

- 2.7 Therefore, the amendments made to claim 1 (main request) do not meet the clarity requirements of Article 84 EPC.

3. Admissibility of the first auxiliary request

3.1 In the annex to the summons to oral proceedings, the Board raised, amongst others, the following issues:

"6.2 The subject-matter of claim 1 (sole request) appears to encompass methods in which both the high and the low molecular weight ethylene polymers are melted together (patent in suit, figures 1 and 5). In this case, the "melting zone" appears to blend into the "homogenising zone" which thus cannot be clearly delimited (see also patent in suit, paragraph [0017]: "By melting zone, it is meant ... having as less as possible homogenising efficiency"; Document D15, column 2, lines 55 to 61; see also the corresponding reference to "lentil soup" in document D6, page 3, lines 21 to 24) and therefore leaves features 'e1' and 'e2' concerning "the homogenising zone" unclear.

6.3 Similarly, the introductory part of claim 1 (sole request) refers to "at least one homogenising zone" which seems to imply the possibility of several "homogenising zones". The reference to "the homogenising zone" in both features 'e1' and 'e2' of claim 1 (sole request) therefore appears to be unclear (Article 84 EPC)".

In this context, features 'e1' and 'e2' were:

- "e1) the residence time of the polyethylene composition in the homogenising zone is at least 1.5 minutes, and
- e2) the average shear rate applied in the homogenising zone does not exceed 100 s^{-1} ".

Thus, the clarity issue for which the main request is not allowable, had already been set out in full in the

annex to the summons to oral proceedings. The appellant was therefore already aware of this objection and thus had had the opportunity to react to this clarity issue before the oral proceedings. In consequence, the first auxiliary request, which was only submitted during the oral proceedings, is late filed. Furthermore, the appellant did not provide any reasons for the late filing of the first auxiliary request.

- 3.2 Claim 1 according to the first auxiliary request differs from claim 1 according to the main request in that the expression "*a compounding device which is a tandem assembly of a melting equipment and homogenising equipment and comprises a melting zone preceding a homogenising zone*" is replaced by "*a compounding device which comprises a single melting zone preceding a single homogenising zone and which is a tandem assembly of a melting equipment and homogenising equipment*".

This amendment does not solve the clarity issue of how a homogenising zone can be delimited objectively when melting together different molecular weight components of a multimodal polyethylene.

- 3.3 In addition, the specific limitation to a *single* melting zone and a *single* homogenising zone has not been explicitly discussed previously and gives rise to doubts under Article 123(2) EPC.
- 3.4 Thus, the first auxiliary request is not appropriate to overcome the doubts of the Board with respect to these issues and is therefore clearly not allowable. The Board therefore exercises its discretion not to admit the belated first auxiliary request into the proceedings (Article 114(2) EPC and Article 13(1) RPBA).

4. Second to fifth auxiliary requests

The further amendments made to claim 1 respectively of the second to fifth auxiliary requests do not affect the lack of clarity concerning the delimitation of the homogenising zone discussed above in the context of the main request. Thus, the arguments concerning the lack of clarity of claim 1 of the main request carry over to claim 1 respectively of the second to fifth auxiliary requests. The appellant did not contest this point. Therefore, the second to fifth auxiliary requests are not allowable for the same reasons of lack of clarity as the main request.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:

D. Meyfarth

W. Zellhuber