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Datasheet for the decision of 25 March 2011

Case Number: T 1886/08 - 3.3.06

Application Number: 01942659.2

Publication Number: 1252268

IPC: C10L 1/18

Language of the proceedings: EN

Title of invention:
Method of reducing the vapour pressure of ethanol-containing motor fuels for spark ignition combustion engines

Patentee:
Hull, Angelica

Opponent:
BP Oil International Limited

Headword:
Vapour pressure reduction of fuels/HULL

Relevant legal provisions:
EPC Art. 54, 56

Relevant legal provisions (EPC 1973):
-

Keyword:
"Novelty - main request (yes)"
"Inventive step - main request (yes)"

Decisions cited:
-

Catchword:
-

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Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number: T 1886/08 - 3.3.06

D E C I S I O N
of the Technical Board of Appeal 3.3.06
of 25 March 2011

Appellant: (Opponent)
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Decision under appeal: **Decision of the Opposition Division of the European Patent Office posted 25 July 2008 rejecting the opposition filed against European patent No. 1252268 pursuant to Article 101(2) EPC.**

Composition of the Board:

Chairman: P.-P. Bracke
Members: E. Bendl
J. Geschwind

Summary of Facts and Submissions

I. The appeal is against the decision of the Opposition Division to maintain the patent as granted.

II. In opposition proceedings the Opponent objected to lack of novelty and inventive step of the patent-in-suit. In its decision the Opposition Division concluded that the set of claims as granted meets the requirements of the EPC and rejected the Opposition.

III. The set of claims as granted consists of a total of nine claims of which the only independent Claim 1 reads as follows:

"1. A method of reducing the vapour pressure of a C_3-C_{12} hydrocarbon-based motor fuel mixture for conventional spark ignition internal combustion engines containing 0.1 to 20% by volume of ethanol, not more than 0.25% by weight of water according to ASTM D 6304, and not more than 7% by weight of oxygen according to ASTM D 4815, by at least 80 % of the ethanol induced vapour pressure increase, and more preferably to the vapour pressure of the C_3-C_{12} hydrocarbon component (a) alone, wherein, in addition to the C_3-C_{12} hydrocarbon component (a) and an ethanol component (b), an oxygen-containing component (c) is present in the fuel mixture in an amount from 0.05 up to 15% by volume of the total volume of the fuel mixture; the component (c) being selected from at least one of the following types of compounds:

- alkanol, having from 3 to 10 carbon atoms;
- dialkyl ether, having from 6 to 10 carbon atoms;
- ketone, having from 4 to 9 carbon atoms;

- alkyl ester of alkanoic acid, having from 5 to 8 carbon atoms;
- hydroxyketone, having from 4 to 6 carbon atoms;
- ketone ester of alkanoic acid, having from 5 to 8 carbon atoms;
- oxygen-containing heterocyclic compound selected from the following:
  tetrahydrofurfuryl alcohol, tetrahydrofurfuryl acetate, dimethyltetrahydro-furan, tetramethyltetrahydrofuran, methyl tetrahydropyrane, 4-methyl-4-oxytetrahydropyrane and the mixtures hereof; and

wherein a component (d), selected from at least one C_6-C_{12} hydrocarbon, is present in the fuel mixture in an amount such that the ratio (b):((c)+(d)) is from 1:200 to 200:1 by volume."

IV. The Opponent/Appellant filed an appeal against the decision of the Opposition Division, cited documents

D2 = US-A-5 208 402,
D3 = US-A-4 806 129,
D4 = WO-A-87/01384,
D11= Oxygenate issues for future fuels, D.J. Boot et W.J. Piel, AIChE 1991 Spring National Meeting, Preprint N74a
D12= Gasoline reformulation-A new process for a mature industry; Fractionate, innovate and reformulate, J.G. Grant et R.A. Pourciau, NPRA Fuels and Lubricants National Meeting, 1991, Paper N.FL-91-115
D16= Hydrocarbon Processing, 93-100, June 1996,

and argued inter alia in the course of the appeal proceedings that the requirements of Articles 54 and 56 EPC still were not met.

V. The Proprietor/Respondent inter alia maintained the set of claims as granted (main request), filed comparative tests, in particular examples 1-7 submitted with the letter of 15 June 2009 and concluded, that the requirements of the EPC were met.

VI. The main arguments of the **Appellant** were as follows:

Novelty

– The compositions listed in the table at the bottom of column 4 of D3 comprise compounds (a)-(d) as defined in the patent-in-suit. These compounds must have been admixed. Furthermore lines 3-11 in column 1 of D3 describe that the EPA (i.e. the US Environmental Protection Agency) requirements have been met, which means that the vapour pressure of the fuel composition must be reduced.

– D2 teaches to use toluene optionally in combination with an ether to reduce the vapour pressure of natural gasoline components. According to the last passage of column 7 ethanol is present too in these compositions.

– Thus, the disclosure of D3 and D2 destroy novelty of Claim 1 of the patent-in-suit.

Inventive step

– D11 is the closest state of the art.

– Starting from D11 the combination with either of documents D2,D3,D4,D12,D16 renders the claimed subject-matter obvious.

– The comparative tests submitted by the Respondent cannot be used to show any effect, because different amounts of gasoline were used.

– Thus, the claimed subject-matter is not inventive.

VII. The main arguments of the **Respondent** were as follows:

Novelty

– None of the documents D2 or D3 describes a method for reducing the vapour pressure of an ethanol-containing fuel mixture with all the parameters of Claim 1 of the patent-in-suit.

– The claimed subject-matter is therefore novel.

Inventive step

– D11 is the closest state of the art.

– The comparative tests provided by the Respondent show, that the combination of compounds (a)-(d) in specific ratios leads to reduced vapour pressure compared to the use of only compounds (a)-(c). This is not derivable from the available prior art documents.

– Therefore the claimed subject-matter involves an inventive step.

VIII. The Appellant requests that the decision under appeal be set aside and that the European patent no. 1 252 268 be revoked.

The Respondent requests that the appeal be dismissed or in the alternative that the patent be maintained on the basis of the auxiliary requests 1 to 5 filed with letter of 24 February 2011.

Reasons for the Decision

1. Novelty of the main request

1.1 Novelty vis-à-vis D3

1.1.1 With reference to the table in column 4 of document D3 the Appellant argued, that this passage describes a method in which all four ingredients (a)-(d) as required by Claim 1 of the patent-in-suit are admixed. Since lines 3-11 of column 1 of D3 state that the EPA requirements have to be met, the Appellant concluded that D3 describes a "method for reducing the vapour pressure of a C_3-C_{12} hydrocarbon-based motor fuel mixture".

1.1.2 The Board cannot agree with this line of argumentation. D3 describes an "oxygenated extender that is essentially lower in cost than the gasoline" (D3, column 1, lines 15/16). Although compounds like toluene and xylene are cited in column 2, line 47 to reduce

vapour pressure, this passage is to be seen in the context of the use of benzene, as explained by the sentence following the cited passage: "they", i.e. toluene and xylene, "are best used to balance the high vapour pressure of the benzene".

1.1.3 Balancing the high vapour pressure of benzene in the fuel extender does not mean that the vapour pressure of the fuel mixture is reduced by at least 80% of the ethanol induced vapour pressure increase or even to the vapour pressure of the C_3-C_{12} hydrocarbon component (a) alone, as required by the method of the patent-in-suit.

1.1.4 Also the passage stating that the extender formulation meets the EPA requirements does not automatically mean, that the method described in D3 fulfills the criteria concerning vapour pressure reduction of the patent-in-suit.

1.1.5 Thus, D3 does not directly and unambiguously disclose a method for reducing the vapour pressure as defined by Claim 1 of the patent-in-suit.

1.2 Novelty vis-à-vis D2

1.2.1 Document D2 describes a liquid fuel for internal combustion engines with an environmentally acceptable vapour pressure. To prepare the fuel at least one octane-enhancing component is added to a natural gasoline component; this octane-enhancing component has to be selected from a list of compounds which comprises inter alia toluene and ethers. The fuel may further contain methanol or ethanol.

1.2.2 In order to arrive at the method of Claim 1 of the patent-in-suit a series of selections has to be made, when starting from D2:

- ethanol, which is only an optional ingredient according to D2, has to be added in an amount of 0,1 to 20% by volume, whereas D2 defines an open-ended range, namely that "**up to about 10%** by volume **or more**" ethanol may be present (emphasis added);
- at least one specific octane-enhancing compound, which falls within the definition given for compound (c) of the patent-in-suit, has to be selected in such amounts, that not more than 7% by weight of oxygen is present in the fuel composition;
- a compound corresponding to the definition of compound (d) of the patent-in-suit has also to be added;
- ethanol and the compounds corresponding to compounds (c) and (d) in the patent-in-suit have to be used in such proportions, that the ratio defined in the patent-in-suit is met.

1.2.3 Thus, also D2 does not directly and unambiguously disclose a method of reducing the vapour pressure, as currently claimed.

1.2.4 Claim 1 therefore meets the requirement for novelty over the cited prior art.

2. Inventive step

According to the problem and solution approach, which is used by the Boards of Appeal of the European Patent

Office in order to decide on the question of inventive step, it has to be determined which technical problem the object of a patent objectively solves vis-à-vis the closest prior art document. It also has to be determined whether or not the solution proposed to overcome this problem is obvious in the light of the available prior art disclosures.

2.1 The patent-in-suit refers to a method of reducing the vapour pressure of a C_3-C_{12} hydrocarbon-based motor fuel mixture including ethanol.

Both parties considered document D11 to represent the closest state of the art. The Board does not see any reason to deviate from this approach.

D11 is a report on the use of oxygenates for gasoline. Ethers and light alcohols like ethanol are mentioned to be most frequently used as oxygenates; it is also highlighted that the drawback of an increase in vapour pressure due to the addition of ethanol may be overcome by further adding ethers or higher alcohols like butanol.

The additional supplementation of the fuel mixture with a C_6-C_{12} hydrocarbon (corresponding to compound (d) of the patent-in-suit) is not disclosed.

2.2 According to the Respondent the combination of compounds (c) and (d) in the ethanol-containing fuel mixture lowers vapour pressure even more than with either of compounds (c) or (d) alone.

The technical problem vis-à-vis D2 can therefore be defined as the further improvement of the vapour pressure reduction of the ethanol-containing hydrocarbon fuel mixture.

2.3 As the solution to this problem the method according to Claim 1 of the patent-in-suit has been proposed.

2.4 To prove the allegedly improved effect the Respondent filed inter alia a comparative test with his letter of 15 June 2009. This test shows in experiment no. 1 the vapour pressure of compound (a), i.e. pure gasoline (69,3 kPa), reports in experiment no. 5 on a mixture of (a)gasoline (85%) +(b) ethanol (5%) and (c)ETBE (10%) with a vapour pressure of 70,3 kPa, in experiment no. 6 on a mixture of (a)gasoline (85%) + (b)ethanol (5%) and (d)iso-octane (10%) with a vapour pressure of 69,9 kPa and in experiment no. 7 on a composition according to the invention comprising (a)gasoline (85%) + (b)ethanol (5%) + (c)ETBE (5%) + (d)iso-octane (5%) with a vapour pressure of 68,8 kPa.

2.4.1 As can be seen from experiments no. 5-7 identical amounts of gasoline and ethanol were contained, but the simultaneous use of compounds (c) and (d) resulted in a lower vapour pressure than the use of either (c) or (d). The vapour pressure of experiment no. 7 is not only lower than the vapour pressure of experiments no. 5 and 6, but also lower than the pressure of pure gasoline (experiment no. 1).

2.4.2 Given the identical amounts of gasoline, ethanol and the sum of further component(s) used in experiments 5-7, the Appellant's objection that Proprietor's tests

cannot be compared, cannot be considered valid. Although it was disputed by the Appellant that a synergistic effect exists, the Board does not doubt that the use of a combination of (a)+(b)+(c)+(d) under the conditions defined above is superior to the use of only compounds (a)+(b)+(c)/(d).

2.4.3 Therefore the posed problem is considered to be solved by the proposed solution. The Appellant did furthermore not provide any proof that the problem has not been solved over the entire claimed range.

2.5 The remaining question to be clarified is, whether, starting from D11, the proposed solution was obvious for the skilled person.

2.5.1 Since D11 does not contain any teaching to use a C_6-C_{12} hydrocarbon in addition to compound (c) to reduce vapour pressure of an ethanol-containing hydrocarbon-based motor fuel mixture, it has to be clarified, whether the skilled person would derive such a teaching from the combination of D11 with one of the remaining documents cited in the context of inventive step.

2.5.2 D2 refers to the reduction of vapour pressure by adding at least one octane enhancing compound like toluene or an ether to a natural gasoline component. However, it is not disclosed that the combination of compounds falling within the definition of compounds (c) and (d) of the patent-in-suit leads to any improved effects.

2.5.3 D3 aims at low-cost gasoline extenders. Since the aim is entirely different from the patent-in-suit, the

skilled person would not derive from D3 that vapour reduction can be further improved.

2.5.4 D4 relates to the reduction of unacceptable hydrocarbon emissions and proposes to use a combination of a C_1-C_6 aliphatic alcohol, cyclopentadienyl manganese tricarbonyl antiknock agents and aromatic hydrocarbons together with non-leaded gasoline fuel. No hint can be found in D4 for modifying the solution of D11 to result in the solution proposed in the patent-in-suit.

2.5.5 D12 discloses processes for gasoline reformulation. Even when accepting that D12 teaches that C_4 and lower fractions are preferably not included in the gasoline, there is still no disclosure that the combination of compounds (c) and (d) in the ratios specified in Claim 1 of the patent-in-suit lead to an improved reduction of vapour pressure in ethanol containing gasoline.

2.5.6 Finally, D16 aims at predicting the effects of oxygenates on gasoline vapour pressure. No hint can be found that the combination of compounds (c) and (d) leads to reduced vapour pressure.

2.5.7 Thus, since neither the closest state of the art nor its combination with the documents cited lead to the solution as proposed in the patent-in-suit, the claimed subject-matter is considered to involve an inventive step.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

D. Magliano P.-P. Bracke