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Datasheet for the decision of 23 November 2012

Case Number: T 1736/10 - 3.3.06

Application Number: 98922833.3

Publication Number: 985010

IPC: C10G 45/64

Language of the proceedings: EN

Title of invention:
Process for producing high grade diesel fuel

Patentee:
Neste Oil Oyj

Opponents:
ExxonMobil Research and Engineering Company
Sasol Chevron Consulting Limited

Headword:
Bifunctional catalyst/NESTE OIL

Relevant legal provisions:
RPBA Art. 13(1), 13(3)

Relevant legal provisions (EPC 1973):
EPC Art. 54(1)(2), 56

Keyword:
"Admissibility of auxiliary request I (yes)"
"Novelty (main request and auxiliary request I) (yes)"
"Inventive step (main request and auxiliary request I) (no) - obvious to try with expectation of success"

Decisions cited:
T 1271/05

Catchword:
-

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Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number: T 1736/10 - 3.3.06

D E C I S I O N
of the Technical Board of Appeal 3.3.06
of 23 November 2012

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Decision under appeal: **Interlocutory decision of the Opposition Division of the European Patent Office posted 17 June 2010 concerning maintenance of European patent No. 985010 in amended form.**

Composition of the Board:

Chairman: P.-P. Bracke
Members: L. Li Voti
J. Geschwind

Summary of Facts and Submissions

I. The present appeal is from the decision of the Opposition Division to maintain the European patent no. 0 985 010, concerning a process for producing a diesel fuel, in amended form.

II. In their notices of opposition the two Opponents sought the revocation of the patent on the grounds of Articles 100(a) EPC, because of lack of novelty and inventive step of the claimed subject-matter, and of Articles 100(b) and (c) EPC.

The following documents were cited *inter alia* in support of the oppositions:

(E6): US-A-4764266;
(E7): US-A-5565088;
(E30): SE 9700149-9;
(E31): English translation of (E30).

III. The Opposition Division found in its decision that the claimed subject-matter according to the then pending auxiliary request 1 complied with all the requirements of the EPC.

In particular, as regards the inventive step of the claimed subject-matter, the Opposition Division found that neither document (E7) nor document (E30/31) could be used as closest state of the art in the evaluation of inventive step; document (E6) represented instead a suitable starting point. However, the available prior art documents would not give to the skilled person any incentive for replacing the zeolite beta catalyst used

in document (E6) with a SAPO-11 molecular sieve in order to produce a diesel having a low aromatic content while maintaining the cetane number.

IV. Appeals were filed against this decision by the Patent Proprietor and by Opponent II.

V. The Patent Proprietor (Appellant I) submitted with the statement of the grounds of appeal two sets of claims and an experimental report. Moreover, it submitted with the letter of 24 October 2012 two further sets of amended claims as auxiliary requests II and III.

Opponent II (Appellant II) submitted with the letter of 12 May 2011 an experimental report.

Oral proceedings were held before the Board on 23 November 2012. At the beginning of the oral proceedings, the Patent Proprietor submitted a new main request, which was not admitted into the proceedings after debate. The Patent Proprietor thus reformulated its requests as indicated hereinbelow.

VI. The independent claim 1 according to the Patent Proprietor's final main request, which corresponds to the previous auxiliary request I, i.e. the set of 5 claims considered by the Opposition Division to comply with all the requirements of the EPC, reads as follows:

"1. A process for producing a middle distillate suitable as a diesel fuel, with improved low temperature properties and a low content of aromatic compounds, from a hydrocarbon feed as the starting

material, characterized in that the feed material is a mixture of hydrocarbons boiling in the range of 150 to 400°C and in that said feed is contacted in a single reaction step, in the presence of hydrogen, and at a temperature between 300-400°C, at a pressure of 50-80 bar, hydrocarbon feed liquid hourly space velocity being between 0.5 and 3 h^{-1} and hydrogen feed 200-500 N l/l, with a bifunctional catalyst containing 0.01-10 wt-% of platinum in addition to SAPO-11 molecular sieve, and a carrier for the simultaneous removal of aromatics and isomerization of paraffins, and the bifunctional catalyst is obtained by impregnation of the catalyst with platinum using the pore filling method."

Claim 1 according to the auxiliary request I, which corresponds to the previous auxiliary request III, differs from claim 1 according to the main request only insofar as it specifies that the feed material is a middle distillate mixture of hydrocarbons boiling in the range of 150° to 400°C, and the wording ", and a carrier for the simultaneous removal of aromatics and isomerization of paraffins," is replaced by the wording "and a carrier so as to simultaneously remove aromatics and isomerize paraffins,".

VII. The Patent Proprietor submitted in essence that

- the auxiliary request I had been submitted as a reply to the objections and the experimental report submitted by the Appellant II during the written procedure and was admissible;

- the invention concerned the treatment of a petroleum middle distillate for isomerizing paraffins and

reducing the aromatics content (this aspect of the invention was further clarified by means of the amendments contained in claim 1 of auxiliary request I); as regards the meaning of the wording "middle distillate" it would have been understood by the skilled person at the priority date of the patent in suit to represent a mixture of hydrocarbons as indicated in claim 1 containing also a considerable amount of aromatics, for example, at least 10%;

- therefore, document (E30/31), concerning the treatment of a hydrogenated Tall Oil Fatty Acid (hereinafter referred to as TOFA), which was not a petroleum derivative and did not contain aromatics, was not a suitable starting point for the evaluation of inventive step; furthermore, the skilled person would have not derived from this document any information about the suitability of the disclosed catalysts for simultaneously isomerizing paraffins and reducing the aromatics content;

- the closest prior art was represented instead by document (E6); the cited prior art did not contain any suggestion that the replacement of the catalyst used in document (E6) with that of claim 1 and the use of a higher pressure could lead in a single step to an improved diesel fuel having an improved pour point and a lower content of aromatics by maintaining a similar cetane number, as convincingly shown in the comparative tests submitted with the statement of the grounds of appeal;

- moreover, claim 1 of the auxiliary request I specified also that the starting feed had to be a

distilled fraction and not a hydrocracked mixture as used in example 4 of document (E6);

- as regards the Opponent II's tests of 12 May 2011, they had not been carried out on a petroleum middle distillate since the treated mixture of hydrocarbons contained only 2% of aromatics; therefore, they were not relevant.

VIII. The Opponents submitted *inter alia* that

- auxiliary request I had been late filed and was not clearly allowable; therefore, it was not to be admitted;

- claim 1 according to the main request and the auxiliary request I were not limited to the use of a feed derived from petroleum and containing necessarily aromatics;

- in fact, the term "middle distillate" was identified in the patent in suit as a mixture of hydrocarbons boiling in the range of 150 to 400°C and included a hydrogenated TOFA as used in document (E30/31);

- furthermore, the respective wordings of the two requests "for the simultaneous removal of aromatics and isomerization of paraffins" and "so as to simultaneously remove aromatics and isomerize paraffins" had the same meaning; therefore, the amendments contained in claim 1 of the auxiliary request I did not limit in any way the claimed subject-matter;

- moreover, there was no distinction between the impregnated catalyst used in example 2 of document (E30/31) and that used in the claimed process;

- therefore, the claimed subject-matter lacked novelty or inventive step over document (E30/E31).

IX. The Patent Proprietor requests that the appeal of Opponent II be dismissed or, in the alternative, that the patent be maintained on the basis of the auxiliary request I, filed during the oral proceedings.

X. Opponent II requests that the decision under appeal be set aside and the patent be revoked.

Reasons for the Decision

1. *Admissibility of Patent Proprietor's auxiliary request I*

Auxiliary request I was originally submitted with the letter dated 24 October 2012, i.e. about one month before the oral proceedings, as auxiliary request III.

As explained in said letter, the amendments to claim 1 addressed the arguments and the experimental evidence submitted by Opponent II in support of its novelty and inventive step objections.

Therefore, even though these amendments could have been submitted earlier, they had been clearly occasioned by the grounds of opposition and they attempted to overcome the objections raised by Opponent II.

The Board finds also that the amendments were easily understandable and clearly explained in the Patent Proprietor's letter and they did not change the argumentation of the Patent Proprietor as regards novelty and inventive step.

Hence, the other parties had sufficient time before oral proceedings in order to examine and possibly adapt their cases to the proposed amendments. Moreover, it could be reasonably expected that the parties would have been able to deal with these amendments during oral proceedings.

Therefore, the amendments to the Patent Proprietor's case comply with all the requirements for the exercise of the Board's discretion mentioned in Articles 13(1) and (3) RPBA and have to be admitted.

The Board remarks in this respect that the criterion for admissibility invoked by Opponent II, i.e. that the amended claims have to be clearly allowable in order to be admitted (as indicated, for example in the Case Law of the Boards of Appeal of the EPO, 6th edition, 2010, page 890, 16.2.2, second full, paragraph), is not a criterion listed in Articles 13(1) and (3) RPBA and is certainly not applicable in a case like the present one, wherein the amendments could be easily understood and dealt with by the parties and did not change the Patent Proprietor's argumentation in defence of its patent.

2. *Interpretation of claim 1 of the Patent Proprietor's main request and auxiliary request I*

2.1 Both claims 1 according to the Patent Proprietor's main request and auxiliary request I concern a process for producing a middle distillate, with improved low temperature properties and low content of aromatic compounds, from a hydrocarbon feed as the starting material, wherein the feed material is a mixture of hydrocarbons boiling in the range of 150° to 400°C; claim 1 of the auxiliary request I specifies additionally that the mixture of hydrocarbons used as feed material is a middle distillate.

In the Patent Proprietor's view, the wording "middle distillate" would have been understood by the skilled person at the priority date of the patent in suit as meaning a petroleum distilled fraction containing a mixture of hydrocarbons boiling in the range of 150° to 400°C and including a considerable amount of aromatics, for example at least 10%. Both Opponents contested this restrictive interpretation of the wording and were of the opinion that the patent in suit defined the wording "middle distillate" just as a generic mixture of hydrocarbons boiling in the range of 150° to 400°C, which had not to be necessarily a distilled fraction, and supported an interpretation according to which the middle distillate did not contain any aromatic compounds at all.

The Board remarks that no documents were cited which show a definition of the wording "middle distillate" belonging to common general knowledge. Moreover, no evidence was submitted by the Patent Proprietor or by

the Opponents in support of their interpretation of the wording "middle distillate".

Therefore, in such a case, it is the established jurisprudence of the Boards of Appeal of the EPO that the claim has to be interpreted taking into account the content of the description. In particular, if there is an unambiguous, throughout applicable, disclosure of a term in the description, this should be taken when interpreting the wording of the claims (see Case Law of the Board of Appeal, 6th edition, 2010, page 283, II.B.5.3.3, especially fourth full paragraph and T 1271/05, point 4.3 of the reasons).

2.2 Paragraph 19 of the patent in suit illustrates the starting feed material of the invention (page 3, line 41). This paragraph explains that the feed used according to the invention is a middle distillate and states that "by middle distillate is understood a mixture of hydrocarbons boiling in the range of 150° to 400°C" (page 3, lines 43 to 44 of the patent in suit). Moreover, it is also specified that such a middle distillate feed can be "solvents, petrols, light and heavy gas oils...distillated from such materials as crude oil, or the products of a catalytic cracking or hydrocracking" (page 3, lines 45 to 46).

Furthermore, even though the invention includes undoubtedly the use as a feed of a middle distillate containing aromatics, since it relates explicitly to the removal of aromatics and describes it in some examples (see e.g. page 3, lines 46 to 47 and examples 2 to 5), examples 6 to 8, which have been indicated as reference examples in the amended version

of the patent in suit found by the Opposition Division to comply with the requirements of the EPC, relate to the use as a feed of a hydrogenated TOFA, which mixture of hydrocarbons boiling in the range of claim 1 does not comprise aromatics, is defined in tables 6 to 8 as being a middle distillate feed and is used for producing an improved middle distillate (see page 8, line 43 and page 9, line 10 and 43).

2.3 Claim 1 according to the main request contains also the wording "...said feed is contacted... with a bifunctional catalyst... for the simultaneous removal of aromatics and isomerization of paraffins...". With respect to the interpretation of this part of claim 1 there was also disagreement among the parties, since the Patent Proprietor was of the opinion that the wording "for the simultaneous removal of aromatics and isomerization of paraffins" related to the wording "said feed is contacted" and limited the claim to the use of a feed containing aromatics, whilst the Opponents considered the above mentioned wording to relate only to the immediately preceding description of the used catalyst, thereby identifying a quality of such a catalyst but not implying any necessary limitation on the content of aromatics of the feed.

The description of the patent in suit specifies in paragraph 16 that "the catalyst ensures the removal of aromatics and the simultaneous isomerization of paraffins" (page 3, lines 27 to 28).

Therefore, in the Board's judgement, the skilled person, by considering the wording of the whole claim, the way it is drafted and the fact that the removal of

aromatics and the simultaneous isomerization of paraffins are indicated as qualities of the catalyst also in the description, would have understood that the above mentioned disputed wording which follows directly, without any sentence break or separation, the description of the catalyst, can only relate to the subject-matter immediately preceding it, i.e. the catalyst. In fact, it would have been very easy to draft the disputed wording as part of the process and separately from the description of the catalyst, if it would have been intended to define in a more limited way the single process step and not the catalyst to be used.

Hence, the above disputed wording can only concern a quality of the used catalyst and, consequently, restricts the bifunctional catalyst to be used according to claim 1 to one which is able to simultaneously remove aromatics and isomerising paraffins without requiring the necessary presence of aromatics in the starting feed.

2.4 As regards the modification in claim 1 of auxiliary request I of the wording "for the simultaneous removal of aromatics and isomerisation of paraffins" into "so as to simultaneously remove of aromatics and isomerising paraffins", the Board finds that this wording, for the same reasons given above, would have been considered by the skilled person to relate to the immediately preceding disclosure of the catalyst.

Therefore, this wording would not have been understood by the skilled person to identify a separate process step which necessitates the presence of aromatics in

the feed, but only a potentiality of the catalyst to activate the simultaneous isomerization of paraffins and removal of aromatics, if present.

The Board thus finds that the modifications carried out in claim 1 of the auxiliary request I do not change the meaning and do not limit in any way the extent of claim 1 according to the main request.

2.5 The Board concludes that the skilled person, by reading the whole patent specification, would have understood that the word "middle distillate" is used in the patent in suit to identify a generic mixture of hydrocarbons boiling in the range of 150° to 400°C, which mixture does not need to be a distilled fraction of a petroleum feed and does not require necessarily the presence of aromatics.

This interpretation is also not in disagreement with the opening paragraph 1 of the patent in suit stating that "the present invention relates to chemical industry, especially to petroleum refining". In fact, this paragraph indicates petroleum refining as a preferred technical field of application but it does not exclude an application to other chemical technical fields such as, for example, that of hydrogenated TOFA, shown in reference examples 6 to 8.

2.6 For the sake of completeness the Board remarks that even though each claim 1 according to both requests requires that "said feed is contacted in a single reaction step", the claims do not require that the feed is prepared in a specific way or is not pre-treated. In fact, as indicated explicitly in paragraph 19 of the

patent in suit, the feed can also be the product of a catalytic cracking or hydrocracking (page 3, line 46). Therefore, it is clear that a preparation step for the feed is not excluded before the single step contact with the catalyst.

3. Patent Proprietor's main request and auxiliary request I

Since the amendments to claim 1 of the main request, contained in claim 1 of auxiliary request I, do not change the extent of the claim, as explained above, the Board will relate in its following reasoning to both requests together.

3.1 *Novelty*

3.1.1 Example 1 of document (E30/31) was cited against the novelty of claim 1.

The Patent Proprietor did not contest during appeal that this document is prior art in the sense of Article 54(2) EPC 1973, as found in the decision under appeal (points 4 and 5 of the reasons).

However, said example 1, relating to the production of a middle distillate by contacting a hydrogenated TOFA feed in a single reaction step, in the presence of hydrogen, with a SAPO-11 molecular sieve containing a not defined amount of platinum, discloses that the catalyst was obtained using normal processes for producing catalysts, such as those presented in the previously cited Finnish patents, which patents seem to be those cited on page 2, lines 7 to 10. The content of

these patents is not specified in document (E30/31) and they have not been submitted during the appeal proceedings.
Therefore, example 1 does not contain an explicit and unambiguous disclosure of a catalyst obtained by impregnation with 0.1 to 10% by weight of platinum using the pore filling method as required by claim 1 of the patent in suit.

3.1.2 Moreover, even though the process of example 2 of document (E30/31) uses a SAPO-11 molecular sieve catalyst prepared by impregnation and containing 0.5% by weight of platinum, there is no explicit and unambiguous disclosure in this document that the specific method indicated in example 2 is necessarily one of those generically indicated in example 1.

3.1.3 The Board thus concludes that the claimed subject-matter is novel over the cited prior art.

3.2 *Inventive step*

3.2.1 The invention of the patent in suit relates to a process for producing high grade middle distillate suitable as a diesel fuel without substantially altering the distillation range (see paragraph 1).

As explained in paragraphs 2 to 7, desirable properties of a high grade diesel fuel are a low content of aromatic compounds, a high cetane number and an adequate density. In fact, the content of aromatic compounds has an influence on the particle emission from a diesel engine. Furthermore, a reduction of the amount of aromatic compounds and an increase of the

cetane number reduce emissions of nitrogen oxides, and a high cetane number seems to reduce the formation of smoke at low temperatures, and the particle emissions. In addition, lowering the content of polynuclear aromatic compounds reduces the health hazards associated to diesel exhaust gases.
Moreover, the density of a diesel fuel should remain constant throughout the year to ensure the smooth running of the engine to reduce emissions therefrom. The diesel fuel must also remain liquid in all conditions of use so as not to form precipitates in the fuel feeding devices. For these reasons it should have good low temperature properties such as the cloud and pour points.

Methods for reducing the content of aromatic compounds and therefore increasing the cetane number, such as hydrogenation, and processes for selectively cracking off normal paraffins that lead to poor properties at low temperatures, were familiar to those skilled in the art.

However, a balance between favourable low temperature properties and a high cetane number was difficult to achieve since normal paraffins have high cetane numbers, but poor low temperature properties and, on the other hand, aromatics have superior low temperature properties, but low cetane numbers; in fact, when normal paraffins are removed, the low temperature properties of the product are improved, but the cetane number is lowered and the content of aromatic compounds is usually increased (paragraphs 2 and 7).

Therefore, the technical problem underlying the invention is formulated in the patent in suit as the provision of a process which enables the production in a single step, by using a middle distillate as the feed, of a high grade diesel fuel with superior low temperature properties and a low content of aromatic compounds, without significantly changing the cetane number of the product (paragraphs 13 and 14).

3.2.2 The documents (E6), (E7) and (E30/31) have been proposed by the parties as suitable starting points for the evaluation of inventive step.

Document (E6) relates to an integrated refining scheme for hydroprocessing high boiling petroleum feedstocks to form naphthas and middle distillates of high quality while simultaneously minimizing hydrogen consumption (see column 1, lines 7 to 15 and column 3, lines 18 to 23). As illustrated in example 4, a petroleum feedstock is treated in a single step to isomerise paraffins, thereby improving its low temperature properties and reducing the content of aromatics (column 24, lines 38 to 44); a fraction suitable as diesel fuel can be recovered therefrom (see column 24, lines 46 to 51 and table 17).
However, this document does not deal, at least explicitly, with the maintenance of the cetane number.

Document (E7) deals with an upgrading of a diesel fuel, which brings about an improved pour point reduction and a reduction of the aromatics content (column 2, lines 19 to 29; column 3, lines 56 to 69; test 1).
However, also this document does not deal explicitly with the maintenance of the cetane number.

Document (E30/31) deals with the production of a high grade middle distillate not containing aromatics and suitable as diesel fuel by treating a middle distillate feed obtained from a vegetable oil in a single step in order to improve its low temperature properties without affecting its cetane number (see page 2, lines 21 to 24; page 3, lines 13 to 17; page 5, lines 13 to 16).

Therefore, the Board finds that document (E30/31), being the only cited document addressing the technical problem of maintaining the cetane number, is the only document describing a technical problem identical to that addressed to in the patent in suit.

Therefore, document (E30/31) has to be chosen as the most suitable starting point for the evaluation of inventive step.

3.2.3 As explained on page 11, lines 1 to 3, of document (E30/31) and clearly derivable from a comparison of tables 2 and 4 of example 1 of this document, a middle distillate hydrogenated TOFA not containing aromatics is converted in a single step into a middle distillate suitable as a diesel fuel not containing aromatics and having better low temperature properties without affecting the cetane number. Therefore, the process disclosed in this document already solved convincingly the technical problem addressed to in the patent in suit.

The technical problem underlying the invention thus can only be formulated as the provision of another process for producing, by using a single treatment and a middle

distillate as the feed, a high grade diesel fuel with improved low temperature properties and a low content of aromatic compounds, without significantly changing the cetane number of the product.

The Board has no doubt that this technical problem has been solved by means of the process steps according to claim 1.

3.2.4 The isomerisation of the hydrogenated TOFA of example 1 of document (E30/31) is carried out at a temperature from 250 to 400 °C, at a pressure of 50 bar, at a feed rate of 3 l/h and a hydrogen stream of 500 l/l (page 8, lines 21 to 23). In this respect, it has not been disputed that these process conditions correspond to those required by the process of claim 1.

Moreover, the hydrogenated TOFA feed, which is a mixture of hydrocarbons boiling in the range of 150 to 400°C (see table 2 on page 7), is contacted in a single step with a molecular sieve catalyst such as SAPO-11, containing an alumina carrier and platinum as hydrogenating compounds (see page 8, lines 7 to 12 and 19 to 20).

The molecular sieve catalyst SAPO-11 is identical to that which can be used according to the patent in suit, since it can be prepared by the same method according to document US 4440871 (see page 8, line 9 of document (E30/31) and paragraph 22 of the patent in suit). Moreover, it contains platinum on an alumina carrier as hydrogenating component like the catalyst of the patent in suit (see page 8, lines 10 to 11 of document (E30/31) and paragraphs 23 and 24 of the patent in suit).

Therefore, there is no doubt that the catalyst disclosed in document (E30/31) is a bifunctional catalyst suitable for simultaneously isomerising paraffins and removing aromatics as required in claim 1 of the patent in suit.

Hence, the disclosure of example 1 of document (E30/31) differs from the subject-matter of claim 1 according to the main request and auxiliary request I only insofar as it does not specify how much platinum is contained in the catalyst and if the catalyst is obtained by impregnation with platinum using the pore filling method.

However, neither the patent in suit nor the experimental evidence submitted by the Patent Proprietor with the letter of 24 October 2011, suggest or show that a particular selection of the amount of platinum or a particular method of preparing the catalyst, in particular of impregnating the catalyst, brings about any technical advantage or is critical for the invention. In fact, also the decision under appeal had already found that there was no evidence that the particular method of preparation of the catalyst required by claim 1 would bring about any additional technical effect (see point 15 of the decision under appeal, first full paragraph).

It remains thus only to decide whether it was obvious for the skilled person to use a SAPO-11 catalyst impregnated with 0.01 to 10% by weight of platinum by the pore filling method in example 1 of document (E30/31) in order to provide another process bringing about similar results, i.e. improved low temperature

properties and low content of aromatic compounds, without significantly changing the cetane number.

3.2.5 Document (E30/31) discloses in example 2 another treatment of the same hydrogenated TOFA feed used in example 1, i.e. a middle distillate feed not containing aromatics, wherein the feed is contacted under similar conditions with a SAPO-11 molecular sieve catalyst containing alumina as carrier and 0.5% by weight of platinum added by impregnation using an aqueous $Pt(NH_3)_4Cl_2$ solution (see page 11, lines 10 to 16).

Therefore, in the light of the disclosure of this further example of the same invention, it would have been obvious for the skilled person to try the impregnated SAPO-11 catalyst of example 2 also in the process of example 1 and to expect similar technical results.

Finally, it has not been disputed that the pore filling method was a known method for impregnating a catalyst at the priority date of the patent in suit (see also last but one paragraph on page 12 of the decision under appeal). Therefore, it would have been also obvious for the skilled person to carry out the impregnation step of example 2 of document (E30/31) by the known pore filling method and to use such a catalyst in the process of example 1.

The Board thus concludes that the subject-matter of claim 1 according to the main request and the auxiliary request I lacks an inventive step.

3.3 Since both the Patent Proprietor's requests fails on these grounds, it is not necessary to deal with the other objections raised by the Opponents and with Opponent II's experimental report of 12 May 2011.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The patent is revoked.

The Registrar: The Chairman:

D. Magliano P.-P. Bracke