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**Datasheet for the decision
of 7 December 2016**

Case Number: T 1501/11 - 3.2.05

Application Number: 02011247.0

Publication Number: 1364760

IPC: B29B9/14

Language of the proceedings: EN

Title of invention:

Emission-reduced articles from longfiber reinforced polypropylene

Patent Proprietor:

Borealis Technology Oy

Opponent:

Sabir Petrochemicals B.V.

Headword:

Relevant legal provisions:

EPC 1973 Art. 100(b), 56, 54(2)

EPC Art. 123(2)

Keyword:

Amendments - added subject-matter (no)

Sufficiency of disclosure (yes)

Novelty (yes)

Inventive step (yes)

Decisions cited:

Catchword:



Beschwerdekammern
Boards of Appeal
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Case Number: T 1501/11 - 3.2.05

D E C I S I O N
of Technical Board of Appeal 3.2.05
of 7 December 2016

Appellant: Sabic Petrochemicals B.V.
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Decision under appeal: Interlocutory decision of the Opposition
Division of the European Patent Office posted on
13 May 2011 concerning maintenance of the
European Patent No. 1364760 in amended form.

Composition of the Board:

Chairman M. Poock
Members: P. Lanz
G. Weiss

Summary of Facts and Submissions

- I. The appeal by the opponent is against the decision of the opposition division that, taking into account the amendments made by the patent proprietor during the opposition proceedings, European patent EP-B-1 364 760 and the invention to which it relates are found to meet the requirements of the European Patent Convention.
- II. During the opposition proceedings, the opponent raised the grounds for opposition according to Article 100(a) EPC 1973 (lack of novelty and lack of inventive step) and Article 100(b) EPC 1973.
- III. Oral proceedings were held before the board of appeal on 7 December 2016.
- IV. The appellant requested that the decision under appeal be set aside and that the European patent be revoked.
- V. The respondent (patent proprietor) requested that the appeal be dismissed (main request) or that the decision under appeal be set aside and that the patent be maintained in amended form on the basis of the first to sixth auxiliary requests filed with letter dated 26 March 2012.
- VI. The independent claims of the main request have the following wording:

"1. Granules which are comprised of long fiber reinforced polypropylene, the granules being obtained by first contacting reinforcing fibers, preferably in the shape of an endless roving, with a molten first polypropylene having an MFR of from 100 to 150 g/10 min and then coating the impregnated fibers with a molten

second polypropylene being a propylene homopolymer having an MFR of from 0.2 to 60 g/10 min, thereby forming a strand of fiber reinforced polypropylene and subsequently cutting the strand into granules, whereby the amounts of fiber and of first and second polypropylene are selected for the granules to have a fiber content of from 2 to 30 vol% and where the granules - in a cross-sectional view - have a two-layer-structure, preferably a core sheath-structure, where the inner layer is comprised of the reinforcing fibers being impregnated with the first polypropylene which has an MFR which is at least 2 times the MFR of the second polypropylene, which comprises the outer layer."

"2. Use of granules which are comprised of long fiber reinforced polypropylene, the granules being obtained by first contacting reinforcing fibers, preferably in the shape of an endless roving, with a molten first polypropylene having an MFR of ≥ 35 g/10 min and then coating the impregnated fibers with a molten second polypropylene having an MFR ≤ 80 g/10 min, thereby forming a strand of fiber reinforced polypropylene and subsequently cutting the strand into granules, whereby the amounts of fiber and of first and second polypropylene are selected for the granules to have a fiber content of from 2 to 30 vol% and where the granules - in a cross-sectional view - have a two-layer-structure, preferably a core-sheath-structure, where the inner layer is comprised of the reinforcing fibers being impregnated with the first polypropylene which has an MFR which is at least 2 times the MFR of the second polypropylene, which comprises the outer layer, for producing articles with improved emission behaviour having an emission value of ≤ 60 $\mu\text{g/g}$, the

articles being produced by a moulding or extrusion process."

VII. Reference is made to following documents:

D1: NL 1010646;

D1a: English translation of D1;

D2: JP 05 177629;

D2a: Machine translation of D2;

D3: US 4 937 028;

D4: US 2002/0052440;

D5: EP 0 663 418;

E3: VDA Empfehlung 277 "Nichtmetallische Werkstoffe der Kfz-Innenausstattung Bestimmung der Emission organischer Verbindungen", dated January 1995;

E4: WO 99/65661;

E5: Ides prospector datasheet of Braskem PP (formerly Sunoco PP) F1000HC;

E6: Ides prospector datasheet of Braskem PP (formerly Sunoco PP) F350HC2;

E7: Experimental test report of Borealis;

E8: Additional experimental test report of imat uve GmbH.

VIII. The appellant's submissions may be summarised as follows:

Added subject-matter

In claim 1 no explicit limitation with respect to the emission values of the articles produced from the claimed granules was mentioned, whereas in the second paragraph on page 4 of the application as filed an emission value (of $\leq 40\mu\text{g/g}$) was clearly disclosed in combination with the MFR (melt flow rate) ranges of the first and second polypropylenes in the granules. By omitting the emission value, which was not an inherent property of the claimed material, the patent was now also directed to granules having the specified polypropylene types and MFR, however, without yielding the emission value of $\leq 40\mu\text{g/g}$. In fact, with a fibre content of 2 vol% as now claimed and on the basis of the information given in Table 1, example 1 of the application as filed, an emission value of $48.6\ \mu\text{g/g}$ could be calculated. Such granules with emission values of $>40\mu\text{g/g}$ were in contradiction to the teaching of the second paragraph on page 4 of the application as filed. Finally, it had to be emphasised that this was not a new objection first raised during the appeal proceedings, but was already dealt with in the impugned decision.

Sufficiency of disclosure

Claims 1 and 2 as maintained in amended form required the fibres to be impregnated ("*...and then coating the impregnated fibers with a molten second polypropylene ...*"). Moreover, according to paragraph [0029] of the published patent, the impregnating

polypropylene had to be treated in order to be able to thoroughly impregnate the fibres. It was, however, not defined whether the first polypropylene and the impregnating polypropylene were the same and which of the several possible treatments had to be applied. The disclosure of the patent was therefore insufficient in that respect.

Additionally, the information given in the patent was not sufficient to achieve the technical effect of lowering the emission values to $\leq 60\mu\text{g/g}$ (or even $\leq 40\mu\text{g/g}$). In fact, the appellant's tests using polypropylenes according to datasheets E5 and E6 resulted in emission values of $682\mu\text{g/g}$ and $497\mu\text{g/g}$, respectively, when measured according to the standard of document E3. Moreover, the MFR for the first polypropylene had no upper limit. Since it was known that a high MFR resulted in increased emission values, it could not be understood how the manufactured articles of the contested patent could yield the low emission values presently claimed. It had to be concluded that the invention was not sufficiently disclosed over the whole range of MFR values claimed.

Finally, reference was made to the last features of claim 2, which stated that the articles having an emission value of $\leq 60\mu\text{g/g}$ were produced by a moulding or extrusion process. According to paragraph [0049] of the contested patent, the test for measuring the emission value had to be done on samples cut from a moulded specimen of a specific dimension. The test could therefore not be used to measure the emission of any article. Hence, it remained unclear how the emission values should be measured on moulded articles of undefined shape or on the extruded articles of claim 2.

Novelty

The subject-matter of claim 2, which was drafted as a normal use claim, was not novel in view of document D1. In fact, the purpose of claim 2 was to produce an article. Document D1 disclosed reinforcing fibre rovings covered with a molten first polypropylene layer having an MFR of 700 g/10 min, which was coated with a molten second polypropylene having an MFR 40 g/10 min, cutting the strand into granules with a fibre content of 14 vol% and using them for producing articles in the form of test sheets (cf. translation D1a, page 2, lines 14 to 23, page 6, line 28, page 7, lines 5 to 17 and page 8, lines 1 to 12). The claimed emission value was an inherent property of the used granules, which were already known from document D1. The subject-matter of claim 2 was thus not novel.

Inventive step

Document D3 was the closest prior art, from which the subject-matter of claim 1 differed in that the first polypropylene in document D3 had an MFR of 350 g/10min (cf. D3, column 5, line 17) and in that the second polypropylene was not disclosed as being a homopolymer of propylene but rather as "polypropylene" in general (cf. D3, column 5, line 56).

These differing features were not interrelated and their possible contributions had to be assessed independently of each other. It was not shown that the claimed granules had lower emission properties than those of the prior art. However, for the sake of argument, it was accepted that the partial technical problem linked to the MFR value was to reduce their

emissions in combination with ensuring a good impregnation of the fibres.

As could be seen from the respondent's statement recorded in the minutes of the oral proceedings before the opposition division ("*...for the skilled person it is generally known that the emission value of the resin directly corresponds with the value of the MFR of the resin*", cf. page 4, second paragraph), it was part of the common general knowledge that lowering the MFR resulted in lower emission values. Moreover, document D5, which related to articles formed of long glass fibre-reinforced materials having two polypropylenes, disclosed on page 3, lines 23 to 27 and page 5, lines 13 and 14 that the fibre impregnation was still good even if the MFR was lowered, and that the optimum range for the MFR was about 80 to 150 g/10 min. Hence, the solution to the first partial problem was obvious in view of the admitted common general knowledge and the teaching of document D5. As to the second differing feature, the specific choice of a polypropylene homopolymer was a simple selection from a limited number of alternatives.

The subject-matter of claim 1 was therefore not inventive. The same reasons applied to the subject-matter of claim 2.

During the written procedure, the appellant challenged the presence of an inventive step in the subject-matter of claim 1, also starting from document D5, in particular example 3. The subject-matter claimed differed from this disclosure only in that the second polypropylene layer was not applied in a separate mixing process.

The objective technical problem was to provide a further form of a long glass fibre-filled polypropylene resin containing glass fibres impregnated with a high MFR polypropylene and a low MFR homopolymer of polypropylene.

A skilled person confronted with this technical problem would consult document D3, which belonged to the same technical field, and learn that he could apply the second polypropylene as a layer around the fibres impregnated with the first polypropylene (cf. D3, column 5, lines 54 to 58) in order to achieve the obvious advantage of simplifying material handling and preventing mixing failures. The same arguments applied to a combination of document D5 with documents D1, D2 or E4.

For the above reasons, the subject-matter of claim 1 was not based on an inventive step.

IX. The respondent's submissions were essentially as follows:

Added subject-matter

It had to be noted that the objection of added subject-matter was raised for the first time during the appeal proceedings, although the perceived deficiency was already present when the patent was granted. The appellant was thus not entitled to raise it at such a late stage. As to the substance, one had to keep in mind that, if the appellant wanted to rely on the argument that not all of the claimed granules exhibited as moulded article the emission values indicated in the patent, it was upon him to provide the elements of proof in the form of real life examples, and not only

allegations based on a theoretical calculation. From the respondent's point of view, it was not apparent why not mentioning in the claims a technical effect which was indicated in the description should cause problems under Article 123(2) EPC.

Sufficiency of disclosure

At the time of filing of the application it was known that polymers with high MFR were obtained by producing polymers with low or moderate MFR and subsequently degrading them. In the examples of the patent, a commercial product (HK060AE) was used which was a typical member of the class of high MFR polypropylenes obtained by increasing the melt flow rate by degrading a polypropylene with higher melt flow rate. Thus, the statement that the impregnating polypropylene had to be treated did not cause any problems under Article 100(b) EPC 1973, in particular since the patent contained examples which enabled the skilled person to rework the invention.

Moreover, it was noted that the appellant did not submit any reports on its testing. It was therefore impossible for the board and the respondent to verify exactly under what conditions the polymers had been analysed. Additionally, differences existed in the measuring conditions according to the method of the patent and the method of document E3, in particular regarding the oven temperature program, the injector temperature, and the detector temperature (cf. paragraph [0051] of the published patent and item 3.2 of document E3). Thus, the method allegedly used by the appellant was not a true reproduction of the method required by the patent. Furthermore, the appellant's measurements had been carried out on a single polymer

and not, as required, on a specimen made from the granules containing a fibre and two different polypropylenes. No comparison was possible between the examples falling under the claimed subject-matter and the measurements provided by the appellant. In order to demonstrate that the results of the appellant's test were not reliable, the respondent had carried out further experiments (cf. documents E7 and E8). A first batch of granules was tested, which had been produced using the same polypropylenes the appellant had used for its tests and which did not have the core-shell structure of the disputed claims. Although the emission value of these granules was measured according to the standard the appellant had used (which was not according to the patent), the resulting emissions were at 74µg/g, which was much lower than the emission values obtained by the appellant. The allegation of an insufficient disclosure of claim 1 was therefore unsubstantiated.

As to the argument of the missing upper limit of the MFR of the first polypropylene, one had to take into account that claim 2 was directed to the use of granules for producing articles and that it had the additional requirement that the emission values of the articles were $\leq 60\mu\text{g/g}$. Moreover, reference was made to the five working examples of the patent and to the fact that the samples prepared from the claimed granules possessed emission values in the range of $\leq 60\mu\text{g/g}$. Contrary to such experimental evidence to be found in the present patent, the appellant had not provided any emission values for the claimed granules (or the article moulded therewith) having the claimed fibre component, the claimed combination of an impregnating and a coating polymer and the claimed two layer structure. In conclusion, there was no proper evidence

available that could support the view that the use of the granules according to claim 2 would not lead to articles having emission values not higher than 60µg/g. As to the measurement of the emission values of the articles produced according to claim 2, the appellant had not submitted any evidence that using the test described in the patent for measuring the emission values of the produced articles of claim 2 would not yield reliable results. The subject-matter of claim 2 was therefore sufficiently disclosed in that respect, too.

Novelty

Claim 2 was directed to the use of granules to improve emission behaviour. Document D1 did not address the emission requirement. Accordingly, the technical feature "reducing the emission of an article to values of not more than 60µg/g" of claim 2, received no mention in document D1. Furthermore, claim 2 comprised the step of impregnating the fibres, which had to be distinguished from a coating of the fibre bundle as proposed in document D1. Thus, document D1 could not be novelty-destroying for the independent use claim of the patent.

Inventive step

Document D3 was the closest prior art since it disclosed subject-matter conceived for the same purpose or aiming at the same objective as the claimed invention and had the most relevant technical features in common, i.e. it required the minimum of structural modifications.

The difference between the granules of document D3 and those of claim 1 as maintained could be seen in the specific selection of the first polypropylene in view of the MFR and the specific selection of the second polypropylene, in particular in view of the MFR.

This specific selection of parameters contributed to obtaining granules with low emission and good mechanical properties. The comparative tests submitted by the appellant were not suitable as a basis for contesting that the technical effect of low emission values was achieved, since only single components and no moulded samples of granules were analysed in these tests. Moreover, they were not suitable as proof that the specific example 1 in document D3 had emission values similar to the ones of the granules of the patent, because the appellant did not measure granules with a two-layer structure within the terms of the patent.

Thus, in view of the improvements shown by the examples in the patent, the technical problem to be solved was to provide granules with low emission.

As document D3 did not provide any hint or guidance as to the specific selection of ranges as claimed in claim 1, document D3 could not take away inventive step. The same was true for document D5, which did not mention emission problems and had inferior mechanical properties. Accordingly, the skilled person would not consider document D5. Even if the document were to be taken into account, a combination of the teaching of document D3 with that of document D5 would not anticipate all the features of claim 1, since document D5 was lacking the information that the melt flow rate MFR of the first polypropylene had to be twice as high

as the melt flow rate of the second polypropylene. Moreover, no evidence was provided for the allegation that it belonged to the common general knowledge that the emission values depended on the MFR. Given these considerations, claim 1 was inventive in view of document D3, also when taking into account document D5.

Equally, the appellant's inventive step attack starting from document D5 could not be successful. Document D5 failed to disclose not only the two-layered structure but also the aspect that the MFR of the first polypropylene must be twice as high as the melt flow rate of the second polypropylene. Moreover, in document D5 example 3 was not presented as particularly preferred over the other examples, so that its selection as a starting point was already based on an *ex-post facto* analysis. Since claim 1 differed from document D5 not only in its structure, but also regarding the specific selection of the interrelated MFR values, the presence of an inventive step had to be acknowledged vis-à-vis document D5 alone, but also in view of a combination of D5 with any of the further documents cited in the proceedings.

As there was no mention in any of the documents that the claimed granules were suitable for the purpose of lowering the emission values, the subject-matter of claim 2 was also based on an inventive step.

Reasons for the Decision

1. Content of the patent

1.1 It is noted that the content of page 11 of the application as originally filed does not form part of the patent specification published as EP 1 364 760 B1.

1.2 In the decision under appeal (cf. point 2 of the Reasons), the opposition division found that the documents forming the basis of the decision to grant the opposed patent included the content of original page 11. According to Legal Advice No. 17/90 (which was still applicable at the time the decision was taken), the text on which the decision to grant the patent was based had to be accepted as authentic. Consequently, the content of original page 11 formed part of the content of the granted patent.

1.3 This finding of the opposition division remained uncontested during the appeal proceedings and is endorsed by the board.

2. *Added subject-matter*

2.1 The appellant argues that in the second paragraph on page 4 of the application as filed, which formed a basis for present claim 1, an emission value of $\leq 40\mu\text{g/g}$ was clearly disclosed in combination with the claimed MFR ranges of the first and second polypropylenes in the granules. The emission values were not an inherent property of the claimed material, and an explicit limitation with respect to the emission values of the articles produced from the claimed granules was therefore required in claim 1.

2.2 The board notes that this objection under Article 123(2) EPC is discussed in the impugned decision (cf. point 3 of the Reasons). It can therefore not be regarded as a fresh ground for opposition introduced at the appeal stage, which could be considered by the board only if the patent proprietor agreed (cf. G 10/91, OJ EPO 1993, 420, Headnote III.)

2.3 As to the substance of the objection, reference is made to the contested wording in the second paragraph on page 4 of the application as originally filed:

"According to an even more preferred embodiment of the present invention the first polypropylene has an MFR of from 100 - 150 g/10 min and the outer layer is comprised of a propylene homopolymer with an MFR of from 0.2 - 60 g/10 min, where the produced articles have an emission value of $\leq 40\mu\text{g/g}$."

In the above passage, the two polypropylenes combined in the preferred embodiment are defined by their respective MFR values, while the indicated emission value is presented as relating to the article produced from these two polypropylenes. In the context of the application as a whole, a skilled person would understand that the last part of the phrase ("*where the produced articles have an emission value of $\leq 40\mu\text{g/g}$* ") constitutes the technical effect achieved by the preferred embodiment of a moulded article made from granules having a certain structure with an outer and an inner polypropylene layer, wherein the polypropylenes have specific MFR values. Since present product claim 1 is directed to granules with this structure, including the two polypropylene layers and their respective MFR values, it does structurally speaking not go beyond the content of the application as filed. Furthermore, it is uncontested that product claim 1 comprises all the parameters of the granules necessary to achieve the asserted technical effect.

For these reasons, the subject-matter of claim 1 of the main request meets the requirements of Article 123(2) EPC.

3. *Sufficiency of disclosure*

3.1 Generally, an objection of lack of sufficient disclosure presupposes that there are serious doubts in that respect, substantiated by verifiable facts. In order to establish insufficiency of disclosure, the burden of proof is upon an opponent to establish that a skilled reader of the patent, using common general knowledge, would be unable to carry out the invention (cf. Case Law of the Boards of Appeal of the European Patent Office, 8th Edition, 2016, II.C.8).

3.2 The appellant's first objection regarding the treated impregnating polypropylene (cf. paragraph [0029] of the published patent) is a mere allegation which is not substantiated by verifiable facts. Moreover, the patent specification contains a specific example of a commercially available treated impregnating polypropylene (cf. paragraph [0066] of the published patent). Thus, the first objection is not sufficient to call into question the sufficiency of the disclosure of the claimed invention.

3.3 Regarding the further arguments that the upper limit of the MFR of the first polypropylene was missing and that the technical effect could not be achieved, it is observed that claim 2 defines a use of certain granules for producing articles with a specific property. It comprises not only the indication of MFR values for two polypropylenes but also the limitation that the emission values of the produced articles have to be $\leq 60\mu\text{g/g}$. The description of the contested patent contains five working examples for the subject-matter claimed, all of them resulting in emission values of the produced articles being clearly below $60\mu\text{g/g}$.

Therefore, the teaching in the patent specification has to be presumed to be sufficient to arrive at an emission value of $\leq 60\mu\text{g/g}$.

- 3.4 The appellant's submissions do not prove the contrary. Account has to be taken of the fact that the emission values of the contested patent relate to the articles moulded from granules containing fibre and two different polypropylenes arranged in two layers. The patent also states that it was due to this structure that the claimed emission values could be achieved (cf. paragraphs [0031] and [0032] of the published patent). Since the measurement results presented by the appellant were not obtained from a moulded article according to the invention and since they were measured using a method different from the one specified in the patent, they are of limited value for proving that the technical effect of the invention could not be achieved due to insufficiency of disclosure. Furthermore, there is no evidence on file that the application of the emission value test of paragraphs [0046] *et seq.* on samples taken from different moulded or extruded articles prepared according to the teaching of the patent would lead to unreliable results.

In conclusion, no evidence has been made available that could support the view that the use of the granules according to claim 2 would not lead to articles having emission values not higher than $60\mu\text{g/g}$.

- 3.5 Hence, the disclosure in the patent as a whole has to be considered sufficient to enable the skilled person to carry out the invention as defined in the claims, Article 100(b) EPC 1973.

4. *Novelty*

4.1 The appellant contests the novelty of the subject-matter of claim 2.

4.2 As established in point 3.3 above, claim 2 defines a use of certain granules for producing specific articles not only by the indication of MFR values for two polypropylenes but also by the limitation that the emission values of the produced articles have to be $\leq 60\mu\text{g/g}$. It is uncontested between the parties that document D1 does not explicitly disclose any emission values. As to the alleged implicit disclosure of this feature, it is observed that the MFR values of the polypropylene layers disclosed in the context of the granules of document D1 differ substantially from the MFR values of the polypropylenes contained in the examples of the patent in suit, for which the emission values are said to be $\leq 60\mu\text{g/g}$. In view of these differences in the MRF values it is not possible to draw any definite conclusion on the emission properties of the test sheets of document D1. Consequently, document D1 does not clearly and unambiguously disclose an article (inherently) having an emission value of not more than $60\mu\text{g/g}$. The same is true for the further prior art documents on file.

For these reasons, the subject-matter of claim 2 of the main request is new, Article 54(1) and (2) EPC 1973.

5. *Inventive step*

5.1 Document D3 discloses in example 1 granules comprised of long fibre-reinforced resin, wherein the fibres are first coated with high MFR polypropylene, which, in

turn, is covered with a low MFR polypropylene. It is therefore directed to the same purpose as the claimed invention and has more of the relevant technical features in common with the subject-matter claimed than document D5, which does not disclose the two-layered structure.

- 5.2 The subject-matter of claim 1 differs from example 1 of document D3 in that the first polypropylene has a lower MFR value and the second polypropylene is specified as being a homopolymer.
- 5.3 Regarding the technical effect achieved, reference is made to the patent specification, according to which a lowering of the emission values depends, at least in part, on the fact that a first polypropylene having a high MFR for achieving a good impregnation is enclosed by a second polypropylene which has low emission values due to a low MFR. To ensure good impregnation, low emissions and good mechanical properties, the polypropylene of the inner layer must have an MFR which is at least two times higher than the MFR of the polypropylene of the outer layer (cf. paragraphs [0029] to [0031]).

It is observed that the granules of document D3 also have a two-layer structure. However, there the polypropylene of the inner layer has an MFR which is clearly higher than the one presently claimed (350 g/10 min vs. 100 to 150 g/10 min). It is not contested that this difference has the effect of (further) lowering the emission values of granules.

Based on these considerations, the objective technical problem to be solved by the invention resides in lowering the emissions.

- 5.4 As to the claimed solution, it is observed that document D5 does not disclose a two-layered structure and remains silent on the aspect of emission. It is therefore not evident that its teaching would point the skilled person towards the claimed invention. The same is true for the other cited documents, none of which discusses the emission values of granules or moulded articles, let alone a dependency of the emission of the granules (or a moulded article) on the MFR of the inner layer of a two-layered (polypropylene) coating. Finally, it is added that there is no objective evidence on file to establish the common general knowledge of the skilled person at the date of filing. Consequently, the appellant's attacks starting from documents D3 or D5 have to be considered as based on an *ex-post facto* analysis. This reasoning applies not only to the subject-matter of claim 1 but also to independent claim 2.
- 5.5 The board concludes that the subject-matter of claims 1 and 2 of the main request is not rendered obvious by the available prior art and is therefore based on an inventive step, Article 56 EPC 1973.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:



D. Meyfarth

M. Pooch

Decision electronically authenticated