

Internal distribution code:

- (A) [] Publication in OJ
(B) [] To Chairmen and Members
(C) [X] To Chairmen

D E C I S I O N
of 21 June 1994

Case Number: T 0245/91 - 3.3.3

Application Number: 83106043.9

Publication Number: 0100843

IPC: C08L 23/04

Language of the proceedings: EN

Title of invention:
Ethylene polymer blend

Patentee:
Phillips Petroleum Company

Opponent:
Hoechst Aktiengesellschaft

Headword:
-

Relevant legal norms:
EPC Art. 54, 56

Keyword:
"Novelty (confirmed - combination of selected ranges)"
"Inventive step (denied - expectable property improvement)"

Decisions cited:
T 0666/89, T 0026/85

Catchword:
-



Case Number: T 0245/91 - 3.3.3

DECISION
of the Technical Board of Appeal 3.3.3
of 21 June 1994

Appellant:
(Proprietor of the patent) Phillips Petroleum Company
5th and Keeler
Bartlesville
Oklahoma 74004 (US)

Representative:
Dost, Wolfgang, Dr.rer.nat., Dipl.-Chem.
Patent- und Rechtsanwälte
Bardehle, Pagenberg, Dost, Altenburg,
Frohwitter, Geissler & Partner
Galileiplatz 1
D-81679 München (DE)

Respondent(s) I - IV:
(Opponent I) Hoechst Aktiengesellschaft
Zentrale Patentanteilung
Gebäude F 821
D-65926 Frankfurt an Main (DE)

(Opponent II) Stamicarbon B.V.,
P.O. Box 605
NL-6160 AP Geelen (NL)

(Opponent III) Dow Benelux N.V.
Aert van Nesstraat 45
NL-3012 CA Rotterdam (NL)

Representative:
Huber, Bernhard, Dipl.-Chem.
Patentanwälte
H. Weickmann, Dr. K. Fincke
F. A. Weickmann, B. Huber
Dr. H. Liska, Dr. J. Prechtel, Dr. B. Böhm
Postfach 86 08 20
D-81635 München (DE)

(Opponent IV) Union Carbide Chemicals and Plastics
Company Inc.
Old Ridgebury Road
Danbury, Connecticut 06817-0001 (US)

Representative:
Barz, Peter, Dr.
Schmied-Kowarzik & Partner
Siegfriedstrasse 8
D-80803 München (DE)

Decision under appeal: **Decision of the Opposition Division of the
European Patent Office dated of 6 April 1990,
posted on 14 December 1990 revoking European
patent No. 0 100 843 pursuant to Article 102(1)
EPC.**

Composition of the Board:

Chairman: C. Gérardin
Members: P. Kitzmantel
 R. Teschemacher

Summary of Facts and Submissions

- I. European patent application No. 83 106 043.9 in the name of Phillips Petroleum Company, which had been filed on 21 June 1983, claiming priority from a US application filed on 22 June 1982, resulted in the grant of European patent No. 0 100 843 on 29 April 1987 on the basis of 6 claims, independent Claim 1 reading as follows:

"Ethylene polymer blend having a density in the range of 0.940 to 0.965, the polymer component of which consists essentially of

- a) 40 - 70 parts by weight of a high molecular weight, low density ethylene polymer having a high load melt index (HLMI) in the range of 0.1 to 1.5 g/10 min, having a density in the range of 0.930 to 0.945 g/cc, a heterogeneity index < 10 and having essentially no other branching than short chain branching, and having a content of copolymerized comonomer of 5 to 10 weight percent of at least one olefin having 4 to 10 carbon atoms per molecule,
- b) 60 - 30 parts by weight of a low molecular weight high density ethylene polymer having a melt index (MI) in the range of 45 - 300 g/10 minutes, having a density of 0.950 to 0.975 g/cc, a heterogeneity index of < 6 and being essentially linear and having a content of copolymerized comonomer, if any, of less than 2 weight percent of olefin having 4 to 10 carbon atoms per molecule."

Granted Claims 2 and 3 are dependent upon Claim 1, granted Claim 4 relates to a process for producing a blend according to Claim 1, granted Claim 5 is appendent to Claim 4 and granted Claim 6 relates to a process for producing an ethylene polymer sheet or film from a blend according to Claim 1.

II. Notice of Opposition was filed by:

Opponent I (Respondent I), Hoechst AG, on 12 December 1987 (with letter dated 10 December 1987),

Opponent II (Respondent II), Stamicarbon bv, on 26 January 1988,

Opponent III (Respondent III), Dow Chemical (Nederland) B.V. (by change of name now Dow Benelux N.V.), on 29 January 1988. (with letter dated 28 January 1988), and

Opponent IV (Respondent IV), Union Carbide Corporation, on 29 January 1988,

requesting revocation of the patent in its entirety on the grounds of lack of novelty and/or lack of inventive step having regard to, among others, the following documents:

D8: JP-A-54161657 (and English translation), and
D12: US-A-3 280 220.

III. By its decision announced orally on 6 April 1990 (written decision date-stamped 14 December 1990) the Opposition Division revoked the patent, holding that the subject-matter of Claim 1 was novel, but did not involve an inventive step over D8, which described similar blends of high molecular weight polyethylene (HM-PE) homo- or copolymers with low molecular weight polyethylene (LM-PE) homo- or copolymers. In the absence of significantly improved properties, the use in such blends of a HM-PE being a copolymer could not be considered inventive when the suitability of both, HM-PE homo- and copolymers, was already disclosed.

- IV. On 25 February 1991 (letter dated 22 February 1991) the Appellant (Patentee) lodged an appeal against the revocation of the patent by the Opposition Division and paid the appeal fee. Grounds of Appeal were submitted on 24 April 1991.
- V. Oral Proceedings, which were attended by all parties except Respondent II, were held on 21 June 1994.
- VI. The Appellant denied the D8-based lack of novelty objection of the Respondents and contended that the subject-matter of Claim 1 would amount to the purposeful selection of a small area from the very broad disclosure in D8.

In regard to inventive step over D8 the Appellant pointed to the surprisingly enhanced Environmental Stress Cracking Resistance (ESCR) of blends containing HM-PE copolymers, as compared to HM-PE homopolymers, in Table XI of the patent in suit. It also presented evidence allegedly demonstrating that blends according to D8, when stabilized by the same stabilizers as those used in the patent in suit, exhibited a relatively low ESCR.

While according to D8 the melt index (MI) should be lower than 0.05, such low MIs would be less preferred according to the patent in suit.

The Appellant further argued that the state of the art, particularly D12, did not provide any incentive to use HM-PE copolymers for the achievement of high ESCR values; moreover, the broad molecular weight distribution of the polymers used in D12, caused by their preparation with chromium oxide catalysts, contrasted with the low heterogeneity index of the polymer components of the patent in suit.

VII. The Respondents argued that the subject-matter of Claim 1 was not novel or at least not inventive over D8, which disclosed blends of HM-PE copolymers and LM-PE homo- or copolymers defined by ranges of parameters from which the like ranges in Claim 1 were obvious, broad selections. That such blends were not exemplified in D8 could not detract from the fact that all of the four possible combinations of HM-PE and LM-PE homo- and copolymers, two of which fell within the scope of Claim 1 of the opposed patent, must be considered to have been available or at least obvious to the skilled reader of D8.

In addition, D12 disclosed that the presence of comonomers in an ethylene polymer favoured a high ESCR, thus rendering obvious the choice of copolymers for the HM-PE component of the blends according to D8.

VIII. The Appellant requested that the decision under appeal be set aside and the patent be maintained unamended. As an auxiliary request the Appellant requested that the patent be maintained with Claim 1 in an amended version which contains the following disclaimer after paragraph b): "with the proviso, that blends having a melt index of lower than 0.05 are excluded."

The Respondents requested that the appeal be dismissed.

IX. At the conclusion of the oral proceedings the decision of the Board to dismiss the appeal was announced.

Reasons for the Decision

1. The appeal is admissible.

2. *Novelty, main request*

2.1 D8 discloses blends of a "Polyolefin A" and a "Polyolefin B" which both may be ethylene homopolymers or copolymers of ethylene with an alpha-olefin, which could be propylene or butene-1, in an amount of less than 10% by weight (cf. English translation page 2, lines 1 to 2; page 4, paragraph 4 to page 5, paragraph 2, in particular page 5, lines 1 to 2, 15 to 21).

2.2 The amounts and properties of "Polyolefins A and B" are defined by ranges which encompass the corresponding ranges of the HM-PE and LM-PE according to Claim 1 of the patent in suit:

	patent in suit (Claim 1)	D8 (Claim 1)
HM-PE:		
amounts, parts b. wt.	40-70	30-70
molecular weight	400 000-700 000 (typical range acc. Table II)	300 000-700 000
high load MI	0.1-1.5 g/10 min	---
density	0.930-0.945	0.915-0.955
heterogeneity		
index (HI)	<10	2-10
comonomer amount, wt%	5-10	<10, prefer. <5 (p.5, para. 2)
comonomer type	C-4-10 olefin, pref. C-4	e.g. propylene, butene-1 (p.5, para. 2)

	patent in suit (Claim 1)	D8 (Claim 1)
LM-PE:		
amount, parts b. wt.	60-30	70-30
molecular weight	10 000-20 000	10 000-40 000
MI, g/10 min	45-300	25-1300 (p.7, 1.16-17)
density	0.950-0.975	0.940-0.977
heterogeneity		
index (HI)	<6	2-10
comonomer amount, wt%	<2	<10, prefer. <5 (p.5, para. 2)
comonomer type	C-4-10 olefin	e.g. propylene, butene-1 (p.5, para. 2)

2.3 From the above table it results that most of the ranges in Claim 1 of the patent in suit can be obtained by narrowing down the ranges according to D8 by approximately 25 to 80% and restricting them to their central portion. This is particularly true for the HM-PE ("Polyolefin A" of D8) with the exception of the amount of comonomer being above the preferred range of D8. With regard to the molecular weight, comonomer amount and especially the MI of the LM-PE ("Polyolefin B" of D8) the ranges according to present Claim 1 are towards the end of the respective ranges according to D8 and amount to 50%, 20% and 20%, respectively, of their breadth.

2.4 In a situation like the present, where several ranges of parameters are to be considered, a careful comparison has to be carried out in order to assess whether or not the subject-matter of the claimed invention, here the **combination** of selected ranges, was available to the skilled person. Any obviousness considerations are to be strictly avoided.

2.5 As has been emphasized in T 666/89, OJ EPO 1993, 495, particularly Reasons 8, last paragraph, under the EPC novelty must be decided by reference to the total

information content of a cited prior document. This means that the enabling disclosure of a document is not restricted to the worked examples, but extends to the whole description. Vice versa this means also that the specific disclosure in the examples must not be neglected when interpretation of the specification is necessary for the assessment of the subject-matter that was unambiguously available, since the examples in most cases contain guidance as to what the actually promising solutions of the underlying technical problem are which knowledge is indispensable for the evaluation of what the enabling disclosure in a prior art document is. Only under this aspect the concept explained in T 26/85, OJ EPO 1990, Reasons 9 and in T 666/89, Reasons 7, can be applied, i.e. to assess whether the person skilled in the art would, in the light of all the technical facts at his disposal, **seriously contemplate** applying the technical teaching of the prior art document in the range of overlap.

- 2.6 As far as this can be judged by converting the MI data in Table 1 of D8 into **high load** MI values (estimation by taking account of the corresponding MI and high load MI data in Table III of Appellant's comparative evidence submitted with letter of 20 July 1992), from the 14 HM-PEs (A-1 to A-14) only two (A-5 and A-11) meet the high load MI, density and HI requirements of present Claim 1, and from the 10 LM-PEs only three (B-3, B-8 and B-10) meet its MI, density and HI requirements. Consequently, only one from eleven blends (Application Example 10 in Table II) fulfils the requirements of present Claim 1 with respect to the properties MI, density and HI. However, in none of the HM- and LM-PEs a comonomer is used, which is obligatory for the HM-PE of present Claim 1.

2.7 When assessing whether the HM-PE copolymer/LM-PE homo- or copolymer blends according to present Claim 1 have been made available to the skilled person within the meaning of Article 54(2) EPC, it has therefore to be considered that in order to arrive at this subject-matter there should have been combined

- a HM-PE which in contrast to the homopolymer preferred in D8 is a copolymer, comprising a selected comonomer (not propylene) in not preferred amounts (5 to 10 wt%), and
- a LM-PE which requires a combination of only 20% of the MI range defined in D8 (the selected area being at the lower end of this range and being not a preferred area of said range: see Table 1: three from the ten LM-PEs B-1 to B-10 are within the selected MI area) with 50% of the molecular weight range defined in D8 (the selected area being the non-preferred lower end of the range in D8: see Table 1: four from the ten LM-PEs B-1 to B-10 are within the selected MW area).

2.8 In the Board's judgement, the combination of features discussed in the preceding paragraph would not have been seriously contemplated by the skilled reader and was not made available to him, because said features were not prominent in D8 and did not lend themselves, therefore, to an unambiguous, implicit disclosure.

2.9 A further point to consider is the number of parameters used to define the claimed subject-matter since, as the comparison made in point 2.2 above makes clear, each of the ethylene polymers is characterized by several parameters. Even if most of the ranges for these parameters correspond to a more or less central portion of the range limiting the corresponding parameter in the

composition according to D8, because of the number of parameters involved, which exceeds 10, the scope of the claimed blends is in reality quite narrow with regard to the breath of the definition of the known composition. For this reason, too, the argument of an implicit description in D8 of this narrow selection cannot be accepted.

2.10 The subject-matter of Claim 1 of the main request is therefore novel.

3. *Auxiliary request, Article 123(2) EPC*

3.1 Claim 1 of the auxiliary request differs from the main request by the addition of the statement "with the proviso, that blends having a melt index of lower than 0.05 are excluded."

3.2 While the introduction of a disclaimer of the suggested wording, the content of which is undoubtedly disclosed in Claim 1 of the English translation of D8, would not be objectionable under Article 123(2) EPC when used in order to establish novelty over D8, even if not founded on a disclosure in the original application, its introduction into Claim 1 of the present main request, pertaining to novel subject matter (for the purpose of improving the argumentative position in regard to inventive step), is only allowable under Article 123(2) if the content of the disclaimer can be derived from the original disclosure of the patent in suit.

3.3 According to Table I, last column (page 4 of the original application; page 3 of the patent in suit) the MI of the blends can be within the range 0,01 to 0,6 g/10 min, preferably 0,03 to 0,5 g/10 min. According to the numerous examples in Tables IV to XV in accordance with the alleged invention, the MI of the

blends varies from 0,04 g/10 min (Table VI, column 8) to 0,47 g/10 min (Table IX, column 1) with 0,05 g/10 min being individualized in Table VI for the two blends in columns 7 and 9.

- 3.4 In view of the comprehensive disclosure of individual MI values of a multitude of blends there can be no doubt that the value of 0,05 g/10 min, reported in Table VI for two particular blends, can be regarded as a value generally applicable to blends according to the present subject-matter and can therefore without contravention of Article 123(2) EPC be chosen to delimitate the claimed scope, if necessary.

4. *Novelty, auxiliary request*

Since the subject-matter of Claim 1 of the main request is novel over D8, the subject-matter of Claim 1 of the auxiliary request, being narrower with regard to the MI of the claimed blends, must also be novel.

5. *Inventive step, main request*

- 5.1 Nearest prior art is D8, and particularly Table II, Working Example 10, disclosing a blend of a HM-PE with a LM-PE which meets all the features of Claim 1 of the patent in suit, except that the HM-PE is a homopolymer and not a copolymer. The Environmental Stress Cracking Resistance (ESCR) of the blend of Example 10 is indicated as being 3200 hours which is a very high value (in the patent in suit a high ESCR is indicated only as being > 1000 hours). In the appealed decision it was held, on the basis of this high ESCR value of Example 10 of D8, that an improvement of the ESCR could not be recognized for the claimed blends.

The Board is, however, satisfied by the evidence submitted with Appellant's submission of 21 July 1992 that, when using the same stabilization package as the one used in the contested patent, the ESCR values are considerably lower: for blend B3 in Table III of the aforementioned letter, which blend corresponds to the one according to Example 10 of D8, the ESCR is indicated as being (only) 173 hours. In spite of the small differences in the properties of components H3 and L1 of blend B3 as compared with the corresponding components A-11 and B-8 of Example 10 of D8, it must be accepted that under the stabilization conditions of the patent in suit the blends according to D8 have relatively low ESCR values.

- 5.2 Starting from D8 it was therefore the object underlying the subject-matter of the patent in suit to provide blends of HM-PE and LM-PE which exhibit an improved ESCR.

Appellant's allegation of an improved processability of the claimed blends as compared to those according to D8 cannot be recognized, since the MIs (which are a measure for the degree of thermoplasticity and hence processability) set out in both specifications overlap (patent in suit, Table I: 0,01 - 0,6 g/10 min; D8, Claim 1: < 0,05 g/10 min) and since for the preparation of both blends the same mixing devices may be used (patent in suit, page 4, line 27: Banbury mixer, page 5, lines 31 to 35: Farrel 2FCM; D8, page 8, last paragraph: Farrel continuous mixer, Banbury mixer).

Consequently, an improvement of the processability cannot be recognized and cannot therefore be part of the problem to be solved by the claimed subject-matter.

5.3 Concerning the issue of inventive step it must therefore be asked whether or not the skilled person, wishing to improve the ESCR of the blends according to D8, had any incentive to use as the HM-PE component a copolymer and to select both, the HM-PE and the LM-PE component, according to the property combination set out in section 2.2 above.

5.4 D8 by itself does not contain any information which could induce the skilled person to expect an improved ESCR from the use either of a HM-PE copolymer (having a comonomer content outside the range preferred in D8) instead of the exemplified and therefore preferred HM-PE homopolymers, or of a LM-PE component having a MI within the small selected range of 45 to 300 g/10 min. D8 by itself is therefore not able to render obvious the present solution of the existing problem.

5.5 D12 is directed to blends of (A) a copolymer of ethylene and butene-1 having a density in the range of 0.920 to 0.950 and a high load MI of 0.1 to 20 (= HM-PE) and (B) a homopolymer of ethylene having a density in the range of 0.955 to 0.970 and a MI of 1.0 to 20 (= LM-PE) (cf. Claim 1).

5.5.1 There is in particular a clear recommendation in D12 that ethylene olefin copolymers excel in ESCR (see column 2, lines 37 to 40): "It has been found that copolymers of ethylene and higher olefins, such as butene-1, have a lower crystallinity, lower density and are less subject to environmental stress cracking than homopolymers of ethylene". From the statement in column 2, lines 47 to 52 it can be concluded that the same effect extends also to blends of copolymers: "It has been found that a blend of copolymers of ethylene-butene-1, one produced by the particle form process and the other produced by the solution form process provides

a blend having quite desirable characteristics with regard to environmental stress cracking." (The terms "particle form" and "solution form" as used in D12 imply a high or low molecular weight corresponding to the terms HM-PE and LM-PE as used in the present specification: D12, column 2, lines 29 to 35; column 3, lines 13 to 55).

- 5.5.2 Although it is indicated in D12 that in blends of HM-PE copolymers with LM-PE polymers a better ESCR can be achieved when the LM-PE is a homopolymer, this finding does not detract from the validity of the general conclusion that copolymers favour a high ESCR. This results clearly from Tables IV and V, column 7 (the heading of Table V is erroneous with respect to the term "solution-form copolymer blends", which should correctly read "solution-form homopolymer blends"; this correction being obvious from Table V itself, in particular from the second column "Weight percent", and also from the drawing).

Tables IV and V and the drawing reveal, firstly, that the ESCR values improve together with the amount of HM-PE copolymer and, secondly, that the difference in ESCR between blends where the LM-PE is a homo- and those other blends where it is a copolymer is diminishing when the amount of the HM-PE copolymer increases to 35 wt%. The teaching concerning the advantageous ESCR values of blends containing LM-PE homopolymer is therefore limited to blends with relatively low amounts of HM-PE copolymer and cannot, thus, be extended to all HM-PE/LM-PE blends. Hence, Appellant's argument that the present use of a HM-PE copolymer would go counter the teaching in D12 of a preference for homopolymers is inconsistent with the evidence arising from D12. Therefrom it results that in the presence of amounts of 35 wt% or more of HM-PE copolymer in blends with LM-PE homo- or copolymer the

skilled person will expect a considerable ESCR-improving contribution of the HM-PE copolymer. Since the lower limit of the amount of HM-PE in the blends according to Claim 1 of the patent in suit is 40 wt%, this conclusion applies fully to these blends.

5.5.3 D12, therefore, comprises a clear incentive for the skilled person wishing to enhance the ESCR of the blends disclosed in D8 to turn to HM-PE copolymers. The selection of the most favourable property ranges, especially the amount and choice of comonomers for the HM-PE as well as the MI of the LM-PE, can be made by routine experimentation based on trial and error, thus not requiring any inventive skill.

Consequently, the subject-matter of Claim 1 of the main request does not involve an inventive step within the meaning of Article 56 EPC.

5.6 The fact that the polymers used in D12 may be prepared in the presence of a chromium oxide catalyst (cf. column 4, lines 16 to 19) has no bearing on this conclusion. On the one hand, the Appellant's contention that such polymers had a broader molecular weight distribution than the one obtained by using the Ziegler-type catalysts preferred for the polymers according to the patent in suit is unproved and even rather doubtful (in view of the small Mw/Mn values reported in Table 1 of D8); on the other hand, there is no prima facie recognisable correlation between molecular weight distribution and ESCR, and the Appellant did not discharge the burden of proof for such a correlation, which burden under the circumstances was upon him. The Appellant's arguments in that respect are therefore considered inconclusive.

6. *Inventive step, auxiliary request*

The introduction of the lower MI limit of the blend of < 0,05 into Claim 1 is a further delimitation against the disclosure of D8.

When starting from that citation, the problem underlying the subject-matter of Claim 1 of the auxiliary request was the same as for the main request, except for the additional aspect of an improved processability, achieved by a selection of HM- and LM-PE components which guarantee a MI ≥ 5 g/10 min.

Since, as far as this can be judged from the arguments presented by the parties, the problems of processability and of ESCR, from the technical point of view, have nothing in common, their contribution to the issue of inventive step must be assessed separately.

Concerning the measures taken to enhance the ESCR, Claim 1 of the main and of the auxiliary requests are identical and the conclusion as to the obviousness of these measures must be the same.

In regard to the processability aspect of the problem to be solved, it was prima facie obvious that a higher MI, which improves the molten flow, will be beneficial to thermoplastic processing. Nothing inventive can therefore be seen in choosing, for this purpose, blends having a higher MI than the ones disclosed in D8; moreover the arbitrary determination of the lower MI limit of 0,05 g/10 min in itself cannot be regarded as inventive either. The proviso in the auxiliary request concerning the MI cannot, therefore, provide an inventive step.

The auxiliary request must therefore also fail for lack of inventive step.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:


E. Gorgmaier

The Chairman:


C. Gérardin