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D E C I S I O N  
of 3 February 1999

Case Number: T 0191/97 - 3.3.3

Application Number: 88309063.1

Publication Number: 0314309

IPC: C08G 67/02

Language of the proceedings: EN

Title of invention:  
Process for preparing polyketones

Patentee:  
The British Petroleum Company PLC

Opponent:  
Shell Internationale Research Maatschappij B.V.

Headword:

-

Relevant legal provisions:  
EPC Art. 56, 114(2)

Keyword:  
"Late-filed evidence - insufficiently relevant - excluded"  
"Inventive step (yes) - no hint to solution of technical  
problem in the state of the art"

Decisions cited:  
T 0181/82, T 0219/83, T 0035/85, T 1002/92

Catchword:

-



Case Number: T 0191/97 - 3.3.3

D E C I S I O N  
of the Technical Board of Appeal 3.3.3  
of 3 February 1999

Appellant: Shell Internationale Research Maatschappij B.V.  
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Decision under appeal: Interlocutory decision of the Opposition Division  
of the European Patent Office dated 26 November  
1996 and issued in writing on 17 December 1996  
concerning maintenance of European patent  
No. 0 314 309 in amended form.

Composition of the Board:

Chairman: C. Gérardin  
Members: R. Young  
A. Lindqvist



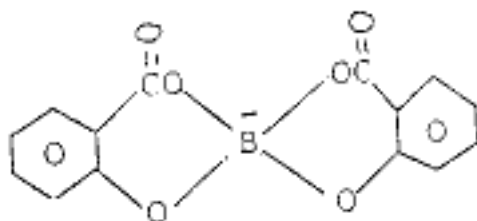
## Summary of Facts and Submissions

- I. The mention of the grant of European patent No. 0 314 309, in respect of European patent application No. 88 309 063.1, filed on 29 September 1988 and claiming a GB priority of 8 October 1987 (GB 8723603) was announced on 27 April 1994 (Bulletin 94/17).
- II. Notice of Opposition was filed on 26 January 1995 on the ground of lack of inventive step. The opposition was supported inter alia by the documents:
- D1: EP-B-0 315 318;
- D3: EP-A-0 222 454;
- D5: "Gmelins Handbuch der Anorganischen Chemie, Bor", Part 13 (1926) pages 97 to 98;
- D6: "Gmelin Handbuch der Anorganischen Chemie, Borverbindungen", Part 33/8 (1976) page 118; and
- D7: EP-A-0 121 965.
- III. By an interlocutory decision which was given at the end of oral proceedings held on 26 November 1996 and issued in writing on 17 December 1996, the Opposition Division held that the grounds for opposition did not prejudice the maintenance of the patent in amended form, on the basis of a set of Claims 1 to 8 filed during these oral proceedings. Claim 1 reads as

follows:

"A process for preparing polyketones by polymerising a mixture of carbon monoxide and one or more olefins in the presence of a palladium catalyst characterised in that the palladium catalyst is prepared by reacting together:

- (a) a source of palladium;
- (b) a bidentate amine, phosphine, arsine or stibine having the formula  $(R^1)_2M-R^2-M(R^1)_2$  wherein the M atoms are independently selected from nitrogen, phosphorous, arsenic or antimony, the  $R^1$  groups are independently alkyl, cycloalkyl or aryl groups and  $R^2$  is an alkylene group, and
- (c) a source of an anion having the formula:



or substituted derivatives thereof."

Claims 2 to 5 are dependent claims directed to elaborations of the process according to Claim 1.

Claim 6, an independent claim, is worded as follows:

"A process for preparing polyketones by polymerising a mixture of carbon monoxide and one or more olefins in the presence of a palladium catalyst as defined in claim 1 which comprises the steps of

- (a) contacting the palladium catalyst with the mixture

of carbon monoxide and one or more olefins,  
(b) allowing the palladium catalyst to polymerise or  
polymerise partially the mixture of carbon monoxide  
and one or more olefins,  
(c) separating the palladium catalyst from the  
products of step (b),  
(d) contacting the palladium catalyst with further  
carbon monoxide and one or more olefins."

Claim 7, a dependent claim, is directed to an  
elaboration of the process according to Claim 6.

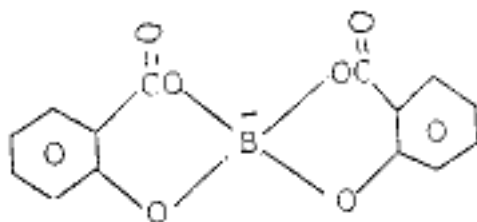
Claim 8, an independent claim, is worded as follows:

"A palladium catalyst prepared by reacting together:

(a) a source of palladium,

(b) a bidentate amine, phosphine, arsine or stibine  
having the formula  $(R^1)_2M-R^2-M(R^1)_2$  wherein the M  
atoms are independently selected from nitrogen,  
phosphorus, arsenic or antimony, the  $R^1$  groups are  
independently alkyl, cycloalkyl or aryl groups and  $R^2$   
is an alkylene group, and

(c) a source of an anion having the formula:



or substituted derivatives thereof."

According to the decision, document D3, which was  
considered to be the closest state of the art,

disclosed a process for the preparation of polyketones by polymerising a mixture of carbon monoxide and ethylene in the presence of a catalyst comprising:

- a) a palladium source;
- b) a bidentate amine, phosphine, arsine or stibine;  
and
- c) an anion of an acid with a pKa of less than 6, for example p-toluene sulphonic acid.

The subject-matter claimed in the patent in suit differed from this disclosure in that a boron/salicylic acid complex was present as the anion c). Whilst some unanswered questions arose from the experimental data on file, the examples deriving from the Patentee demonstrated an improvement due to the presence of boron acid complexes as compared to non-complexed acids. There was in any case no hint that 2,5-dihydroxybenzoic acid should be selected rather than the p-toluene sulphonic acid preferred according to D3, let alone that it should be replaced with similarly structured salicylic acid. Furthermore, whilst documents D5 and D6 disclosed that boron/salicylic acid complexes were known to represent relatively strong acids, it had been admitted that there was no literature on file which stated that such complexes had been used as catalytic compounds in any organic reactions. Furthermore, Example 1d in D7 demonstrated that hydrochloric acid, which was listed in D3 as a suitable source of the anion, led to a very low polymerisation yield. Consequently, the proposed replacement was not obvious and the grounds of opposition did not prejudice maintenance of the patent



as amended.

- IV. On 5 February 1997, a Notice of Appeal against the above decision was filed, together with payment of the prescribed fee.

In the Statement of Grounds of Appeal filed on 16 April 1997, the Appellant (Opponent) argued in substance as follows:

- (a) It belonged to the common general knowledge of the skilled person that boric acid formed adducts with, inter alia, ortho-oxyarylcarboxylic acids, which adducts were relatively strong acids, as shown in D5 and D6. Salicylic acid was an ortho-oxyarylcarboxylic acid of pKa about 3, the formula of its adduct with boric acid being shown in D5. It was therefore predictable that CO/olefin polymer would be obtained when, in the CO/olefin copolymerisation according to D3, a catalyst was used, which contained, as the anion, an anion of the adduct of boric acid and salicylic acid. Hence, there was nothing preventing the skilled person from selecting 1:2 adduct of boric acid and a salicylic acid as the acid.
- (b) The argument that there was no literature on file stating that such adducts had been used as catalytic compounds in organic reactions was irrelevant, since D3 did not state or suggest that only such anions could be used which had

already been used as catalytic compounds.

- (c) The examples in the patent in suit were not suitable for comparing the activities of the catalysts employed, because under the high concentration conditions applied there was evidently a mass transfer limitation, so that the results were not reproducible, as was shown by the different results obtained in Example A [Comparative Test A] in the patent in suit and Example B [Comparative Test B] of D1. Furthermore, comparative data previously filed by the Appellant (Experiments 1 to 3 filed with the Notice of Opposition) showed that the catalyst containing the boric acid/salicylic acid adduct was inferior to that containing p-toluenesulphonic acid.

The Statement of Grounds of Appeal was accompanied by a report containing two further experiments, numbered 4 and 5, to supplement the results of Experiments 1 to 3 previously filed, and to show that the advantages alleged for the patent in suit were not valid.

V. The Respondent (Patentee) argued, in a submission filed on 10 October 1997, substantially as follows:

- (a) There was no disclosure in D3 of a bidentate amine ligand.
- (b) With regard to the selection of a boric acid/salicylic acid adduct, the question was not

whether there was anything preventing the skilled person from trying such adducts, but whether there was anything motivating him to do so. There was nothing in the cited documents which suggested that these particular adducts could be used in the process of D3 to provide an advantageous yield of polymer.

- (c) As regards the experimental data, more polymer was obtained per unit time, according to the example of the patent in suit, than in Comparative Test A, which differed from the example according to the patent in suit only in the replacement of the boric acid/salicylic acid complex  $H[B(OC_6H_4CO_2)_2]$  by para-toluenesulphonic acid. Even if the comparison were made with Comparative Test B of D1 (not forming state of the art), as canvassed by the Appellant, more polymer was still produced in the single example of the patent in suit. The further experiments supplied by the Appellant were not identical examples showing a widely differing result.

VI. With a summons issued on 1 October 1998, the Board invited the parties to attend oral proceedings set for 3 February 1999.

VII. On 4 January 1999, the Appellant filed a report of further Experiments 6 to 12, to show that, when examples identical to those of the patent were reproduced, the results varied so widely that the error was greater than the alleged improvement.

VIII. Oral proceedings were held before the Board as scheduled.

In its preliminary remarks, the Board noted that a further amended page of description had been submitted ten days after the oral proceedings before the Opposition Division (page 4, filed on 6 December 1996). This page was not, however, regarded as forming part of the text of the patent under consideration. This was confirmed by the Respondent.

As to the experimental data in the submission filed on 4 January 1999 by the Appellant (section VII, above), the Board decided, after hearing the parties, to exclude this from consideration, pursuant to Article 114(2) EPC.

The Appellant, furthermore, filed, during the oral proceedings, a Table of experiments summarising the results of the experimental data so far submitted. Apart from the results of the experiments filed on 4 January 1999, it was admitted to the proceedings.

IX. The Appellant requested that the decision under appeal be set aside, and the patent in suit revoked in its entirety.

The Respondent requested that the appeal be dismissed, and that the patent be maintained in the form approved by the Opposition Division, i.e. not including amended page 4 as filed on 6 December 1996.

## Reasons for the Decision

1. The appeal is admissible.
2. Late-filed evidence

The report of "Experiments 6 - 12", submitted by the Appellant on 4 January 1999, was filed less than one month before the date appointed for the oral proceedings. The Respondent was thereby deprived of any opportunity to repeat the Appellant's experiments with a view to formulating an adequate reply. It must therefore be regarded as late-filed. The argument of the Appellant, that the experiments were intended to meet the Respondent's criticism of the failure to repeat the exemplified process, fails to take into account that the relevant criticism was submitted on 10 October 1997, i.e. over fourteen months previously. No reason was given for the failure to respond earlier. Consequently, the report "Experiments 6 -12" must be regarded as unnecessarily late-filed.

As regards the content of the latter, it goes beyond the factual framework of the proceedings so far. According to the principles laid down in the decision T 1002/92 (OJ EPO 1995, 605), such matter should only very exceptionally be introduced into the proceedings in the appropriate exercise of the Board's discretion if it is prima facie highly relevant in the sense that it can reasonably be expected to change the eventual

result and is thus highly likely to prejudice the maintenance of the European patent (Reasons for the decision, point 3.4(3), fifth sub-paragraph). Since, however, in the Board's view, the relevance of the late-filed evidence was not such as to meet this criterion, it was excluded from the proceedings under Article 114(2) EPC.

The Table of experiments filed at the oral proceedings is merely a summary of the experimental results already in the proceedings and thus does not go beyond the factual framework of the case, except insofar as it also refers to the results filed on 4 January 1999, which were excluded from consideration (section VIII, above). Apart from the latter results, therefore, it was admitted to the proceedings.

3. The text underlying the decision

The text of the patent in suit considered and decided upon, in the sense of Article 113(2) EPC, by the Board, is the same as that which forms the basis of the decision under appeal. This in turn is the text decided upon at the oral proceedings held on 26 November 1996 before the Opposition Division and attached to the minutes thereof. This text consists of:

Claims:

Claims 1 to 8, filed during the oral proceedings of 26 November 1996;

Description:

pages 2 to 4, filed during the oral proceedings of  
26 November 1996.

The text does not include page 4 filed on 6 December  
1996.

4. Admissibility of amendments

No objection has been raised under Article 123(2) or  
123(3) EPC against the amended form of the patent in  
suit, and the Board sees no reason of its own to take  
a different view. Consequently, no objection under  
Article 123 EPC arises in respect of the claims and  
description forming the text under consideration.

5. The patent in suit; the technical problem

The patent in suit is concerned with preparing  
polyketones by polymerising a mixture of carbon  
monoxide (CO) and one or more olefins in the presence  
of a palladium catalyst, the catalyst being prepared  
from the following components:

- (a) a palladium source;
  - (b) a bidentate amine, phosphine, arsine or stibine;  
and
  - (c) a source of an anion
- (Claim 1; Claim 8).

Such subject-matter is, however, known from D3, which represents the closest state of the art.

5.1 According to D3, a catalyst composition comprises:

- a) a compound of a Group VIII metal chosen from palladium, cobalt and nickel,
- b) an anion of an acid with a pKa of less than 6, and
- c) a bidentate ligand of the general formula:  
 $R^1 R^2-M-R-M-R^3 R^4$ , wherein M represents phosphorus, arsenic or antimony, R is a bivalent organic bridging group containing two or three carbon atoms in the bridge and  $R^1$ ,  $R^2$ ,  $R^3$  and  $R^4$  represent hydrocarbon groups which may or may not be substituted with polar groups, on the understanding that at least one of the groups  $R^1$ ,  $R^2$ ,  $R^3$  and  $R^4$  is substituted with a polar substituent (Claim 1).

The acid is a sulphonic acid, preferably p-toluenesulphonic acid or a carboxylic acid, preferably trifluoroacetic acid (Claim 5), although tartaric acid, 2,5-dihydroxybenzoic acid and hydrochloric acid are mentioned (column 2, line 49 to column 3, line 6).

Eligible polar substituents are, for instance, halogens and groups of the general formula  $R^5-O-$ ,  $R^5-S-$ ,  $R^5-CO-$ ,  $R^5-CO-O-$ ,  $R^5-CO-NH-$ ,  $R^5-CO-NR^6-$ , etc., wherein  $R^5$  and  $R^6$  represent similar or dissimilar alkyl or aryl groups (column 3, lines 27 to 33).



According to the relevant Comparative Example 2 in conjunction with Comparative Example 1, however, in which no polar substituent is present in component (c), the catalyst used was solution consisting of:  
6 ml methanol,  
0.02 mmol palladium acetate,  
0.02 mmol 1,3-bis(diphenylphosphine)propane and  
0.04 mmol p-toluenesulphonic acid.

The solution was introduced into an autoclave into which 200 ml methanol had previously been introduced and, after expulsion of air and heating to a temperature of 85°C, had been pressurised to 55 bar with a 1:1 carbon monoxide/ethene mixture for 3 h. A copolymer having a limiting viscosity number of 0.52 dl/g was prepared at a reaction rate of 5.0 kg copolymer/g palladium/h.

5.2 Compared with this state of the art, the technical problem addressed by the patent in suit was to provide particularly high reaction rates and a low catalyst deactivation on recycle (page 2, lines 28 to 30).

5.3 The solution proposed according to the claims of the patent in suit consists of:

- (i) replacing component (c) by the boron/salicylic acid complex specified in Claims 1 and 8 as the source of anion; and
- (ii) using a bidentate ligand having no polar group.

5.3.1 Whilst it was common ground that feature (i) represented a modification of the disclosure of D3, there was some discussion, at the oral proceedings, as to whether the term "aryl" in the definition of the bidentate ligand in Claim 1 of the patent in suit in fact excluded polar groups, and therefore, whether feature (ii) represented an additional distinction over the disclosure of D3.

5.3.2 The argument of the Appellant, that the term "aryl" in the definition of the ligand groups  $R^1$  in the patent in suit did not exclude such groups substituted with polar substituents, is not convincing to the Board for the following reasons:

5.3.2.1 Firstly, the full definition of the  $R^1$  groups in the patent in suit is "the  $R^1$  groups are independently alkyl, cycloalkyl or aryl groups". Thus, the term "aryl" represents a third possibility after an aliphatic and a cycloaliphatic hydrocarbon group has been defined. It is logical to regard "aryl" as referring to a third hydrocarbon group, which, together with first two covers all three possible categories of such groups (aliphatic, cycloaliphatic and aromatic).

5.3.2.2 Secondly, there is no reference in the entire disclosure to any further substituents, let alone polar ones. In this connection, the only aryl group actually described is phenyl (page 3, lines 40 to 41 and 44 to 47; Example 1). Thus, interpreting the claim in the light of the description, there is no

justification for reading the term "aryl" as referring to anything else than aromatic hydrocarbon substituents.

5.3.2.3 Thirdly, this interpretation is implicitly supported by the position adopted by the Respondent, at the oral proceedings, that such a distinction did in fact exist.

5.3.2.4 Consequently, the correct interpretation of the term "aryl group" in Claim 1 of the patent in suit, in the Board's view, is "aromatic hydrocarbon group".

5.3.3 In summary, the solution of the technical problem differs from the disclosure of D3 in respect of features (i) and (ii) above.

5.4 Although the patent in suit contains an example showing a higher amount of polyketone polymer formed per unit time for a given weight of catalyst, as well as a favourably low catalyst deactivation on recycle, using a catalyst according to the patent in suit, compared with an otherwise identical process using p-toluenesulphonic acid as component (c), the existence of the reported improvement was also a matter of dispute.

5.4.1 The argument of the Appellant, that Comparative Test B in D1 and Comparative Test A in the patent in suit, whilst giving the same yield of polymer (5.07 g) using the same reactants, had different reaction times (one hour in the case of Comparative Test B in D1 as

against 40 min in Comparative Test A in the patent in suit), is not directly relevant to the claimed subject-matter, because it is the comparison of two comparative tests, neither of which is according to the claimed subject-matter. Furthermore, D1 is of even date with the patent in suit and thus does not form state of the art. Finally, even if it were accepted that the 5.07 g polymer were obtained according to Comparative Test A in the patent in suit in a shorter time than according to Comparative Test B in D1, this merely means that the former represents a more severe standard than the latter. Yet it is with the former that the relevant example according to the patent in suit is compared. Hence, the yield obtained according to the example of the patent in suit, which is greater still than that obtained according to Comparative Test A, shows a convincing improvement.

5.4.2 The report of Experiments 1 to 3, filed with the original Notice of Opposition, was criticised, on the basis that the procedure used was not identical with that exemplified in the patent in suit. In particular, the experiments incorporated features, such as a much higher dilution of the reactants, and the initial seeding of the reactor with a ready-formed terpolymer, which were different, and, in the case of seeding, had not been known at the priority date of the patent in suit. These criticisms, which were accepted as valid in the decision under appeal (Reasons, point 4.5), have not been refuted in the subsequent proceedings. Nor does the Board see any reason of its own to take a different view. Consequently, the experimental report

containing Experiments 1 to 3 is not regarded as relevant to the claimed subject-matter or, therefore, as putting the validity of the improvement exemplified in the patent in suit in question.

5.4.3 The further experimental data, filed by the Appellant with the Statement of Grounds of Appeal, namely Experiments 4 and 5, are not intended to be repetitions of the claimed process, but are variants of Example 2 (for comparison) of D3. This example of D3 is, however, itself a variant of the teaching according to D3, since it does not involve the use of a polar group in the ligand component (section 5.3 etc., above). Quite apart from this, there are a number of differences between the latter procedure and that according to the patent in suit, as follows:

- (a) The concentration of the catalyst components in the carrier solvent according to Example 2 of D3 is much lower than that according to the example in the patent in suit. Indeed, the Appellant has criticised the example of the patent in suit on the basis that the concentration of the components was too high to ensure free mass transfer (section IV(c), above).
- (b) Whereas, according to Example 2 of D3, the monomer reactants (CO, ethene) are introduced into the autoclave reactor prior to the addition of a solution containing the components of the catalyst, the opposite order is followed in the

example according to the patent in suit:  
according to the latter, the monomer reactants  
are introduced into the autoclave after the  
solution of catalyst components.

5.4.3.1 Whilst neither of the parties was able to offer any explanation of the significance of the latter difference, it was not denied that such differences existed. Consequently, the comparison between the example in the patent in suit and Comparative Test A in the latter, which differ only by the replacement, in Comparative Test A, of the boron acid/salicylic acid complex by p-toluene sulphonic acid, represents a closer comparison than that with the closest state of the art D3.

5.4.3.2 In this connection, an Applicant or Patentee may discharge his onus of proof by voluntarily submitting comparative tests with newly prepared variants of the closest state of the art making identical the features common with the invention in order to have a variant lying closer to the invention so that the advantageous effect attributable to the distinguishing features of the invention is thereby more clearly demonstrated (T 35/85 of 16 December 1986, not published in OJ EPO, Reasons for the decision, point 4, supplementing T 181/82 "Spiro-compounds", OJ EPO 1984, 401).

5.4.3.3 In summary, the pair of results from the example and Comparative Test A, respectively, in the patent in suit are regarded as representing a more demanding comparison than that with the relevant disclosure of

D3. Consequently, they represent at least as fair a comparison for the establishment of a relevant improvement in polymer yield per unit weight and time of catalyst according to the patent in suit.

5.4.3.4 The criticism of the Appellant, that there would be lack of freedom of mass transfer due to the high concentrations of the components in the latter Example, fails to take account of the fact that the Respondent, like the Appellant, is an expert in the field of such polymerisation processes and is, moreover, under a heavy obligation of good faith in the presentation of his invention to the public. The argument, whilst undoubtedly directing attention to a difficulty which may arise in the practical operation of such a process, does not in itself suffice to convince the Board that the difficulty is insuperable. On the contrary, in the case of irreconcilable assertions of fact by the parties, which cannot be finally resolved by the Board, the practice is to decide the matter in favour of the Patentee (T 219/83, OJ EPO 1986, 211). Hence, the results reported in the patent in suit are regarded as reliable.

5.4.4 Furthermore, in the absence of any relevant and convincing evidence to the contrary (sections 5.4.1; 5.4.3, above), there is no reason to doubt the similar improvement, as between the example and Comparative Test A, reported in the patent in suit, in the activity of the catalyst on recycle.

5.4.5 In summary, the Board finds it credible that the

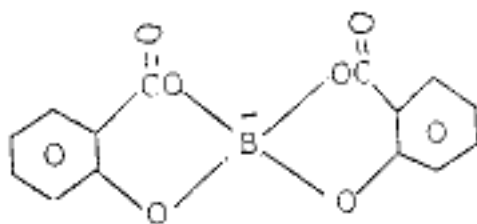
claimed measures provide an effective solution of the stated problem.

6. Novelty

Lack of novelty of the subject-matter claimed in the patent in suit was not a ground of opposition and has not been alleged at any stage of the proceedings.

7. Inventive step

The first question which has to be determined in relation to inventive step is whether the skilled person, starting from the procedure described in D3, would expect that an improved or at least comparable yield of polymer would be achieved by replacing, in the catalyst, the p-toluene sulphonic acid, as acid having a pKa of less than 6, by a source of an anion of the formula:



or a substituted derivative thereof (step (i) of the solution of the stated problem).

7.1 There is no suggestion, in D3, to use salicylic acid, let alone a boron complex thereof, as component (c). Even the 2,5-dihydroxybenzoic acid referred to in the general description (column 3, lines 2 to 3) is not



preferred. Consequently, there is no hint to the solution of the stated problem in D3.

7.2 The argument of the Appellant, that any acid of pKa less than 6 would be expected to provide an effective solution of the technical problem, was based on the concept that the problem would be solved if any polymer at all were formed (sections IV(a); IV(b), above). This position is untenable, however, because the relevant technical problem has been found to be that of providing particularly high reaction rates (section 5.2, above). Consequently, any effective solution of the technical problem would have to provide a result at least comparable to that according to the closest prior art.

7.2.1 In particular, whilst D5 and D6 refer to boron/oxyarylcarboxylic acid complexes and states that their conductivity and hence their acidity is enhanced by the presence of the boric acid, neither document makes any reference to the boron complex acids having any value, or even a possible application in the field of catalysis, let alone polymer catalysis of the type with which the patent in suit is concerned. Consequently, neither of these teachings would be of any assistance to the skilled person searching for further acids at least comparably useful to those disclosed in D3.

7.2.2 Quite apart from this, it was never demonstrated by the Appellant that the boron/salicylic acid complexes according to the patent in suit actually possessed a

pKa less than 6, as required by the teaching of D3. The argument that salicylic acid itself had a pKa of less than 6, and therefore its complex with boric acid must, according to D5, be still more acid, i.e. have a still lower pKa, goes beyond what is said in D5, which makes only a general statement and does not refer specifically to salicylic acid, or even to 2,5-dihydroxybenzoic acid. On the contrary, according to the patent in suit, a similar (now deleted) embodiment of a somewhat similar such boron acid/aromatic compound complex is stated to be hydrolysable and therefore not to have a measurable pKa. Thus, there is no evidence that, even if, in spite of the absence of any incentive in this direction, the attention of the skilled person were for some reason to alight on the boron/acid complexes according to the patent in suit, and he were to measure their pKa, the result would be as required in D3, i.e. less than 6. Consequently, there is no reason for concluding that the acid complexes disclosed in D5 and D6 would fall into the category of acids from which a relevant choice could be made according to D3.

7.2.3 In summary, there is no hint, in D3, even in the light of D5 and D6, to make modification (i) corresponding to the solution of the stated problem.

7.3 According to D7, there is used, as catalyst in the presence of which a process for the preparation of polyketones by polymerising a mixture of CO and an alkenically unsaturated hydrocarbon is carried out, a complex compound obtained by reacting a palladium,

cobalt or nickel compound and an anion of an acid with a pKa less than 2, provided it is neither a hydrohalogenic acid nor carboxylic acid, and a bidentate ligand of specified formula (Claim 1 in conjunction with page 4, line 11 to page 5, line 11).

- 7.3.1 There is no hint to the use of the boron/salicylic acid complexes forming the solution of the technical problem in this document, because it is an essential feature of the process that the relevant anion cannot be a carboxylic acid. Indeed, it was confirmed, at the oral proceedings, by the Appellant, who was also the Proprietor of D7, that at the relevant date it was thought that neither carboxylic acids nor hydrohalogenic acids could be used in such catalysts.
- 7.3.2 Consequently, there is no hint in D7 to make modification (i) of the solution of the stated problem.
- 7.4 Quite apart from this, no arguments or evidence were adduced by the Appellant to show why the skilled person, starting from D3, should have made modification (ii) in the solution of the stated problem, namely the omission of the polar group in the ligand.
- 7.5 In summary, the solution of the technical problem as stated does not arise in an obvious way, starting from D3, whether as to modification (i) or to the combination of modifications (i) and (ii).

7.6 Nor would the result have been different starting from D7 as closest state of the art, since the absolute prohibition, in Claim 1 of the latter, of the use of a carboxylic acid in the relevant anion would constitute a disincentive explicitly dissuading the skilled person from considering any of the relevant acid anions, or, indeed, any other document referring to such anions.

7.7 In other words, the subject-matter of Claim 8, and therefore of Claims 1 to 7, which are all limited to the use of the catalyst according to Claim 8, involves an inventive step in the sense of Article 56 EPC.

#### Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:

E. Görgmaier

C. Gérardin