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Datasheet for the decision of 14 November 2006

Case Number: T 0672/05 - 3.2.05

Application Number: 98912971.3

Publication Number: 0968076

IPC: B29B 17/00

Language of the proceedings: EN

Title of invention:
Process for continuously producing polyester bottles with scrap recycle in a continuous melt-to-preform process

Patentee:
EASTMAN CHEMICAL COMPANY

Opponent:
INVENTA-FISCHER GmbH & Co. KG

Headword:
-

Relevant legal provisions:
EPC Art. 54, 56

Keyword:
"Novelty - yes"
"Inventive step - yes"

Decisions cited:
-

Catchword:
-

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Case Number: T 0672/05 - 3.2.05

D E C I S I O N
of the Technical Board of Appeal 3.2.05
of 14 November 2006

Appellant I: (Opponent)
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Decision under appeal: **Interlocutory decision of the Opposition Division of the European Patent Office posted 6 April 2005 concerning maintenance of the European patent No. 0968076 in amended form.**

Composition of the Board:

Chairman: W. Widmeier
Members: H. Schram
T. Karamanli

Summary of Facts and Submissions

I. Appellant I (opponent) and appellant II (patent proprietor) each lodged appeals against the interlocutory decision of the Opposition Division maintaining European patent No. 0 968 076 in amended form.

In the decision under appeal, it was held that the subject-matter of claim 1 of the main request of appellant II (viz. maintenance of the patent in suit as granted) was not novel with respect to document US-A 2,933,476 (D9).

The Opposition Division further held that the grounds of opposition under Article 100(a) EPC (lack of novelty, Article 54 EPC, and lack of inventive step, Article 56 EPC) and under Article 100(c) EPC (extension beyond the contents of the application as filed, Article 123(2) EPC) did not prejudice the maintenance of the patent in amended form.

II. Oral proceedings were held before the Board of Appeal on 14 November 2006.

III. Appellant I requested that the decision under appeal be set aside and that the patent in suit be revoked in its entirety.

Appellant II requested that the decision under appeal be set aside and that the patent in suit be maintained as granted. As an auxiliary measure, he requested that the decision under appeal be set aside and that the

patent in suit be maintained in amended form on the basis of the following documents filed on 1 March 2006:

(i) claims 1 to 16 filed as first auxiliary request; or
(ii) claims 1 to 16 filed as second auxiliary request; or
(iii) claims 1 to 16 filed as third auxiliary request; or
(iv) claims 1 to 16 filed as fourth auxiliary request; or
(v) claims 1 to 16 filed as fifth auxiliary request; or
(vi) claims 1 to 13 filed as sixth auxiliary request.

IV. Claim 1 of the patent as granted (main request of appellant II) reads as follows:

"1. A process for the continuous production of shaped molded polyester articles which comprises:
a) reacting polyester homopolymer or copolymer precursors in a reactor under conditions sufficient to produce a stream of molten polyester homopolymer or copolymer;
b) flowing the stream of molten polyester into at least one molding apparatus and forming solid molded articles and polyester scrap therefrom without solidifying the polyester prior to entry into the molding apparatus;
c) separating the polyester scrap from the solid molded articles; and
d) recycling the polyester scrap to step (a) by adding it to the polyester precursors in the reactor."

V. The following documents were *inter alia* referred to in the appeal proceedings:

D1 US-A 4,138,374
D9 US-A 2,933,476
D10 DE-C 195 05 680

VI. Appellant I argued in writing and at the oral proceedings essentially as follows:

In column 7, lines 42 to 44, of the patent in suit the term "molding" was explicitly given a broad meaning as follows: "For the purposes of this invention, molding includes any known manner of producing shaped solid articles from a melt". This broad interpretation was supported by the expressions (emphasis added) "molded or otherwise formed" and "molding or other shaping machine" in column 1, line 11, and column 3, line 5, respectively, of the patent in suit. For legal certainty, it was not allowable to interpret the expressions "molding" and "molding apparatus" in claim 1 of the main request narrowly, as proposed by appellant II, namely that the claimed process required using a mold. Similarly, step (d) of claim 1 of the main request, viz. *recycling the polyester scrap to step (a) by adding it to the polyester precursors in the reactor*, encompassed the case that scrap was added to a point in the process where the polymer melt stream contained prepolymers (see column 3, lines 13 to 19, of the patent in suit). Since esterification or transesterification occurring in step (a) was never 100% complete, polyester precursors were present at the end of the polyester polymerization process. It was

further noted that claim 1 of the main request did not exclude that the scrap itself could be subjected to further processing steps, such as grinding or reacting the scrap with a glycol, before it was recycled (see column 1, lines 13 to 15, and column 3, lines 19 to 25, of the patent in suit).

Document D1 disclosed a process for the continuous production of shaped polyester articles such as cast film, fiber, or ribbon, wherein polyester material was forced through an extrusion die (see column 3, lines 17 to 21). Such shaped polyester articles were to be considered as "shaped molded polyester articles" as claimed in claim 1 of the main request on a proper interpretation of said claim in the light of the description (see above paragraph). Likewise, the extrusion die used in the method known from document D1 was to be considered as a molding apparatus falling within the ambit of claim 1 of the main request. Document D1 taught that scrap polyester, preferably waste material from the fiber or film manufacturing process, was blended with the prepolymer in the finisher (see column 5, lines 39 to 45), so that step (d) of claim 1 of the main request was also disclosed in document D1. Since it was not disputed that document D1 disclosed the remaining features of claim 1 of the main request, there was no need for further substantiation. It followed that the subject-matter of claim 1 of the main request lacked novelty vis-à-vis document D1.

Document D9 disclosed a process for the continuous production of shaped polyester articles such as cast film by using an extrusion die (see column 4, lines 61

to 63), whereby scrap resulting from slitting from film the beaded edges normally formed on the film during the extrusion of the film to facilitate the subsequent transverse stretching of the film, was added to the melt stream prior to prepolymerization, i.e. scrap obtained from the process was added to the polyester precursors in the reactor (see column 2, lines 50 to 67, and column 3, lines 66 to 70). The subject-matter of claim 1 of the main request thus also lacked novelty vis-à-vis document D9.

Document D9 represented the closest state of the art. If novelty was acknowledged by the Board on the basis of the term "molded" in claim 1 of the main request, the subject-matter of said claim only differed from the process disclosed in document D9 in that the product produced was a "shaped molded polyester" article rather than a "shaped polyester article" such as the film produced by the process according to document D9. However, molding a film into a shaped molded polyester article in a separate, additional process step, was well-known in the art. It was common knowledge that disposable packaging articles such as containers, dishes, cups, bottles, etc., could be conveniently obtained by molding a film into the desired shape in a continuous process starting from the polymerization process known from document D9, by just adding the step of molding the film into a shaped molded article. The person skilled in the art would thus, starting from the process for the continuous production of shaped polyester articles known from document D9, on the basis of common technical knowledge in the molding art, arrive at the subject-matter of claim 1 in an obvious manner. The subject-matter of claim 1 of the main

request did also not involve an inventive step vis-à-vis a combination of documents D9 and D10. On the basis of the intrinsic viscosity range of 0.45 to 1.2 for polyesters given in document D9 (see column 3, lines 57 to 59), the person skilled in the art would realize that the process known from document D9 for producing a cast film was also suitable for producing a shaped molded polyester article such as a polyester preform, since a polyester preform had an intrinsic viscosity within the viscosity range of 0.45 to 1.2 cited in document D9 (see document D10, page 3, lines 16 to 24, where an intrinsic viscosity in the range from 0,5 to 0,75 dl/g is mentioned).

VII. Appellant II argued in writing and at the oral proceedings essentially as follows:

Claim 1 of the main request was directed to a process for producing molded polyester articles. The term "molded article" had a clear technical meaning, namely that a mold, or more particularly a molding apparatus (see step (b) of claim 1 of the main request), was to be used to form or shape the article. It was true that in various passages of the description of the patent in suit, as an alternative to molding the article, a second unspecified possibility to produce the article was mentioned. These unspecified possibilities were however not claimed. These alternatives can be deleted from the passages of the description cited by appellant I. Step (d) of claim 1 of the main request made it clear that *the polyester scrap was added to the polyester precursors while being reacted in the reactor* according to step (a). This was the primary and mandatory point of recycling the scrap, although

additional recycling points were possible (see column 7, line 53, to column 8, line 4, and claims 2 and 3 of the patent in suit).

Document D1 disclosed a process for producing film, fiber or ribbon by means of an extrusion die. Document D9 related to film-casting and filament spinning operations also by means of an extrusion die (see column 1, lines 37 to 46, and column 4, lines 61 to 63). However, an extrusion die was not a molding apparatus, and film, fiber or ribbon could not fairly be said to be molded articles. Consequently, the subject-matter of claim 1 of the main request was novel over documents D1 and D9 for this reason alone. Document D1 also failed to disclose step (d) of claim 1 of the main request, since in the process according to document D1 scrap was added as a final step in the polymerization process (see column 2, lines 51 to 53, and lines 66 to 68; column 6, lines 2 to 5). Whilst document D1 described a direct recycle of scrap polyester from film manufacture (see column 6, lines 20 to 23), such a direct recycle was not unambiguously disclosed in document D9, wherein it was merely stated that a convenience source of solid polyester to be added to the process was provided by scrap film.

Document D10, which was cited in column 2, line 2, of the patent in suit, represented the closest state of the art, since this document related to a process for the continuous production of shaped molded polyester articles. This document failed to address the incorporation of recycled scrap polyester to the polymer formation step. The problem addressed in document D10 was the production of bottle preforms with

a reduction acetaldehyde content. This problem was neither relevant for the applications of the process known from document D9 mentioned therein, viz. film-casting or filament spinning (see column 1, line 39), nor had anything to do with the problem addressed in document D9, i.e. controlling the liquid polymer level in the finisher vessel without disturbing the operating conditions in the other vessels of the continuous polymerization process (see column 2, lines 40 to 44). Thus, the person skilled in the art had no incentive to combine documents D9 and D10. Moreover, it was believed in the art that adding scrap at an early stage of the polymerization process as taught by document D9 was disadvantageous in that it tended to cause upsets in the process, it caused decrease in demand from the monomer supply units and it required additional power (see document D1, column 1, line 55, to column 2, line 5, wherein document D9 is discussed). Combining documents D9 and D10 in the manner as proposed by appellant I was based on hindsight. It followed that the subject-matter of claim 1 of the main request was not obvious for a person skilled in the art and thus involved an inventive step.

Reasons for the Decision

Main request

1. *Interpretation of claim 1*

Molded / molding

Claim 1 relates to "a process for the continuous production of shaped molded polyester articles", which

comprises inter alia the step of "flowing the stream of molten polyester into at least one molding apparatus and forming solid molded articles and polyester scrap therefrom without solidifying the polyester prior to entry into the molding apparatus", cf. step (b) of claim 1 (emphasis added by the Board).

The terms "molded" and "molding" in the expressions "shaped molded polyester articles" and "molding apparatus", respectively, have a precise technical meaning in the art and in the context of claim 1, namely that a mold is used for producing the desired shaped article. Processes wherein a mold is used include "*injection molding, gas-assist injection molding, blow molding, extrusion thermoforming and the like*", see column 7, lines 47 to 51, of the patent in suit.

The sentence "For the purposes of this invention, molding includes any known manner of producing shaped solid articles from a melt" in column 7, lines 42 to 44, of the patent in suit is inconsistent with the common technical meaning of the term "molding". This also applies to the reference "or otherwise formed" in the passage in column 1, lines 9 to 11, of the patent in suit and to the reference "or other shaping machine" in the passage in column 3, lines 3 to 7, of the patent in suit.

Polyester scrap

Step (d) of claim 1 reads: "recycling the polyester scrap to step (a) by adding it to the polyester precursors in the reactor". The antecedent of "the polyester scrap" is the polyester scrap separated from

the solid molded articles referred to in step (c). In other words, step (d) requires that polyester scrap obtained by the continuous melt-to-mold process is recycled (see column 5, lines 25 to 27, of the patent in suit).

Recycling the polyester scrap to step (a)

The expression "recycling the polyester scrap to step (a)" in step (d) of claim 1 is unambiguous: polyester scrap is to be added during "reacting polyester homopolymer or copolymer precursors in a reactor", i.e. at an early phase of the polymerization process, wherein esterification or transesterification, or a subsequent polycondensation takes place (see column 7, lines 53 to 56, of the patent in suit). Nothing else is meant by the second half-sentence in step (d) of claim 1, viz. "by adding it to the polyester precursors in the reactor". The latter expression cannot be construed to mean that scrap can be added to any reactor in the melt phase processing steps, where polyester precursor may be accidentally present because esterification or transesterification of the homopolymer or copolymer precursors has not been completed.

2. *Objection of lack of novelty*

Both document D1 (see column 3, lines 3 to 21) and document D9 (see column 1, lines 15 to 36) disclose a process for the continuous production of shaped polyester articles such as fibers or films, wherein a spinning die or an extrusion die is used.

In the judgement of the Board, polyester filaments and films are shaped articles, not shaped molded articles, and a spinning die or an extrusion die cannot be said to be a molding apparatus.

Document D10 discloses (see page 3, lines 16 to 18) a process for the continuous production of shaped molded polyester articles, it does not however disclose the recycling of polyester scrap.

The subject-matter of claim 1 is thus novel within the meaning of Article 54 EPC with respect to documents D1, D9 and D10.

3. *Objection of lack of inventive step*

The problem the invention seeks to solve is to provide an integrated process for continuously producing formed, molded articles, starting from polyester precursor starting materials, melt, molding and recycling scrap polyester such that little or no polyester waste is generated (see column 1, lines 40 to 44, of the patent in suit).

This problem has been solved by the subject-matter of claim 1. In particular, recycled scrap polyester from the molding step is added during the polyester formation step, cf. step (d) of claim 1.

In the judgement of the Board, there is no hint or suggestion in the prior art cited by appellant I enabling the person skilled in the art to arrive at the invention without exercising inventive skills.

Document D1 relates to a continuous process for producing formed polyester articles such as fibers or films, wherein polyester scrap is recycled. This document does not disclose a process, whereby molded articles are produced. Moreover, document D1 points away from the present invention, since this document teaches (see column 2, lines 51 to 53) that scrap polyester and virgin polyester are to be blended as a final step in the polyester polymerization process, rather than blended during the polyester formation step as taught by document D9, which relates to a continuous process for producing formed polyester articles such as fibers or films.

Document D10 discloses step (a) and step (b) except for the feature "and polyester scrap therefrom" of the process claimed in claim 1, since this document is silent about whether polyester scrap is produced at all. The subject-matter of claim 1 of the main request further differs from what is disclosed in document D10 in that

(c) [the] polyester scrap is separated from the solid molded articles; and in that
(d) [the] polyester scrap is recycled by adding it to the polyester precursors in the reactor.

Assuming that in the process according to document D10 polyester scrap is produced, there are a number of possibilities of as to what can be done with the scrap: blending scrap polyester and virgin polyester as a final step in the polyester polymerization process as taught by document D1; producing pellets from the scrap to be used elsewhere; or wasting the scrap.

Document D9 teaches to dissolve "solid" polymer in a stream of monomer prior to the prepolymerization step, with a view to control the liquid polymer level in the finisher vessel without disturbing the operating conditions in the other vessels of the continuous polymerization operation, see column 2, lines 40 to 44. A convenient source of scrap is said to be scrap film resulting, for example, from slitting from film the beaded edges normally formed on the film during the extrusion of the film to facilitate the subsequent transverse stretching of the film, see column 3, lines 66 to 70.

Appellant I has argued that by adding a subsequent molding step to the process for producing a formed polyester article such as a film as known from document D9 would be obvious to a person skilled in the art and would lead to the process claimed in claim 1. However, claim 1 requires the step of flowing the stream of molten polyester into at least one molding apparatus, cf. step (b). Even if the film produced by the process known from document D9 would be subsequently molded into a molded article in a continuous manner, the resulting process would not include step (b).

Document D10 is silent about an additional dissolving step of solid polymer, as taught by document D9. In the judgement of the Board, the person skilled in the art, starting from the process known from document D10, had thus no incentive to combine the teaching of this document with the teaching of document D9. Moreover, document D10 relates to a molding process, whereas document D9 does not.

In the opinion of the Board, the reasoning of appellant I, which relies on a similarity between intrinsic viscosity ranges mentioned in documents D10 and D9, is based on an *ex post facto* analysis in this respect.

It follows that the subject-matter of claim 1 of the main request is not obvious to the person skilled in the art and therefore involves an inventive step within the meaning of Article 56 EPC.

The subject-matter of claims 2 to 19, which are appendant to claim 1, similarly involve an inventive step.

4. Since the main request of appellant II is allowable, there is no need to consider the first to sixth auxiliary requests of appellant II.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The patent is maintained as granted.

The Registrar: The Chairman:

D. Meyfarth W. Widmeier