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**Datasheet for the decision
of 19 January 2011**

Case Number: T 1080/08 - 3.3.03

Application Number: 01992116.2

Publication Number: 1341836

IPC: C08G 63/78

Language of the proceedings: EN

Title of invention:

METHODS OF POST-POLYMERIZATION INJECTION IN CONDENSATION
POLYMER PRODUCTION

Patentee:

WELLMAN, INC.

Opponents:

BASF Schweiz AG
EASTMAN CHEMICAL COMPANY

Headword:

-

Relevant legal provisions:

EPC Art. 56, 123(2)

Relevant legal provisions (EPC 1973):

-

Keyword:

"Amendments - added subject-matter - (yes) - main request,
second, third, fourth and fifth auxiliary requests"
"Inventive step - (no) - first auxiliary request"

Decisions cited:

-

Catchword:

-



Case Number: T 1080/08 - 3.3.03

D E C I S I O N
of the Technical Board of Appeal 3.3.03
of 19 January 2011

Appellant:
(Patent Proprietor)

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Decision under appeal:

**Decision of the Opposition Division of the
European Patent Office dated 30 January 2008
and posted 3 April 2008 revoking European
patent No. 1341836 pursuant to Article
101(3)(b) EPC.**

Composition of the Board:

Chairman: R. Young
Members: M. C. Gordon
C. Vallet

Summary of Facts and Submissions

I. Mention of the grant of European Patent No. 1 341 836 with the title "METHODS OF POST-POLYMERIZATION INJECTION IN CONDENSATION POLYMER PRODUCTION" in the name of Wellmann Inc. in respect of European patent application No. 01992116.2, filed on 14 December 2001 as international application No. PCT/US01/48423, published as WO 02/48237 A1 on 20 June 2002, and claiming priority dates of 15 December 2000 from US 09/738,150, 17 August 2001 from US 09/932,150 and 14 December 2001 from US 10/017,612 was announced on 2 March 2005 (Bulletin 2005/09) on the basis of 54 claims.

Claim 1 read as follows:

1. A method for introducing additives into a process for making condensation polymers, comprising:

polymerizing oligomeric precursors via melt phase polycondensation to form condensation polymers having carbonyl functionality; and

thereafter introducing into the condensation polymers a reactive carrier having a molecular weight of between 300 g/mol and 10,000 g/mol, the reactive carrier being the delivery vehicle for one or more additives.

Claims 2-54 were dependent claims.

In the following, references to passages or claims in the application i.e. the PCT publication are indicated by *{brackets and italics}*; references to passages and claims of the granted patent are indicated as {brackets and underlining}.

Where the wording of claims is quoted *verbatim* - whether in full or in part - this is indicated by arial 10.

II. Oppositions against the patent were filed by:

- Ciba Spezialitäten Chemie Holding AG, Schweiz (OI) on 30 November 2005 and by
- Eastman Chemical Company (OII) on 1 December 2005.

Both opponents invoked the grounds of opposition pursuant to Art. 100(a) EPC (lack of novelty, lack of inventive step), Art. 100(b) EPC (lack of sufficiency of disclosure) and Art. 100(c) EPC (extension of the subject matter beyond the content of the application as filed).

Inter alia the following documents were cited in support of the oppositions:

- E2: CS-A-177 211 (submitted in the original and as a full English language translation);
- E3: US-A-5 898 058.

III. By a decision dated 30 January 2008 and issued in writing on 03 April 2008 the opposition division revoked the patent.

- (a) The decision was based on a main request and an auxiliary request, both filed during the oral proceedings held before the opposition division on 30 January 2008 and each consisting of a single claim.

The claim of the main request differed from {claim 1} in that in the second phrase (emphasis in the following of the Board):

- The first step was a **continuous** melt phase polycondensation **process**;
- To form a **polymer melt comprising** condensation polymers having carbonyl functionality.

Accordingly the claim of the main request read as follows:

"A method for introducing additives into a process for making condensation polymers, comprising:

polymerizing oligomeric precursors via a continuous melt phase polycondensation process to form a polymer melt comprising condensation polymers having carbonyl functionality; and

thereafter introducing into the condensation polymers a reactive carrier having a molecular weight of between 300 g/mol and 10,000 g/mol, the reactive carrier being the delivery vehicle for one or more additives." (emphasis of the claim as submitted)

The claim of the auxiliary request differed from {claim 1} *inter alia* in that the process was not required to be continuous, in that a catalyst was mandatorily present and in that the additives included a stabilizer to deactivate the catalyst. The claim of this request thus read as follows:

"A method for introducing additives into a process for making condensation polymers, comprising:

polymerizing oligomeric precursors via melt phase polycondensation process in the presence of a polymer reaction catalyst to form a polymer melt comprising condensation polymers having carbonyl functionality; and

thereafter introducing into the condensation polymers a reactive carrier having a molecular weight of between 300 g/mol and 10,000 g/mol, the reactive carrier being the delivery vehicle for one or more additives, said additives including a stabilizer to deactivate the polymerization catalyst." (emphasis of the claim as submitted)

(b) Regarding the main request, the decision held:

- The lower limit of the range of molecular weight of the reactive carrier, i.e. 300 g/mol was disclosed in {paragraph [0068]};
- Although this was disclosed in combination with an upper limit of 2,000 g/mol, according to the specification other values could be selected as the upper limit, e.g. 10,000 g/mol;
- Consequently the original specification comprised the range 300-10,000 g/mol, so that the requirements of Art. 123(2) EPC were satisfied;
- The main request satisfied the requirements of Art. 54 EPC;
- With respect to inventive step all parties agreed that E3 was the closest prior art;
- This disclosed a process employing a non-reactive carrier;
- The distinguishing feature of the claim of the main request was that the carrier was a reactive carrier;
- The technical effect of this was that the carrier did not leach out of the polymer during further processing and later from the manufactured products;
- Consequently the objective technical problem solved by the patent in suit was to provide a process for adding additives wherein the carrier did not leach out from the products;
- The claimed solution to this problem was rendered obvious by E2 which taught addition

of additives via a reactive carrier into a process for producing polymers.

- (c) The auxiliary request lacked an inventive step for the same reason as the main request.
- (d) Accordingly the patent was revoked.

IV. A notice of appeal against the decision was filed by the patent proprietor on 30 May 2008, the prescribed fee being paid in due time.

V. The statement of grounds of appeal was received on 4 August 2008, accompanied by 6 annexes containing a main request and first to fifth auxiliary requests, each consisting of a single claim. Each of the annexes, except for annex 2 (first auxiliary request), contained a - not further elaborated - reference to paragraphs and/or claims in the form of a footnote on the sheet of the corresponding annex. For instance on Annex 1 - the main request - there was a footnote reading:
"[see Paragraphs 25, 33, 52, 54-56, 58, 61, 73, and 81-83]".

- (a) The claim of the main request differed from {claim 1} as indicated for the main request considered in the decision under appeal (see section III, above) and further in that the final phrase of the claim read:

"...thereafter introducing **into the polymer melt formed during the continuous melt-phase polycondensation process**, a reactive carrier [...]" (emphasis of the Board).

The first auxiliary request corresponded to the main request on which the decision had been based (see section III above).

The second auxiliary request was based on the

newly filed main request, but specified that the reactive carrier was a liquid.

The third auxiliary request corresponded to the newly filed main request with the additional feature that the condensation polymers having carbonyl functionality were specified as having: "**a target average degree of polymerisation of at least 70**" (emphasis of the claim).

The fourth auxiliary request corresponded to the main request but specified additionally that the process comprised:

" **reacting a terephthalate component and a diol component to form oligomeric polyethylene terephthalate precursors**" (emphasis of the claim) and correspondingly:

"... to form a **polymer melt comprising polyethylene terephthalate** condensation polymers having carbonyl functionality" (emphasis of the claim).

The fifth auxiliary request corresponded to the auxiliary request forming the basis of the decision under appeal (see section III, above) but specified in the final section that the reactive carrier was introduced into the

"**polymer melt formed during the continuous melt-phase polycondensation process**" (emphasis of the claim), i.e. employed the formulation indicated in **bold** for the newly filed main request however with the additional feature that the additive included a:

"**stabilizer to deactivate the polymerization catalyst.**" (emphasis of the claim)

(b) The submissions of the appellant/patent proprietor regarding the main request can be summarised as follows:

(i) This met the requirements of Art. 123(2) EPC.
In particular the addition of the

carrier/additive(s) to the polymer melt had support in the specification as originally filed since:

- {*Paragraph [0025]*} stated that the invention was an improvement on E3 which taught injection of the additive into the polymer melt resulting from the polycondensation;
- Thus injection of additives into the polymer melt was a basic feature of the invention;
- {*Paragraph [0033]*} disclosed introduction of additives (in a carrier) prior to completion of the melt phase polycondensation;
- {*Paragraph [0034]*} contained a more general reference to melt-phase polycondensation and e.g. the desired degree of polymerisation achieved during the melt phase polycondensation;
- It was clear from this paragraph that additives were introduced into a polymer melt formed by a continuous melt phase polycondensation process;
- {*Claim 2*} recited "completing the melt-phase polycondensation of the condensation polymers after the step of introducing the reactive carrier into the condensation polymers" . Such a step necessarily meant that the preceding additive introduction occurred during the melt phase polycondensation;
- {*Paragraphs [0052], [0054]-[0056] and [0058]*} provided a further general description of the melt-phase polycondensation process;
- {*Paragraph [0073]*} disclosed that after the melt-phase polycondensation an additive was introduced into the polyethylene

terephthalate polymers using a reactive carrier;

- This provided a clear and unambiguous disclosure of the introduction of additives in a reactive carrier into a polymer melt formed during a continuous melt phase polycondensation process. Despite the reference to PET this teaching was generally applicable, reference being made to *{paragraph [0058]}*;
 - *{Paragraphs [0081]-[0083]}* related generally to addition of a stabilizer to the melt;
 - The amendments specifying introduction of the additives into the polymer melt had been made in view of attempts by OII to construe claim 1 of the patent as granted as covering processes in which the additive/carrier were added to a re-melt of a fully polymerized, re-solidified polymer at some subsequent stage;
 - The amended claims made clear this was not the case.
- (ii) The subject matter of the main request was novel.
- (iii) Regarding inventive step:
- The claimed subject matter was distinguished from the disclosure of E3 in that the carrier was reactive, having a molecular weight between 300 and 10,000 g/mol;
 - One technical effect was that the carrier did not leach out during further processing, or later from manufactured products;

- One question to be determined was whether it would have been obvious for the skilled person to adopt for the process disclosed in E3 a reactive carrier as disclosed in another reference;
- E2 only disclosed reactive carriers for use in incorporating additives in a re-melt of an existing polymer;
- Not only did E2 not suggest the use of reactive carriers for introducing additives into a process for making condensation polymers but it also contained a passage stating "**it is essential that introduced additives be entirely inert relative to the reaction medium**" (appellant's emphasis);
- This teaching of E2 had been pointed out during the opposition oral proceedings as clearly teaching against the use of reactive carriers and processes of the type to which the invention in suit related. However this had not been commented on by the opposition division during the oral proceedings, nor was it mentioned in the written decision. The division had simply picked out the passages of E2 relating to the use of reactive carriers as solving the problem of leaching out of the carrier instead of reading the document as a whole.
- The skilled person reading E2 would come first to the passage stating that it was essential that introduced additives - which according to the appellant/patent proprietor had to include carriers - be entirely inert relative to the reaction medium. Further

this passage was nowhere contradicted in the remainder of E2;

- Even if this teaching of E2 were ignored and a reactive carrier employed, there was nothing in E2 to suggest a carrier having a molecular weight of 300 g/mol or more would be preferable. Most of those disclosed in E2 had molecular weights below 300 g/mol.

(c) The appellant/patent proprietor did not present any arguments specifically with respect to any of the auxiliary requests.

VI. The opponents - now the respondents - replied with letters dated 16 February 2009 (OI) and 23 February 2009 (OII).

The submissions of the respondents can be summarised as follows.

(a) Art. 123(2) EPC:

- There was no basis in the application as filed for the feature "molecular weight of between 300 g/mol and 10,000 g/mol". The application as originally filed disclosed various preferred ranges, namely less than 6000 g/mol, less than 4000 g/mol, between 300 and 2000 g/mol and between 400 and 1000 g/mol. The specified range between 300 and 10,000 g/mol was however not disclosed. This range linked arbitrarily the general upper limit with the lower limit of a preferred range;
- The feature "thereafter introducing into the polymer melt formed during the continuous melt-phase polycondensation process", replacing the original formulation "and

- thereafter introducing into the condensation polymers" likewise had no basis in the application as filed;
- According to submissions of the patent proprietor this phrase excluded any process wherein solidification occurred between the continuous melt-phase polycondensation process and addition of the reactive carrier.
 - However there was no clear and unambiguous disclosure of this in the application as originally filed;
 - Neither of the passages referred to by the appellant/patent proprietor in the statement of grounds of appeal (i.e. {paragraphs [0025] and [0033]}) provided support for this feature;
 - In particular, {paragraph [0033]} disclosed that the precursors were polymerised to form condensation polymers of a target average degree of polymerisation and that once this had been achieved, additives were introduced by means of a reactive carrier, and thereafter melt phase polycondensation was completed. This passage could not provide a basis for the indicated feature of claim 1 since the claim did not specify any target average degree of polymerisation or subsequent completion of the polycondensation reaction. Nor did this paragraph disclose that the carrier was added to the melt formed during the continuous melt-phase polycondensation process.

(b) Art. 54 EPC

Respondent OI maintained objections under this Article.

(c) Art. 56 EPC.

Both respondents considered that E3 represented the closest prior art:

- According to {paragraph [0025]} the object was to improve upon the stabilizer addition techniques of E3;
- E3 taught a process whereby a stabilizer additive, if necessary together with an inert liquid carrier, was added at or after the end of the polycondensation reaction;
- The only difference was that according to the operative claims a reactive carrier of defined molecular weight was used;
- The effect of this difference and thus the problem solved was that the carrier could no longer be leached out of the polymer;
- This same problem was addressed by E2 which proposed as the solution to employ carriers which could react with the polymer to become covalently bonded thereto;
- Suitable carriers were disclosed on pages 3-8 of E2, whereby the molecular weights overlapped with the range specified in the operative claims;
- In any case there was no evidence in the patent in suit of any unexpected technical effect associated with the specified molecular weight range.

VII. On 25 October 2010 the Board issued a summons to attend oral proceedings.

In a communication dated 7 December 2010 the Board *inter alia* raised objections pursuant to Art. 123(2) EPC in respect of the - inclusive - upper limit of the molecular weight of the carrier (10,000 g/mol). According to the application as filed, this limit was excluded since the wording {"less than..."} was employed.

VIII. By letter dated 18 November 2010 respondent/OI notified a change of name to BASF Schweiz AG. This was duly registered by the EPO, as notified in a communication dated 14 December 2010.

IX. Together with a letter dated 14 December 2010 the appellant/patent proprietor stated that it would not be represented at the oral proceedings.

The appellant/patent proprietor submitted six annexes, bearing amended main and first to fifth auxiliary requests, each consisting of a single claim, and - with the exception of Annex 2 (first auxiliary request) - bearing a reference to paragraphs and/or claims in the form of a footnote (cf. section V above, sets of claims filed together with the statement of grounds of appeal).

- All requests had been amended compared to the requests filed with the statement of grounds of appeal by specifying the range of molecular weights as being "at least 300 g/mol and less than 10,000 g/mol" (cf communication of the Board - section VII, above);

- Compared to the previous sets of claims under consideration the formulation of the newly filed claims no longer employed the term "between";
- Accordingly the sole claim of the main request read as follows:

"A method for introducing additives into a process for making condensation polymers, comprising:

polymerizing oligomeric precursors via a continuous melt-phase polycondensation process to form a polymer melt comprising condensation polymers having carbonyl functionality; and

thereafter introducing into the polymer melt formed during the continuous melt-phase polycondensation process a reactive carrier having a molecular weight of at least 300 g/mol and less than 10,000 g/mol, the reactive carrier being the delivery vehicle for one or more additives." (emphasis of the claim).

The formulation of the first to fifth auxiliary requests was as reported in section V.(a), differing therefrom in all cases only by the indicated amendment of the specified range of molecular weights of the carrier.

The appellant submitted that the feature "at least 300 g/mol" met the requirements of Art. 123(2) EPC since the now claimed range was within the original range of up to 10,000 g/mol. The minimum (300 g/mol) had a clear basis in claim 39. Although this was in conjunction with a maximum figure of 2000 g/mol the minimum and maximum figures of preferred ranges were independent of each other.

- X. Oral proceedings were held before the Board on 19 January 2011, attended only by the respondents/opponents (see section IX, above).

(a) Main request

Objections pursuant to Art. 123(2) EPC were maintained.

With respect to the feature that the carrier was introduced to the polymer melt:

- There was no general statement that this was added to the melt;
- {Paragraphs [0033] and [0034]} disclosed addition to the melt at a particular stage of the process, i.e. after attainment of a specified degree of polymerisation and that subsequently the melt phase polycondensation was completed;
- The operative claim of the main request contained neither of these features;
- {Paragraph [0073]} did not provide a basis for this feature since it related to a method which was more specific than that specified in claim 1. Similarly {paragraphs [0081]-[0083]} failed to provide a basis for the generality of claim 1.

With respect to the molecular weight range of the carrier:

- The value 300 g/mol was disclosed in {paragraph [0068]} in the context of a range "between" 300 and 2000 g/mol;
- A range "between" two limits excluded these limits. Thus whilst the original disclosure did not include a value of 300 g/mol the amended claim did;
- This objection did not apply to the upper limit of 10,000 g/mol since this remained excluded from the scope of the claim;

- Although there was an example of a specific carrier of molecular weight 300 g/mol (*{paragraph [0072]}* - polyethylene glycol) this did not apply to carriers in general;

Following deliberation the Board announced its conclusion that the specification of the method (timing) of addition of the additive/carrier, i.e. to the melt, did not meet the requirements of Art. 123(2) EPC.

Accordingly the main request was refused.

(b) First auxiliary request.

The respondents/opponents submitted that the change in wording in the final part of the claim compared to the main request i.e. "thereafter introducing into the condensation polymers" instead of "introducing into the polymer melt.." (see sections III.(a) and V.(a), above) meant that this claim encompassed processes which included solidifying and remelting the polymer, i.e. the addition could be at a significantly later time than the melt polymerisation.

Consequently regarding Art. 56 EPC the respondents/opponents submitted:

- Closest prior art was E3 which taught in col. 6 line 65 to col. 7 line 17 introduction of the stabilizer into the final polymer melt near the end of polymerisation. When the stabilizer was a solid, an inert carrier was used;

- The subject matter of the operative claim differed from E3 by the feature that a reactive carrier was employed;
- The purported problem solved and advantages were set out in {paragraph [0031]}, i.e. binding of the carrier, reduced loss of carrier molecules;
- The solution of using an active carrier was taught by E2;
- E2 related to processes in which the polymers were remelted but this was not excluded by the claim of the first auxiliary request;
- Further the molecular weights of the carriers employed in the examples of E2 fell within the range specified in the operative claim.

Following deliberation the Board announced that the first auxiliary request was refused.

(c) Second auxiliary request

The Board indicated that since this had the same wording as the main request regarding the time of addition, the same conclusions pursuant to Art. 123(2) EPC would have to apply *mutatis mutandis* (see section X.(a), above).

This position was not contradicted by the respondents/opponents.

Accordingly the second auxiliary request was refused.

(d) Third auxiliary request

Regarding Art. 123(2) EPC the respondents/opponent submitted:

- {Claim 2} and {paragraphs [0033] and [0034]} disclosed the target degree of polymerisation, that additives were introduced during melt phase polycondensation and that the polycondensation was completed afterwards;
- This last feature, i.e. that the polycondensation was completed subsequent to the addition was however not specified in the claim of the third auxiliary request. Thus some features of {claim 2} (target degree of polymerisation, introduction into the melt phase) had been incorporated in the operative claim in isolation from the other feature thereof which was contrary to the requirements of Art. 123(2) EPC.

(e) Fourth auxiliary request

with respect to Art. 123(2) EPC the respondents/opponents submitted:

- {Paragraph [0073]} was relevant;
- This disclosure was however more specific than the subject matter defined in the claim of the fourth auxiliary request and so could not provide a basis therefor;
- Thus the subject matter of this claim represented an unallowable intermediate generalisation of the disclosure of {paragraph [0073]}.

(f) Fifth auxiliary request

The respondents/opponents submitted that this suffered from the same defect pursuant to Art. 123(2) EPC as the main request.

(g) Following deliberation on the third, fourth and fifth auxiliary requests, the Board announced that none of these met the requirements of the EPC. Consequently these requests were refused.

XI. The appellant (patent proprietor) requested in writing that the decision under appeal be set aside and that the patent be maintained on the basis of the main request or one of the first to fifth auxiliary requests in that order, all filed with the letter dated 14 December 2010.

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

Reasons for the Decision

1. The appeal is admissible.

2. Main request

The wording of the sole claim of this request is reported in section IX, above.

2.1 *Art. 123(2) EPC*

2.1.1 The features of the first two sections of the claim of the main request are based on {*claim 1*}. The feature that the process is continuous is disclosed in {*paragraph [0025]*}.

2.1.2 Although the introduction of a reactive carrier, being the delivery vehicle for one or more additives, is disclosed in {claim 1} this specifies generally that the carrier is added to the condensation polymers. The claim of the main request however requires that the carrier is added "into the polymer melt formed during the continuous melt-phase polycondensation process" .

(a) {Claim 2} and {paragraph [0033]} disclose that the melt polycondensation is conducted until a target average degree of polymerisation has been attained, namely 70. Then, once this condition is satisfied the additive and reactive carrier are introduced and thereafter the melt phase polycondensation is completed.

(b) Although these passages in the Board's view do disclose addition of the carrier to the polymer melt, they contain two features or restrictions which are absent from the claim of the main request:

- The requirement that the additive/carrier combination is introduced only when a particular degree of polymerisation has been obtained;
- That the melt phase polycondensation is thereafter completed.

(c) As the claim of the main request specifies neither of these restrictions its subject matter constitutes a generalisation, extending beyond the content of the application as filed, contrary to the requirements of Art. 123(2) EPC.

2.2 Consequently the main request is refused.

3. First auxiliary request

3.1 *Art. 123(2) EPC*

The sole claim of this request lacks the objectionable feature of the main request relating to the timing of the introduction of the additive and carrier (see section 2.1.2, above). Instead the claim of the first auxiliary request employs the wording of {*claim 1*} thus defining that the additive/carrier are introduced to the condensation polymers after the polycondensation step (see sections V.(a) and IX, above).

As a result the Board raised no objections pursuant to Art. 123(2) EPC in respect of this request.

3.2 *Interpretation of the claim*

There is no restriction either as to the stage of the process or as to the state of these condensation polymers at the time the additives are introduced. In particular the claim does not require that these be molten, let alone that these be the direct - molten - products of the melt polycondensation stage.

Accordingly the claim encompasses processes whereby the polymer is prepared by continuous melt polycondensation, allowed to cool and then, i.e. "thereafter", remelted prior to introduction of the carrier/additive combination.

3.3 *Art. 54 EPC*

Novelty objections against the subject matter of this request were not raised by the respondents/opponents. Nor is the Board aware of any defects in this respect.

3.4 *Art. 56 EPC*

3.4.1 *The patent in suit, the technical problem*

The patent in suit addresses the problem of adding a stabilizer to a polymer in order to "cool" the catalyst, which "cooling" is required for better stabilization of the resulting polymer {paragraph [0010]}.

While addition of stabilizers is simple in the case of batch processes, problems arise in continuous processes as, for example early addition of the stabilizer can lead to reduction in throughput. Moreover typically the stabilizer is dissolved in ethylene glycol the addition of which further slows the polymerisation process ({paragraph [0011]). On the other hand late addition of the stabilizer, e.g. after the polymerisation process, during polymer processing may provide insufficient opportunity for the stabilizer fully to blend with the polymer meaning that degradation and discoloration of the polymer might not be prevented. In addition, adding stabilizer during polymer processing is inconvenient ({paragraph [0012]}).

The patent in suit refers in {paragraphs [0014] and [0015]} to US-A-5 898 058, i.e. E3 in these proceedings, noting that this teaches a method for adding the stabilizer at or after the end of the polymerisation, however without a carrier, thus necessitating the use of an extruder. In {paragraph [0017]} the patent in suit refers to US application Ser. No. 09/738,150, i.e. one of the priority documents (cf section I, above) according to which the additive, in a reactive carrier, is introduced during and preferably after the polycondensation step whereby the carrier not only functions as a delivery vehicle and but also reacts

with the polymer, thus binding the carrier to the resin. Nevertheless as explained in {paragraph [0019]} there remains a need for a post-polymerisation injection technique that ensures that the late introduction of additives will yield condensation polymers whose additives and carriers are integral parts of the polymer resin.

3.4.2 Thus the patent in suit provides a method for adding additives to condensation polymers via a reactive carrier after the melt-phase polycondensation reactions are essentially complete ({paragraph [0020]). According to {paragraphs [0033] and [0042]} in one preferred embodiment after the polymer has attained a given degree of polymerisation in melt phase polymerisation the additive/carrier are introduced and thereafter the melt phase polymerisation is completed. The patent in suit reports no practical examples, but, commencing at {paragraph [0065]} presents calculations relating to the theoretical change in intrinsic viscosity as a result of concentration of the reactive carrier at various molecular weights.

3.4.3 The process according to the claim of the first auxiliary request involves:

- Polymerising precursor to form a polymer melt comprising condensation polymers [...]and
- "Thereafter" introducing the carrier/additive.

As explained in section 3.2, above and in contrast to the explanations in the description, discussed in the foregoing section, the claim of the first auxiliary request does not restrict the meaning of "thereafter" and hence does not restrict the timing of the addition of

the additive/carrier whatsoever. Thus the claim does not exclude e.g. intermediate solidification and remelting of the condensation polymer prior to introduction of the carrier/additive. Further the claim does not require that the melt phase polymerisation be completed subsequent to the addition although this is also not excluded.

3.4.4 *The prior art*

E3, which is assigned to the present patent proprietor and which document has large passages of text in common with the patent in suit, addresses a similar problem. E3 relates to a two stage continuous polycondensation process for the preparation of polyethylene terephthalate. The first stage involves esterification of the terephthalic acid and ethylene glycol to form low molecular weight oligomers. The second stage is the polycondensation stage, which is carried out in the melt (E3 col 5 line 59 to col. 6 line 44). As noted in the discussion of this document in the patent in suit (see section 3.4.1, above) and in contrast to the general teaching of the patent in suit, according to E3 the stabilizer is added to the substantially polymerised polymer melt at or after the end of polymerisation either directly or with an inert carrier (col. 7 lines 1-17).

E2 relates to a process for introducing an additive to a polymer melt wherein the additive is mixed with a carrier which is capable of an addition reaction with terminal groups of the condensation polymer (page 1 first paragraph - page and line references relate to the English language translation).

E2 explains that the use of additives in their original

form leads to problems regarding uniform distribution or uniform metering (page 2 first complete paragraph). In the paragraph bridging pages 2 and 3 E2 reports that some procedures involve metering of additives into polymer melts in the final phase of production whereby the additive is dissolved in a carrier. Polymers have been proposed as carriers but this is not always useful since it is not always possible arbitrarily to mix two polymers and is not flexible, leading to increased apparatusive complexity. Further these processes can require that the carriers even be inert relative to the polymer.

Some heat stable phosphoric esters have been proposed as carriers. However a shortcoming of the use of these as carriers for addition of additives to polyesters and polyamides is that they are cleaved at higher temperatures. This results in phenolic degradation products which cannot be considered inert to the polymer, causing problems in subsequent processing and products. Further such carriers can be leached out later from the products, leading to a change in products over time and during processing (page 3 first complete paragraph).

The solution to this, according to E2 is to employ carriers which become chemically bound to the polymer (page 3 second complete paragraph).

According to the examples of E2 a previously prepared polymer was introduced into a vessel, melted and the additive/carrier introduced. The manner in which the polymers were prepared is not disclosed and is not part of the invention of E2.

3.4.5 *The closest prior art*

By common consent among the parties (see sections III.(b), V.(b).(iii), VI.(c) and X.(b), above) E3 is considered to represent the closest prior art.

In view of the teaching of the patent the technical problem to be solved with respect to this prior art is to provide a method of introducing additives into polymers without the problem of leaching out of the carrier.

This problem is solved according to the claim of the first auxiliary request by employing a reactive carrier as the vehicle for the additive, whereby the addition is to condensation polymers and takes place at a non-defined point subsequent to the formation of said polymers i.e. "thereafter" (see also considerations on the interpretation of the claim in section 3.2, above).

3.4.6 *Obviousness*

As explained in section 3.2, above, the wording of the claim of the first auxiliary request does not exclude a process including a step of intermediate solidification and remelting of the polymer prior to introduction of the additive/carrier and also does not require that the melt phase polycondensation be continued/completed subsequent to the addition.

E2 which as discussed in section 3.4.4, above addresses the same problem as the patent in suit regarding leaching out of carriers from polymers, teaches the use of a reactive carrier in a process in which the additive/carrier is introduced to a previously formed, remelted polymer, the preparation of the polymer itself not being disclosed in E2.

The appellant/patent proprietor has submitted with respect to E2 that this teaches that the requirement

that the "additives" be inert would be understood as applying also to the carrier (passage bridging pages 8 and 9 of the statement of grounds of appeal. See also section V.(b).(iii) above). As explained in section 3.4.4 above this is not what E2 teaches. Although the use of inert carriers is taught in E2 as being preferred in the case of addition to polymer melts, an alternative *modus operandi* disclosed is to add to a previously prepared and remelted polymer a reactive carrier which becomes bound to the polymer (E2 page 3 second paragraph). Thus E2 explicitly teaches that in the case of addition to a previously formed, remelted polymer it is permitted and even recommended to employ a carrier which becomes chemically bound to the polymer. As explained in section 3.2, and reiterated in section 3.4.5, above such a mode of addition is encompassed by the claim of the first auxiliary request. Nor can the specified molecular weight of the carrier i.e. "at least 300 g/mol to less than 10,000 g/mol" support an inventive step, notwithstanding that the allowability of this feature pursuant to Art. 123(2) EPC has not been decided (see also section 8, below). Whilst, as submitted by the appellant/patent proprietor (see section V.(b), final paragraph, above) a number of the compounds disclosed in E2 as reactive carriers, e.g. caprolactone do have molecular weights below 300 g/mol there are also a number with molecular weights within the claimed range e.g. dimeric ethylene isophthalate and trimeric ethylene terephthalate (E2 page 5); cyclic dimeric ethylenediamine isophthalate, cyclic trimeric ethylenediamine terephthalate (E2 page 6). One of these - dimeric cyclic ethylene terephthalate - is employed in an example (example 2). Accordingly E2 does explicitly teach the use of

reactive carriers in the required molecular weight range.

In any case, there is no evidence for a technical effect associated with the selection of a particular molecular weight range for the carrier. Accordingly the specification of the molecular weight range can only be regarded as an arbitrary selection from the teaching of E2 and hence unable to support an inventive step.

Consequently this subject matter is rendered obvious the teaching of E2.

3.5 The subject matter of the first auxiliary request therefore does not satisfy the requirements of Art. 56 EPC with the consequence that the first auxiliary request is refused.

4. Second auxiliary request

The subject matter of the claim of this request differs from the claim of the main request in specifying that the carrier is a liquid.

However since this claim retains the objectionable feature relating to the timing of the introduction of the additive/carrier (see section 2, above) it does not meet the requirements of Art. 123(2) EPC for the reasons indicated for the main request.

The second auxiliary request is refused.

5. Third auxiliary request

The claim of this request differs from the main request in specifying the target average degree of polymerisation of at least 70.

This feature is disclosed in {*claim 2*} and {*paragraph [0033]*}.

However both of these passages disclose this in combination with a further feature, namely {"further comprising completing the melt phase polycondensation after the step of introducing the reactive carrier into the condensation polymers" .

Due to the omission of this feature the subject matter of the claim of the third auxiliary request represents a generalisation of the indicated passages of the disclosure of the application with the consequence that the requirements of Art. 123(2) EPC are not satisfied.

The third auxiliary request is refused.

6. Fourth auxiliary request

The claim of the fourth auxiliary request is restricted compared to the claim of the main request in that it is directed to a method comprising reacting a terephthalate component and a diol component to form oligomeric polyethylene terephthalate precursors.

{*Paragraph [0073]*} - emphasised by the respondents in their oral submissions (see section X.(e), above) - discloses a process which involves a melt polycondensation process starting from reaction of terephthalic acid and ethylene glycol to form polyethylene terephthalate polymers.

This passage further discloses that "Thereafter" a carrier/additive is introduced "which facilitates uniform blending into the polymer melt". There is no disclosure in {*paragraph [0073]*} of subsequent completion of the melt polycondensation. Consequently this passage of the description discloses the sequence of process steps specified in the claim of the fourth auxiliary request. However this disclosure is restricted to a method employing specific reactants - namely terephthalic acid and ethylene glycol.

The wording of the claim of the fourth auxiliary request, although encompassing these reactants is more general since it relates to not further defined "terephthalate component" and "diol component".

The reference in the claim to "oligomeric polyethylene terephthalate precursors" does not impose any restriction on this general definition of the starting materials since a number of different starting materials can be employed to obtain the indicated oligomers.

Accordingly the subject matter of the claim of the fourth auxiliary request represents an intermediate generalisation of the subject matter of {*paragraph [0073]*} and hence contains subject matter extending beyond the content of the application as filed, contrary to the requirements of Art. 123(2) EPC.

Nor can {*paragraph [0041]*} - which was one of those listed in the footnote of the sheet entitled "Annex 5" bearing the fourth auxiliary request (cf section V, above) - provide a basis for this subject matter.

Although {*paragraph [0041]*} employs in its first phrase the same wording as the claim, i.e. a "terephthalate component" and a "diol component", it further specifies - in contrast to {*paragraph [0073]*} - that ethylene glycol is continuously removed during the polycondensation.

Since the claim of the fourth auxiliary request fails to specify this feature it represents an intermediate generalisation of the disclosure of {*paragraph [0041]*} of the application as filed, contrary to the requirements of Art. 123(2) EPC.

Further {*paragraph [0041]*} specifies that "thereafter one or more additives are introduced into the polyethylene terephthalate polymers". This wording does not disclose addition "into the polymer melt formed during the continuous melt phase polycondensation process" as required by the claim of the fourth auxiliary request, and therefore does not provide a basis for this feature of the claim either, contrary to the requirements of Art. 123(2) EPC.

The fourth auxiliary request is therefore refused.

7. Fifth auxiliary request

As explained in sections V and IX, above, the claim of this request differs from the claim of the main request in that the term "continuous" is not present in the second paragraph and further in that the claim specifies that the reaction is carried out "in the presence of a polymer reaction catalyst" and that the additives include a "stabilizer to deactivate the polymerization catalyst".

The additional features are disclosed in {*paragraph [0079]*}.

However the claim retains the objectionable wording of the main request relating to the timing of the addition of the additive/carrier, i.e. addition "into the polymer melt formed during the continuous melt-phase polycondensation process" (see section 2, above).

Consequently, for the reasons indicated with respect to the main request, the fifth auxiliary request does not meet the requirements of Art. 123(2) EPC.

The fifth auxiliary request is refused.

8. Consequently for the reasons given in sections 2-7, none of the requests on file meet the requirements of the EPC.

In view of these conclusions it is not necessary for the Board to decide whether the feature relating to the molecular range of the carrier is allowable (see also section 3.4.6, above).

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:

E. Görgmaier

R. Young