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Datasheet for the decision of 13 June 2017

Case Number: T 2400/13 - 3.3.10

Application Number: 08716352.3

Publication Number: 2121560

IPC: C07C67/08, C07C69/80

Language of the proceedings: EN

Title of invention:
BATCH ESTERIFICATION

Patent Proprietor:
ExxonMobil Chemical Patents Inc.

Opponent:
Evonik Degussa GmbH

Headword:
BATCH ESTERIFICATION / ExxonMobil

Relevant legal provisions:
EPC Art. 54, 56, 100(c)

Keyword:
Grounds for opposition - extension of subject-matter (no)
Novelty - (yes)
Inventive step - (yes)

Decisions cited:

Catchword:

Europäisches Patentamt
European Patent Office
Office européen des brevets

Beschwerdekammern

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Case Number: T 2400/13 - 3.3.10

D E C I S I O N
of Technical Board of Appeal 3.3.10
of 13 June 2017

Appellant: (Opponent)	Evonik Degussa GmbH Rellinghauserstrasse 1-11 45128 Essen (DE)
Representative:	Godemeyer Blum Lenze Patentanwälte Partnerschaft mbB - werkpatent An den Gärten 7 51491 Overath (DE)
Respondent: (Patent Proprietor)	ExxonMobil Chemical Patents Inc. 5200 Bayway Drive Baytown, TX 77520 (US)
Representative:	Uexküll & Stolberg Partnerschaft von Patent- und Rechtsanwälten mbB Beselerstraße 4 22607 Hamburg (DE)
Decision under appeal:	**Decision of the Opposition Division of the European Patent Office posted on 5 November 2013 rejecting the opposition filed against European patent No. 2121560 pursuant to Article 101(2) EPC.**

Composition of the Board:

Chairwoman	J. Mercey
Members:	J.-C. Schmid
	T. Bokor

Summary of Facts and Submissions

I. The Appellant (opponent) lodged an appeal against the decision of the Opposition Division rejecting the opposition against European patent No. 2 121 560, which was granted on the basis of fifteen claims, claim 1 of which reads as follows:

"1. A process for the catalysed esterification of reactants comprising an acid or anhydride and an alcohol to produce a plasticizer ester for polyvinylchloride (PVC) from a C_6 to C_{15} monohydric alcohol or a polyol ester from a polyol and a fatty acid, which process comprises a batch reaction sequence that comprises

(i) providing a mixture of the acid or acid anhydride with the alcohol at an initial temperature in a reaction vessel,

(ii) raising the temperature of the mixture to a desired esterification reaction temperature to effect esterification, and

(iii) boiling off water by-product produced in the esterification reaction,

wherein the pressure in the reaction vessel is elevated as the temperature of the mixture is raised during at least the initial phase of raising the temperature of the mixture, thereby reducing reactant vaporisation, and the esterification catalyst is introduced into the mixture at a predetermined mixture temperature that is below the desired esterification reaction temperature and above the initial temperature of the mixture."

II. Notice of opposition had been filed by the Appellant requesting revocation of the patent-in-suit in its entirety on the grounds of lack of novelty and inventive step (Article 100(a) EPC), insufficiency of disclosure (Article 100(b) EPC), and extension of the subject-matter of the patent-in-suit beyond the content of the application as filed (Article 100(c) EPC).

Inter alia, the following documents were cited in the opposition proceedings

(1) WO-A-99/41226,
(1b) German translation of document (1),
(1c) English translation of document (1),
(2) EP-1 719 753 and
(9) DE-B-197 21 347.

According to the Opposition Division, claim 1 of the patent as granted met the requirement of Article 123(2) EPC. The invention was sufficiently disclosed in the patent-in-suit to be carried out by a skilled person in the art. The feature in process claim 1, "the pressure in the reaction vessel is elevated as the temperature of the mixture is raised during at least the initial phase of raising the temperature of the mixture, thereby reducing reactant vaporisation", henceforth referred to as feature (a), should be interpreted as requiring the action of increasing the pressure in the reaction vessel during the initial phases of the reaction. This feature was not disclosed in the process disclosed in document (1c).

The feature of claim 1 of the patent-in-suit requiring that "the esterification catalyst is introduced into the mixture at a predetermined mixture temperature that

is below the desired esterification reaction temperature and above the initial temperature of the mixture", henceforth referred to as feature (b), was also not unambiguously disclosed in document (1c). The subject-matter of claim 1 of the patent as granted was therefore novel over document (1).

With regard to inventive step, document (1), represented by its English translation (document (1c)), was the closest prior art to the invention. The technical problem underlying the patent-in-suit was the provision of an improved process for producing a plasticizer ester. The solution was the process of claim 1 characterized by the distinguishing features (a) and (b). Feature (a) allowed heat input to be efficiently used to heat the reactant and meant more alcohol in the liquid phase, resulting in an improved reaction rate and a reduced reactor cycle time, while feature (b) allowed more reaction control. Those effects were furthermore supported by the experimental data provided by the Respondent (patent proprietor) with a letter dated 10 September 2013. There was no teaching in document (1c) which would suggest to the skilled person to carry out these specific steps in order to solve the problem posed. Both the description and the examples of document (1c) taught that the pressure should remain constant from the beginning of the reaction and subsequently be lowered. The skilled person would also not contemplate combining document (1c) with any of the other cited documents, since none of them provided the skilled person with the teaching to carry out features (a) and (b) in order to improve the process of document (1c). The subject-matter of the claims of the patent as granted involved therefore an inventive step.

III. According to the Appellant, the amendment of "C_4 to C_{15} monohydric alcohol" into "C_6 to C_{15} monohydric alcohol" in claim 1 as granted was not supported by paragraph [0058] of the application as filed, so that the requirement of Article 123(2) EPC was not met for claim 1 of the patent as granted.

Claim 1 of the patent-in-suit comprised the requirement that the pressure in the reaction vessel was elevated as the temperature of the mixture was raised during at least the initial phase of raising the temperature of the mixture, thereby reducing reactant vaporisation. This requirement referred to the state of the pressure level in the reaction vessel with the consequence that the pressure did not need to be increased if the initial pressure level was already elevated. This requirement was therefore not a distinguishing feature over document (1c). The subject-matter of claim 1 of the patent as granted therefore lacked novelty over document (1).

With regard to inventive step, the closest prior art to the invention was document (1c). The experiments filed by the Respondent with the letter dated 10 September 2013 did not demonstrate that the problem of reducing the reaction time was solved by the claimed process, let alone over the whole scope of claim 1. Furthermore the proposed solution to the problem of reducing reaction time was obvious in the light of document (1) alone, or in combination with document (2), (9) or document

(10) GB 958 369.

Hence, the subject-matter of claim 1 of the patent as granted lacked an inventive step.

IV. With a letter dated 9 July 2014, the Respondent filed auxiliary requests 1 to 4. It requested that late filed document (10) not be admitted into the proceedings. The amendment of "C_4 to C_{15} monohydric alcohol" present in originally filed claim 1 into "C_6 to C_{15} monohydric alcohol" in claim 1 as granted was properly based on paragraph [0058] of the application as filed.

Feature (a) required that the pressure in the reaction vessel was raised as the temperature of the mixture was raised, such that the subject-matter of claim 1 was novel over document (1) on account of both features (a) and (b).

This document represented the closest prior art to the invention. The technical problem was to reduce reaction time (batch cycle time), to improve catalyst use and overall efficiency of the reaction and to save resources. The experiments filed with the letter dated 10 September 2013 showed that this problem was solved by the process of claim 1 of the patent as granted in view of the differentiating features (a) and (b). This was not obvious in the light of the cited prior art. Accordingly, the subject-matter of claim 1 of the patent as granted involved an inventive step.

V. The Appellant requested that the decision under appeal be set aside and the patent be revoked.

The Respondent requested that the appeal be dismissed, or subsidiarily that a patent be maintained on the basis of one of the auxiliary requests 1 to 4, filed with the letter dated 9 July 2014.

VI. At the end of the oral proceedings held on 13 June 2017, the decision of the Board was announced.

Reasons for the Decision

1. The appeal is admissible.

Main request: claims as granted

2. Article 100(c) EPC

The Appellant submitted that the amendment of the feature "C_4 to C_{15} monohydric alcohol" present in originally filed claim 1 into the "C_6 to C_{15} monohydric alcohol" as found in claim 1 of the patent as granted extended the subject-matter of the patent-in-suit beyond the content of the application as filed.

Paragraph [0058] of the application as filed discloses the range of C_4 to C_{15}, preferably C_6 to C_{13}, for the alcohols. It is directly and unambiguously derivable from the content of the application as filed that the alcohols referred to in this paragraph are monohydric alcohols, since the polyols are described in the preceding paragraphs [0056] and [0057] and are not concerned with the general range of C_4 to C_{15}. Therefore the amendment of "C_4 to C_{15} monohydric alcohol" into "C_6 to C_{15} monohydric alcohol" is properly based on paragraph [0058] of the application as filed.

For these reasons, the Board concludes that the subject-matter of claim 1 of the patent as granted does not extend beyond the content of the application as

filed, such that the ground for opposition pursuant to Article 100(c) EPC is disqualified.

3. Article 100(b) EPC

In opposition proceedings the Opposition Division found that the invention was disclosed in the patent-in-suit in a manner sufficiently clear and complete for it to be carried out by a skilled person in the art. The Appellant did not raise any objections in appeal proceedings in this respect. The Board does not see any reason to take a different view. Hence, it is unnecessary to go into more detail in this respect.

4. Interpretation of claim 1

4.1 Appellant and Respondent had diverging views with regard to the interpretation of the feature (a) of claim 1 of the patent-in-suit which reads as follows: "the pressure in the reaction vessel **is elevated** as the temperature of the mixture is raised during at least the initial phase of raising the temperature of the mixture, thereby reducing reactant vaporisation" (emphasis added).

According to the Respondent, "the pressure is elevated" required that the pressure in the reaction vessel was raised as the temperature of the mixture was raised.

According to the Appellant, the expression "the pressure is elevated" also included, besides the active raising of the pressure, the state of elevated pressure, i.e. above atmospheric, with the consequence that no increase of pressure was required by feature (a) of claim 1 provided the pressure was maintained above atmospheric pressure.

4.2 The meaning that first comes to mind when reading feature (a) is that the pressure in the vessel increases as the temperature of the mixture rises. This reading is supported throughout the patent-in-suit (see paragraphs [0017] "we have found that increasing the pressure…", [0020] "…the reactor pressure is raised…", [0037] "…the pressure will increase…", [0042] "typically, the initial reaction pressure is close to atmospheric pressure… and moves through a maximum…". In particular step (iii) of dependent claim 8 makes plain that the pressure increases "thereby elevating the pressure in the vessel".

From a grammatical point of view, it is true that another meaning could be imaginable when reading this feature, since if "elevated" were taken as a predicative adjective over the subject, the wording "the pressure in the reaction vessel is elevated" would describe the state of the pressure level in the reaction vessel and would not require any action to elevate the pressure in the vessel. However, the skilled person should interpret the claim with a mind willing to understand and would rule out any interpretation that is obviously not intended. The skilled person also would not consider that the same technical feature could have two divergent meanings. For carrying out the process of claim 1 the skilled person has to determine whether "the pressure is elevated" means the pressure only needs to be high ("elevated" is a predicative adjective in feature (a)), or must be increased ("elevated" is the conjugated form of the verb "to elevate" in feature (a)). In the present case, it is clear from the context of the patent-in-suit (see above) that the skilled person will understand feature (a) of claim 1 to mean the pressure

must be actively elevated as the temperature of the mixture is raised in the vessel.

According to the Appellant, paragraph [0026] of the patent-in-suit ("We have found that, by applying and maintaining the pressure above atmospheric during the initial phase…") supported the interpretation according to which feature (a) did not require an elevation of pressure during the initial phase, but only that high pressure applied beforehand should be maintained during the initial phase. The Board, however, does not concur with the Appellant's interpretation in this respect, all the more because said paragraph [0026] also supports dependent claim 8, where the pressure increases during the initial phase in step (ii) and where an elevated pressure is maintained in step (iii).

4.3 Under these circumstances, the Board comes to the conclusion that the sole sensible construction of feature (a) is that it requires that the pressure increases as the temperature of the mixture rises.

5. Novelty

According to the Appellant, the subject-matter of claim 1 lacked novelty with respect to the process disclosed in examples 1 and 2 of document (1).

The subject-matter of claim 1 of the patent-in-suit is characterised by features (a) and (b), as defined above.

Examples 1 and 2 of document (1c) disclose a process for the catalysed esterification of phthalic anhydride with 2-ethylhexanol. The reaction vessel is preheated

in an oil bath and the pressure therein is increased to 1,000 mmHg using nitrogen gas. Then, phthalic anhydride preheated to 140°C is loaded to the flask for 35 minutes as well as part of the 2-ethylhexanol which has been preheated to 170°C for 40 minutes. After the phthalic acid has finished loading, the catalyst is added. The pressure is maintained at 1,000 mmHg for 40 minutes from the start of the reaction in example 1, and for 35 minutes in example 2, and thereafter is gradually lowered.

5.1 with regard to feature (a)

In the process disclosed in the examples of document (1), the reaction vessel is pressurised before the reactants are loaded into the reactor and the pressure remains constant from the point at which the loading of the reactants is started, and is then decreased.

Thus, feature (a) of claim 1 of the patent-in-suit, which requires that the pressure increases as the temperature of the reaction mixture rises, distinguishes the claimed process from that of examples 1 and 2 of document (1c).

5.2 with regard to feature (b)

According to the Appellant, the temperature of the mixture of phthalic anhydride and 2-ethylhexanol continues to rise after addition of the catalyst in the process disclosed in document (1c), since the addition of 2-ethylhexanol preheated at 170°C into the mixture is continued after the catalyst has been added, thus further raising the temperature of the reaction mixture.

However, this argument must be rejected as pure speculation, since the temperature of the oil bath is not indicated in the examples of document (1c), leaving unknown the temperature of the mixture after the phthalic anhydride has finished loading. In the process of example 2 of document (1c), wherein the same device and the same method of loading reactants and catalyst are used as in example 1c, the temperature of the reaction mixture when the catalyst is added is 220°C (reached after 35 minutes), i.e. well above the temperature of the preheated 2-ethylhexanol which continues to be loaded after the phthalic anhydride has finished loading.

There is thus no disclosure in example 1 or 2 of document (1c) that permits to conclude that the temperature of the reactant mixture is increased after the catalyst has been added.

Accordingly, feature (b) of the claimed process is not disclosed in the examples of document (1c).

5.3 Hence, the Board arrives at the conclusion that the subject-matter of claim 1 is novel over document (1) on account of both features (a) and (b) of the process of claim 1 of the patent-in-suit.

6. Inventive step

6.1 Closest prior art

The Board considers, in agreement with the parties that document (1), represented either by its German translation (1b) or its English translation (1c), is the closest prior art to the invention, and, hence

takes it as the starting point in the assessment of inventive step.

Document (1c) discloses a process for producing an ester from a carboxylic acid and/or an anhydride thereof and a C_4 to C_{18} alcohol at a pressure of 0.02 to 5kg/cm^2 G, i.e. above atmospheric pressure (see claim 1). Document (1c) has substantially the same goals as the patent-in-suit and aims at increasing the reaction speed at the beginning of the reaction, reducing reaction time and saving energy costs (see document (1c), page 6, lines 1 to 6). Examples 1 and 2 disclose the catalysed esterification of phthalic anhydride with 2-ethylhexanol, wherein the reaction vessel is preheated in an oil bath and the pressure therein is increased to 1,000 mmHg using nitrogen gas. Then, phthalic anhydride preheated to 140°C is loaded to the flask for 35 minutes as well as part of the 2-ethylhexanol which has been preheated to 170°C for 40 minutes. After the phthalic acid has finished loading, the catalyst is added. In example 1, the pressure is maintained at 1,000 mmHg for 40 minutes from the start of the reaction. In example 2, the temperature of the reaction mixture is increased from 170 to 220°C for 35 minutes while the pressure is maintained at 1,000 mmHg during this time and the catalyst is added after the reaction mixture has reached 220°C. The time required to reach a reaction rate of 99.92% is 150 minutes in example 1 and 180 minutes in example 2.

6.2 *Technical problem*

According to the Respondent, the technical problem underlying the patent-in-suit is to reduce reaction time (batch cycle time), to improve catalyst use and

overall efficiency of the reaction and to save resources.

6.3 Proposed solution

The proposed solution is the process of claim 1 of the patent as granted characterised by features (a) and (b).

6.4 Success

The technical problem put forward by the Respondent comprises four aspects, which are reducing reaction time, improving catalyst use and overall efficiency, and saving resources.

6.4.1 Reduction of the reaction time

The Respondent referred to the experiments filed with letter dated 10 September 2013, wherein it is shown that four processes according to the invention obtained conversion rates between 99.83 and 99.85% after only 94 to 97 minutes, thus allowing a reaction cycle time of 107 minutes, whereas the processes of examples 1 and 2 of document (1c) achieved a conversion rate of 99.92%, with reaction time of 150 and 180 minutes, respectively.

These experiments therefore demonstrate that the claimed process permits significantly reduced reaction times for esterification, when compared to the process disclosed in document (1c).

According to the Appellant, the comparison was not pertinent to show that the problem had been successfully solved by the claimed process, since the

processes representing the invention differed from that disclosed in document (1c) not only by virtue of the distinguishing features (a) and (b), but also by the reactant, catalyst and heating method.

Document (1c) discloses the esterification of phthalic anhydride with 2-ethylhexanol in the presence of tetra isopropyl titanate, whereas in the experiments filed by the Respondent the esterification of phthalic anhydride is carried out with isodecyl alcohol in the presence of tetra isooctyl titanate.

Thus, both the alcohol and catalyst used in the process according to the patent-in-suit have longer alkyl chains than those used in the process of document (1).

However, a different length of the alkyl chain of the alcohol and the catalyst cannot be the sole cause for the huge reduction of reaction time obtained by the claimed process. Indeed, it is not apparent that an alcohol and/or a catalyst with a longer alkyl chain would be favourable for the speed of the reaction. No reason has been provided explaining why a C_{10} alcohol would react faster than a C_8 alcohol or that the use of tetra-isooctyl titanate instead of tetra-isoproyl titanate would speed up the reaction.

The mode of heating the reactants is not disclosed in example 1, whereas example 2 of document (1c) specifies that the reactants are heated for 35 minutes to reach 220°C. In the process reflecting the invention, the time needed to reach 221° is not indicated, but it already takes 16 minutes to reach 190°C, so that the potential of time saving due to the alleged different mode of heating would be at the most 19 minutes, i.e. well below the observed difference of reaction times.

Hence, a different mode of heating the reactants also cannot explain the reduction of reaction time observed.

Accordingly, the Board holds that it is credible that the differentiating features (a) and (b) contributes to the significant reduction in reaction time observed.

The Appellant submitted that the onus of proof lay with the Respondent to show that there was a causal link between features (a) and (b) and the diminution of the reaction cycle time.

However, the Respondent's comparison convinced the Opposition Division that features (a) and (b) resulted, at least to some extent, in the reaction time of the process being reduced (see page 11 of the impugned decision). Hence, it is the duty of the Appellant contesting the conclusion of the Opposition Division to convince the Board to the contrary, i.e. that features (a) and (b) do not contribute to the observed reduced reaction time in the experiments, or to show that the reduction of the reaction time is caused by other differences.

The Appellant merely contested the validity of the comparison pointing out differences between the process of example 2 of document (1c) and the experiments provided by the Respondent, but did not show that these differences could explain the significant reduction of the reaction time, namely of more than 50%. The Appellant neither substantiated its objection nor filed evidence for its allegation that these differences would inevitably cause the huge reduction of the reaction time. As there is no technical reason why this should be the case, and in the absence of any supporting evidence, the Appellant has not discharged

its burden of proof, with the consequence that its unsubstantiated allegation does not convince the Board.

During the oral proceedings before the Board, the Appellant also stated that the amount of catalyst used in the comparisons differed, which statement was refuted by the Respondent. As the Appellant did not further substantiate this point, this argument is disregarded by the Board as unfounded.

Hence, the Board is satisfied that the features (a) and (b) directly contribute to the reduction of the reaction time. Therefore, the Board holds that it is credible that the process of claim 1 successfully solves the technical problem of providing an improved process for the preparation of esters.

6.4.2 The Respondent claimed that other improvements had been achieved with respect to the process of document (1c), such as saving resources, improving catalyst use and overall efficiency of the reaction. Only in the case that the solution to the problem of diminution of the reaction time were found to be obvious in the light of the prior art, would the matter of whether or not other improvements were achieved over document (1c), as alleged by the Respondent, arise. However, since the Board comes to the conclusion that claim 1 of the main request involves an inventive step by virtue of the reduction of the reaction time obtained by the claimed process (see point 6.5 below), it is unnecessary to examine whether other aspects of the technical problem, i.e. of improving catalyst use and overall efficiency of the reaction, have been solved by the claimed process.

6.4.3 Scope of claim 1

The Appellant objected that the technical problem was not solved across the whole scope of the broadly drafted claim 1. There existed serious doubts as to whether processes involving any acid anhydrides, catalysts, high boiling alcohols or any reaction temperatures would solve the technical problem.

However, the solution is not characterised by the nature of the catalysts, anhydrides, alcohols or by the reaction temperatures used in the claimed process. Processes of esterification of acid anhydrides with alcohols in the presence of a catalyst to produce plasticizer esters belong to the prior art.

The proposed solution to the problem of reducing the reaction time over those prior art processes is characterised by features (a) and (b), which require that the pressure increases as the temperature of the reactants mixture rises and that the catalyst is added below the esterification reaction temperature. The Appellant has not objected to the breadth with respect to features (a) and (b), and the Board does not see any reason to do so of its own motion.

Hence, the Board is satisfied that the reduction of reaction time is achieved by features (a) and (b) across the whole scope of claim 1 of the patent-in-suit.

6.5 *Obviousness*

It remains to be decided whether or not the proposed solution to the first aspect of the problem underlying the patent-in-suit is obvious in view of the cited prior art. The Appellant addressed document (1) alone

or in combination with document (2), (9) or (10) in order to show obviousness of the claimed solution.

Accordingly, the question which needs to be answered is whether or not document (1) alone, or in combination with document (2), (9) or (10), teaches the skilled person to elevate the pressure in the reaction vessel during at least the initial phase of raising the temperature of the mixture (feature (a)) and to introduce the esterification catalyst into the mixture at a temperature that is above the initial temperature of the mixture and below the desired esterification reaction temperature (feature (b)), in order to reduce the reaction time.

Document (1c) aims to reduce the reaction time of the esterification (see first lines of page 6). Document (1c) teaches that the reaction must be carried out under a pressure of 0.02 to 5 kg/cm^2 G, which is above atmospheric pressure (see page 8, second paragraph of document (1c)). In examples 1 and 2 of this document, the pressure remains constant from the initial stage of the reaction of the reaction until it is subsequently gradually lowered. Document (1c) teaches that the preferred range of the reaction temperature is 120°C to 250°C and that said temperature depends upon the catalyst used in the reaction. When an organometallic catalyst is used, the preferred range is 160°C to 250°C, more preferably 180°C to 230°C (see first paragraph on page 11 of document (1c)). In example 2 of document (1c), the catalyst is added to the reaction mixture once the desired esterification temperature of 220°C has been reached. Hence there is no pointer in document (1c) to add the catalyst below the esterification reaction temperature, nor to elevate the pressure in the reaction vessel during at least the

initial phase of raising the temperature of the mixture.

According to the Appellant, documents (2), (9) and (10) showed the effect of actively raising the pressure in the reactor.

Document (2) relates to a process for producing esters. In paragraph [0037], it is disclosed that the reaction temperature for the metal-catalysed esterification ranges from 160°C to 270°C, preferably 180° to 250°C, and that higher temperatures speed up the reaction, but favour the formation of by-product. Furthermore, the temperature of the reaction should be sufficient to permit distillation of the alcohol in order to permit the separation of by-product water. In addition, this document teaches that the desired reaction temperature can be controlled by the pressure in the reactor and that the reaction can be carried out at atmospheric pressure or slight superatmospheric pressure in the case of low boiling point alcohols and under reduced pressure for higher-boiling point alcohols (see column 9, lines 20 to 25).

Therefore document (2) does not disclose the solution proposed by the patent-in-suit to introduce the esterification catalyst into the mixture at a temperature that is above the initial temperature of the mixture and below the desired esterification reaction temperature and to elevate the pressure in the reaction vessel during at least the initial phase of raising the temperature of the mixture.

Document (9) relates to a process for producing esters in the presence of a metal catalyst. This document aims to improve known processes by tuning and simplifying

the successive stages of the process and to increase the quality of the ester product (see page 3, paragraph [0011]). However document (9) does not aim at speeding up the esterification reaction. Therefore the skilled person, faced with the problem of reducing the reaction time of the esterification reaction, would not turn to document (9) to find a solution. Moreover, document (9) does not disclose the solution proposed by the patent-in-suit.

Document (10) discloses a process for the **non-catalytic** esterification of terephthalic acid, without removing by-product water from the reaction system (see claim 1; page 3, left-hand column, lines 5 to 24). Accordingly, the skilled person would not have turned to document (10) in order to reduce the reaction time of the process of document (1), which is carried out in the presence of a catalyst with azeotropic removal of water from the reaction medium.

The Respondent requested that late filed document (10) not be admitted into the proceedings. However, as document (10) is disregarded for lack of relevance, whether or not document (10) is admitted into the proceedings has no impact on the decision. Therefore, there is no need to take a formal decision on the admission of document (10) into the proceedings.

6.6 The Board concludes from the above that document (1c) alone or in combination with the further state of the art cited by the Appellant, namely documents (2), (9) and (10), does not lead the person skilled in the art to the solution proposed by the patent-in-suit.

For these reasons, the solution proposed to the problem underlying the invention, i.e. the subject-matter of claim 1, is not obvious in the light of the prior art.

Hence, the subject-matter of claim 1 of the patent as granted, and by the same token that of dependent claims 2 to 15, involves an inventive step.

As a result, the Appellant's challenge to the lack of inventive step is rejected.

7. *Auxiliary requests*

Since the main request is allowable for the reasons set out above, there is no need for the Board to decide on the lower ranking auxiliary requests.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairwoman:

C. Rodríguez Rodríguez J. Mercey

Decision electronically authenticated