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Aktenzeichen / Case Number / N^o du recours : T 312/89 - 3.3.1

Anmeldenummer / Filing No / N^o de la demande : 83 307 869.4

Veröffentlichungs-Nr. / Publication No / N^o de la publication : 00 113 581

Bezeichnung der Erfindung: Middle distillate compositions with improved low
Title of invention: temperature flow properties
Titre de l'invention :

Klassifikation / Classification / Classement : C10L 1/18

ENTSCHEIDUNG / DECISION

vom / of / du 15 May 1990

Anmelder / Applicant / Demandeur : EXXON Research and Engineering Company

Patentinhaber / Proprietor of the patent /
Titulaire du brevet :

Einsprechender / Opponent / Opposant :

Stichwort / Headword / Référence : Distillate composition/EXXON

EPO / EPC / CBE Article 56

Schlagwort / Keyword / Mot clé : "Inventive step (confirmed)"

Leitsatz / Headnote / Sommaire



Case Number : T 312/89 - 3.3.1

D E C I S I O N
of the Technical Board of Appeal 3.3.1
of 15 May 1990

Appellant : Exxon Research and Engineering Company
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Florham Park, New Jersey 07932 (US)

Representative : Franck, Peter Dr.
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Decision under appeal : Decision of Examining Division 029
of the European Patent Office
dated 31 October 1988 refusing
European patent application
No. 83 307 869.4 pursuant to
Article 97(1) EPC

Composition of the Board :

Chairman : R.W. Andrews
Members : J. Jonk
G.D. Paterson

Summary of Facts and Submissions

- I. European patent application No. 83 307 869.4, filed on 22 December 1983 (publication number 113 581) and claiming priority of 4 January 1983 based on GB-8 300 016, was refused by a decision of the Examining Division dated 31 October 1988. The decision was based on Claims 1-4 filed on 18 January 1988, the independent Claim 1 reading as follows:

"The use as an additive for improving the flow properties of a distillate petroleum fuel oil whose 20% and 90% distillation points differ within the range of from 70 to 100°C, and whose 90% to final boiling point is from 10 to 20°C and whose final boiling point is above 350°C of an additive comprising one or more copolymers of ethylene and a vinyl ester of a carboxylic acid containing 1 to 4 carbon atoms containing an average of 32 to 35 wt.% of the vinyl ester and having a number average molecular weight of 1000 to 6000."

Independent Claim 3 relates to the distillate fuel containing said additive. Claims 2 and 4 are dependent claims.

- II. The stated ground for the refusal was that the subject-matter of Claim 1 lacked the required inventive step in the light of the disclosures in EP-A-61 894 (1) and US-A-3 961 916 (2). Essentially it was held that document (1) discloses the improvement of the flow properties of middle distillate fuels boiling in the range 120° to 500°C by the addition of a copolymer of ethylene and vinyl acetate in combination with an oil-soluble nitrogen compound and that, if such additives are, for any reason, unsuitable, it was obvious to try the additives

disclosed in document (2) which consist of mixtures of copolymers of ethylene and vinyl acetate, the great majority of these mixtures falling within the scope of Claim 1.

- III. An appeal was lodged against this decision on 22 December 1988 and the fee for the appeal was paid on 3 January 1989. In the Statement of the Grounds of Appeal filed on 24 February 1989, it was essentially argued that it could not be obvious to turn to the additives of document (2), because comparative example 3 in document (1) shows that Polymer 15, which corresponds to the 75/25 Copolymer B/Copolymer H according to document (2), is in fact an unsatisfactory additive in the fuels of document (1).
- IV. In his letter of 12 October 1989, the Rapporteur expressed the preliminary view that document (1) relates to narrow boiling fuels and that in the Cold Filter Plugging Point test (CFPP-test) said Polymer 15 is clearly satisfactory as is shown in Figures 7, 8 and 9. A skilled person would, therefore, be encouraged to investigate the additives disclosed in document (2).
- V. During the oral proceedings held on 15 May 1990, the Appellant argued that the selection of an additive comprising only one copolymer (alternative (i)) or a mixture of two copolymers (alternative (ii)), wherein the copolymer acting as a growth arrestor is present in the mixture in an amount of at least 10 parts per weight for each part of the copolymer acting as a nucleator, to improve the flow properties of the specific narrow boiling distillate fuels as defined in Claim 1, is not obvious in the light of the state of the art.

VI. The Appellant requested that the decision of the Examining Division be set aside and a patent granted on the basis of Claims 1-4 filed on 8 May 1990, Claim 1 reading as follows:

1. The use as an additive for improving the flow properties of a distillate petroleum fuel oil whose 20% and 90% distillation points differ within the range of from 70 to 100°C and whose 90% boiling-temperature is from 10 to 30°C of the final boiling point, and whose final boiling point is above 350°C of an additive comprising

- (i) a copolymer of ethylene and a vinyl ester of a carboxylic acid containing 1 to 4 carbon atoms, said copolymer containing an average of 32 to 35 wt.% of the vinyl ester and having a number average molecular weight of 1000 to 6000, or
- (ii) a mixture of two copolymers of ethylene and a vinyl ester of a carboxylic acid containing 1 to 4 carbon atoms, one of which copolymers is a growth arrestor while the other one is a wax crystal nucleator, said mixture containing at least 10 parts by weight of said growth arrestor for each part by weight of said wax crystal nucleator and an average of 32 to 35 wt.% of the vinyl ester and having a number average molecular weight of 1000 to 6000.

Claim 3 relates to a distillate fuel as defined in Claim 1 containing 50-500 ppm of said additive (i) or (ii) and Claims 2 and 4 are dependent claims.

Alternatively, as an auxiliary request, the Appellant requested that the patent be granted on the basis of

Claim 1 of the main request in which the reference to additive (ii) has been deleted.

VII. At the conclusion of the oral proceedings, the Board's decision was announced that the patent would be granted in accordance with the main request.

Reasons for the Decision

1. The appeal complies with Articles 106 to 108 and Rule 64 EPC and is, therefore, admissible.
2. The wording of the claims does not give rise to objections under Article 123(2) EPC. The amendment of the temperature range from 10 to 20°C to 10 to 30°C is supported by original Claim 3 and the restriction of the mixture of copolymers to a mixture of two copolymers in the specific weight ratio is supported by the original Claims 4 and 5.
3. The subject-matter of Claim 1 is novel because none of the prior art documents discloses the addition of a copolymer as indicated under (i) or of a mixture of copolymers as defined under (ii) to the subject specific narrow boiling distillate fuels. Consequently, also the subject-matter of independent Claim 3 is novel.
4. The issue to be dealt with is whether the subject-matter of Claim 1 involves an inventive step as required by Article 56 EPC.
 - 4.1 After consideration of the prior art documents cited during the proceedings, it is the Board's opinion that document (1) represents the closest state of the art.

This document describes the improvement of the flow properties of a distillate fuel oil whose 20% and 90% distillation points differ by 106°C and whose 90% boiling temperature is 31°C below its final boiling temperature of 375°C (see fuel 3 mentioned on page 14) by the addition of Polymer 15, which is a mixture of about 75 wt.% of a wax growth arrestor consisting of a copolymer of ethylene and about 38 wt.% of vinyl acetate and having a number average molecular weight of about 1800 (Polymer B) and about 25 wt.% of a wax crystal nucleator consisting of a copolymer of ethylene and about 16 wt.% of vinyl acetate and having a number average molecular weight of about 3000 (Polymer H). According to column 9, lines 40 to 44 of document (2), the additive was considered to be one of the most preferred ones of the type of additives disclosed in this document.

However, it was considered that these known additives were not sufficiently effective in improving the flow properties of the narrower boiling distillate fuel oils as defined in Claim 1 (cf. comparative examples of the subject application).

- 4.2 Therefore, in the light of this closest prior art the technical problem underlying the subject patent application may be seen in providing additives for effectively improving the low temperature flow properties of the narrow boiling distillate fuel oils as defined in Claim 1.
- 4.3 According to Claim 1 of the subject patent application, this technical problem is solved by the use of a specific mixture of copolymers (alternative (ii)) or of specific copolymers in a one-component system (alternative (i)).

In view of the examples and comparative examples (see in particular the tables on pages 18 and 20), the Board is

satisfied that the above defined technical problem is credibly solved.

4.4 In the Board's judgement, the solution of this technical problem by the use of the additive comprising a mixture of two copolymers as indicated under (ii) is not obvious for the following reasons:

(a) The additive (ii) differs from the Polymer 15, which is used in document (1) (Curve J in Figure 9) and in fact is disclosed in document (2) as the most preferred additive in conventional broad boiling middle distillates (see column 9, lines 40-44), by a ratio of at least 10 parts by weight of the growth arrestor for each part of the wax crystal nucleator instead of a ratio 3:1 (see also under point 4.1). It is true that document (2) discloses that this ratio may be 1 to 100 parts by weight of the growth arrestor per 1 to 20 parts by weight of the nucleator, preferably 1:10 parts to 3:1 parts (see column 6, line 64 to column 7, line 1). However, a skilled person had no reason to expect that in the subject narrow boiling distillate fuel oils a better improvement of the flow properties could be obtained by using ratios outside the exemplified ranges of 3:1 and 1:1 of document (2).

(b) Furthermore, in the present additive (ii) the average vinyl ester content of the copolymer mixture must be 32 to 35 wt.%. This essential feature cannot be derived from document (2). Although it is true that most of the copolymer blends used in the examples of document (2) meet this requirement, this only results accidentally from the ratios of the two components employed and there is no indication that using other ratios, such as 10 parts of the growth arrestor for each part of the

nucleator (i.e. the minimum ratio in the subject additive), the two copolymers must be chosen in such a way that said average vinyl ester content is met.

In this connection, it is observed that none of the combinations of the growth arrestor (B) and of the growth stimulators (nucleators) A, C, D, E, F, G or H mentioned in the examples of document (2) (see Table 1), if used in a weight ratio of growth arrestor to nucleator of 10:1 or higher, would meet the required average vinyl acetate content of 32 to 35 wt.%.

Therefore, the teaching of document (2), which is concerned with improving the cold flow properties of broad boiling middle distillate fuel oils, would not suggest to the skilled person that a solution to the problem of improving the cold temperature flow properties of narrow boiling middle distillate fuel oils lies in using an additive comprising a wax growth arrestor and a wax crystal nucleator at a ratio of at least 10:1 and selecting the copolymers in such a way that the average vinyl ester content is in the specified range.

- 4.5 Furthermore, the use of an additive as indicated under (i) of subject Claim 1 is not obvious, because it is commonly known that such one-component additives are less effective in middle distillate fuel oils than mixtures of two copolymers, one of which copolymers is a growth arrestor and the other one is a nucleator (see document (1), Figures 8 and 9 wherein Curve J can be compared with Curves H and I (both one-component additives) and document (2) (see e.g. Table II in example 2)). Therefore, in the light of the prior art, it must be considered surprising that the additive (i) provides about the same improvement in the flow properties of the subject distillate fuel oils as additive (ii) which comprises a mixture of copolymers.

- 4.6 Therefore, in the Board's judgement, the subject-matter of the independent Claims 1 and 3 involves an inventive step. Claims 2 and 4, which relate to preferred embodiments of the invention, derive their patentability from these claims.
5. In view of the above, it is not necessary to consider the Appellant's auxiliary request.

Order

For these reasons, it is decided that:

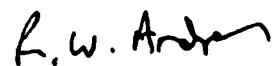
1. The decision under appeal is set aside.
2. The case is remitted to the first instance with an order to grant a patent on the basis of the main request.

The Registrar:



M. Beer

The Chairman:



R. W. Andrews