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**D E C I S I O N**  
of 12 March 1998

**Case Number:** T 0563/95 - 3.3.3

**Application Number:** 86108521.5

**Publication Number:** 0212133

**IPC:** D01F 6/04

**Language of the proceedings:** EN

**Title of invention:**

Method to prepare high strength ultrahigh molecular weight polyolefin articles by dissolving particles and shaping the solution

**Patentee:**

AlliedSignal Inc.

**Opponent:**

Stamicarbon bv

**Headword:**

-

**Relevant legal provisions:**

EPC Art. -

**Keyword:**

"Novelty - (yes) - no implicit disclosure of undisclosed property"  
"Inventive step - (yes) - critical parameter not considered in the prior art"

**Decisions cited:**

T 0198/84, T 0026/85, T 0301/87, T 0279/89, T 0511/92

**Catchword:**

-



Case Number: T 0563/95 - 3.3.3

**D E C I S I O N**  
of the Technical Board of Appeal 3.3.3  
of 12 March 1998

**Appellant:**  
(Proprietor of the patent) AlliedSignal Inc.  
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**Respondent:**  
(Opponent) Stamicarbon bv  
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**Representative:** -

**Decision under appeal:** Decision of the Opposition Division of the  
European Patent Office posted 4 May 1995 revoking  
European patent No. 0 212 133 pursuant to  
Article 102(1) EPC.

**Composition of the Board:**

**Chairman:** C. Gérardin  
**Members:** P. Kitzmantel  
A. C. G. Lindqvist

## Summary of Facts and Submissions

- I. European patent application No. 86 108 521.5 in the name of ALLIED CORPORATION, which had been filed on 23 June 1986, claiming priority from a US application filed on 19 August 1985, resulted in the grant of European patent No. 212 133 in the name of ALLIED-SIGNAL INC. on 18 April 1990 on the basis of 25 claims.

Independent Claim 1 read as follows:

"1. A method to prepare high strength, high modulus polyolefin shaped articles comprising forming a heated solution of said polyolefin from particles of which about 75 to about 100% by weight have a particle size of from about 100 to about 400 microns and having a weight average molecular weight of from about 300,000 to about 7,000,000, then shaping said heated solution, then cooling said shaped solution."

Claims 2 to 25 were dependent on Claim 1.

- II. Notice of Opposition was filed by STAMICARBON BV on 18 January 1991 requesting revocation of the patent in its entirety, on the ground(s) that the claimed subject-matter lacked novelty and/or inventive step.

In the course of the opposition proceedings the Proprietor submitted two new sets of claims as Main Request and Auxiliary Request. As compared to the version as granted, Claim 1 of both requests comprised the feature "at least 40% of the particles being retained on a No. 80 mesh screen (0.177mm) when the polymer has an intrinsic viscosity above 15"; Claim 1 of the Auxiliary Request was furthermore restricted by the feature "the particle size being evenly distributed

in a bell-shaped curve of particle sizes centered at 125 to 200 micrometers for polymer having an intrinsic viscosity above 15 and between 100 and 150 micrometers for polymer having an intrinsic viscosity below 15".

III. By its decision announced orally on 5 April 1995 and issued in writing on 4 May 1995 the Opposition Division revoked the patent in suit.

The decision under appeal held that the subject-matter of Claim 1 of the Main and Auxiliary Requests was novel but did not involve an inventive step. As to novelty, the Opposition Division found that the available evidence concerning the particle size distributions of the ultrahigh molecular weight polyethylenes Hercules UHMW 1900 and Hizex Million 240M, respectively used according to documents

D1: EP-A-64 167 and

D3: EP-A-135 253,

could not unequivocally establish that these products met the respective requirements of the Claims 1 of these requests. Since it was, however, established that Hercules UHMW 1900 **usually** met the particle size distribution specified in Claim 1 of the Main Request for polyolefins having an intrinsic viscosity above 15, and since, according to D1, Hercules UHMW 1900 could be spun to high quality fibers, the skilled person was highly likely to use these commercial polymers irrespective of their particle size distribution characteristics. The latter property could not, therefore, confer inventivity on the subject-matter of Claim 1 of the Main Request. The same obviousness conclusion also applied to the particle size

distribution curves specified in Claim 1 of the Auxiliary Request, because these would not be different from those of several prior art ultrahigh molecular weight polyolefins.

IV. Notice of Appeal against the above decision was filed by the Proprietor (Appellant) on 4 July 1995. The fee for the appeal was paid on the same day and the Statement of Grounds of Appeal was submitted on 4 September 1995.

The Appellant supplemented his case in submissions dated 12 February 1998 and 6 March 1998 as well as during oral proceedings held on 12 March 1998.

In the course of the latter the Appellant filed a new Main Request comprising 19 claims, independent Claim 1 reading as follows:

"1. A method for preparing high strength, high modulus polyethylene shaped articles comprising forming a heated solution of said polyethylene from particles of which 75 to 100% by weight have a particle size of from 100 to 400 microns, at least 40% of the particles being retained on a No. 80 mesh screen (0.177mm), said polyethylene having a weight average molecular weight of from 300,000 to 7,000,000 and an intrinsic viscosity above 15 and up to 19, then extruding said heated solution, then cooling and stretching said shaped solution."

Claims 2 to 19 of the Main Request are dependent on Claim 1.

Apart from the afore-mentioned Main Request, the Appellant submitted on 12 February 1998 a First Auxiliary Request, and on 6 March 1998 Second, Third, Fourth and Fifth Auxiliary Requests.

V. The written and oral arguments of the Appellant may be summarized as follows:

(i) Claim 1 of the Main Request complied with the requirements of Article 123(2) EPC and Article 84 EPC. Although there was a literal inconsistency between the lower limit of 300,000 of the molecular weight and the lower limit of 15 of the intrinsic viscosity, because said viscosity value corresponded to a much higher molecular weight than 300,000, factually an inconsistency did not exist when the whole specification was taken into account.

(ii) The subject-matter of Claim 1 was novel over the cited prior art, particularly over document D1, because the reworking of the disclosure of D1 would fail to inevitably lead to an infringement of said subject-matter (see also the subsequent arguments concerning inventive step).

(iii) The Opposition Division was wrong when it concluded that the solution of the existing problem, i.e. to overcome the processing difficulties encountered when extruding ultrahigh molecular weight polyolefins and to provide a consistent high product quality, lay in the mere use of the commercial polymer Hercules UHMW 1900 as specified in D1. This commercial polymer comprised lots (e.g. No. 90296 and No. 90170: see below) that did not meet the particle size distribution requirements of the patent in suit, as was apparent from

- Evidence P1, a letter from Lloyd A. Hudson of Himont to G. Weedon of Allied Corporation, dated 26 September 1984, referring to lot No. 90296,

and from

- Enclosure 1 of the Respondent's opposition letter dated 18 January 1991, a telex of D. Koch of Himont to Mr Kirschbaum of DSM, dated 20 August 1984, referring to lot No. 90170.

Since there was no information in D1 or in any of the other prior art documents that the existing problem could be solved by the selection of the claimed particle size distribution, this feature conferred inventive step on the subject-matter of Claim 1.

- (iv) In support of his argument that the commercial product used according to the patent in suit, i.e. Hifax 1900 from Himont, caused serious difficulties when scaling up the process from laboratory to plant scale, the Proprietor submitted the following further pieces of evidence:

P7: Confidentiality agreement between Himont Inc and AlliedSignal Inc, dated 15 September 1984,

P8: Declaration of Gene C. Weedon, dated 11 February 1998, amended by a "Supplementary Declaration" dated 11 March 1998,

P9: Declaration of Lloyd A. Hudson, dated 11 February 1998,

P10: Internal Memorandum from T.Y. Tam to G.C. Weedon, dated 29 January 1985, with Tables I & II attached,

P11: Declaration of James J. Dunbar, dated 22 May 1989,

P12: Modern Business Statistics, Freund & Williams, Prentice-Hall Inc, 1956, pages 145 to 149.

VI. The arguments of the Respondent (Opponent) may be summarized as follows:

(i) Concerning the literal inconsistency between the lower limits of molecular weight and intrinsic viscosity in Claim 1 of both requests (cf. point V(i) supra), the Respondent contended that this obscured the scope of these claims.

(ii) As to the issue of novelty, the Respondent's reasoning was twofold:

- in first place, he argued that the polymer Hercules UHMW 1900 used according to D1 normally met the particle size distribution requirements of Claim 1 of the patent in suit, and that, therefore, it was beyond reasonable doubt that the disclosure of D1 anticipated the claimed invention; at least would the skilled person "seriously contemplate" to use polymer lots that had the claimed particle size distribution, thus meeting the anticipation criterion set out in T 26/85 (OJ EPO 1990, 22),

- in second place, the Respondent relied on the fact that the claimed invention amounted to a non-novel selection from the disclosure of D1, because it did not meet two out of three criteria established in T 198/84 (OJ EPO 1985, 209) and T 279/89 of 3 July 1991



(not published in the OJ EPO), namely those that the selected sub-range should be narrow and sufficiently far removed from the preferred part of the known range of the prior art.

- (iii) Concerning the issue of inventive step, the Respondent contended that the particle size distribution feature of the patent in suit was of importance only for the Appellant's particular process and equipment, but not for any process coming under the definition of the method as claimed.

From the fact that Table I of the patent in suit comprised the originally "inventive" lots No. 3 and 10, which had substantially the same particle size distribution, but from which only lot No. 10 fell under the restricted scope of Claim 1 of the now Main Request, it could be concluded that the selection of the particle size distribution was not sufficient for the success and that an essential feature must be missing in the definition of Claim 1.

Thus, the particle size distribution alone did not amount to a critical selection and could not contribute to an inventive step.

The process of D1 rendered fibers of excellent quality and one skilled in the art had every reason to expect similar results when using polymers whose particle size distribution fell within the ranges specified in Claim 1 of the Main Request. The subject-matter of this Claim 1 was therefore obvious over document D1.

VII. The Appellant requested setting aside of the appealed decision and maintenance of the European patent No. 212 133 on the basis of the Main Request submitted during oral proceedings, on the basis of the First Auxiliary Request submitted on 12 February 1998, or on the basis of the Second, Third, Fourth or Fifth Auxiliary Requests all submitted on 6 March 1998.

The Respondent requested dismissal of the appeal.

### Reasons for the Decision

1. The appeal is admissible.

#### *Main request*

2. Article 123(2) and (3) EPC

Claim 1 is fairly based on the application as filed, particularly on its Claims 1, 8 (polyethylene), 12 (intrinsic viscosity above 15 and up to 19), 16 (at least 40% of the particles on a No. 80 mesh screen) and 21 (stretching). The feature "extruding" in lieu of "shaping" the heated solution is based on page 3 (line 9), page 8 (line 7), page 10 (Table V) and page 11 (line 22) of the application as filed.

Apart from necessary adaptations to Claim 1, the dependent Claims 2 to 19 correspond to the following claims in the application as filed (the latter after the colon):

- Claims 2 to 7: Claims 2 to 7,
- Claims 8, 9, 10, 11: Claims 10, 11, 14, 15,

- Claims 12 to 15: Claims 17 to 20,
- Claims 16 to 19: Claims 22 to 25.

The amendments introduced into Claim 1 restrict the scope of the claims as granted - which were identical to those as filed - and do not, therefore, extend the protection beyond that of the patent as granted.

The requirements of Articles 123(2) and (3) EPC are therefore met by the claims of the Main Request.

### 3. *Novelty (Article 54 EPC)*

#### 3.1 Document D1

This citation (cf. Claim 1) relates to a process for producing high strength, high modulus shaped thermoplastic articles of substantially indefinite length which comprises the steps:

- (a) forming a solution of a thermoplastic crystalline polymer having a weight average molecular length between  $7 \times 10^4$  and  $71 \times 10^4$  backbone atoms (e.g. polyethylene, polypropylene) in a first nonvolatile solvent,
- (b) extruding said solution,
- (c) cooling below a temperature at which a rubbery gel is formed,
- (d) extracting the gel with a second volatile solvent,
- (e) drying the gel to form a xerogel; and

- (f) stretching the gel containing the first and/or second solvent, and/or the xerogel.

According to Example 2 the linear polyethylene Hercules UHMW 1900, having an intrinsic viscosity of 17, is used.

There is no information in D1 as to the particle size distribution of this polymer. But apart from this property all other features of Claim 1 of the Main Request are met.

- 3.1.1 During the first instance opposition proceedings the Proprietor, in order to establish that Hercules UHMW 1900 did **not** inevitably have the particle size distribution required by Claim 1, submitted on 3 September 1991 as

**Evidence P1** a letter of Himont, Mr Hudson, to Allied, Mr Weedon, dated 26 September 1984.

P1 reports i.a. the particle size distributions of nine "1900<sup>R</sup> UHMW" lots, which - as is apparent from a comparison of the respective data - are identical to lots 1 to 9 of Example 1, Table I of the patent in suit. There was agreement between the parties that these lots are indeed lots of Hifax 1900, and there was also agreement that the tradenames Hifax 1900 and Hercules UHMW 1900 designate the same products.

While, because of the too high intrinsic viscosity of all these nine lots (lying between 21 and 30) they are beyond the scope of Claim 1 of the Main Request, which requires the intrinsic viscosity to be above 15 and up to 19, the particle size distribution of these lots nevertheless provides valuable information about the variation of this property of Hifax 1900, irrespective of the intrinsic viscosity.

All the nine Hifax 1900 lots referred to in P1, save lot 90256 (= lot 4 in Table I of the patent in suit), meet the two particle size criteria of Claim 1. However, with only 26.5% (6.5% on No. 60 mesh plus 20% on No. 80 mesh), lot 90256 fails to meet the "over 40% on No. 80 mesh" criterion of Claim 1; whether this lot meets the "75% between 100-400 microns" criterion cannot be decided with certainty, because there is no data for a 100 microns sieve (only for 200 mesh = 74 microns). Since the amount retained on the 200 mesh sieve was 55.9%, and since according to the lower graph in **Evidence P-2C**, submitted by the Proprietor on 3 September 1991, the particle size distribution curve of lot 90256 is highly assymmetric it, however, appears that this criterion is also met by said lot.

On the basis of the information contained in P1, in conjunction with Table I of the patent in suit, it must thus be concluded that it is not certain that the polyethylene Hercules UHMW 1900 used according to Example 2 of D1 had the particle size distribution characteristics required by Claim 1 of the Main Request.

- 3.1.2 The reasons to follow the opposite opinion, defended by the Respondent on the basis of the arguments (i) to (iv), cannot be accepted.

These arguments were,

- (i) that lot 90256 of P1 was to be disregarded as a non-representative lot,
- (ii) that document

**D2: G. B. McKenna et al. "Deformation and Failure of Ultra High Molecular Weight Polyethylene" in Technical Papers SPE, Vol. XXVII, 1981, 82-84**

(submitted together with the Notive of Opposition)

showed that the particle size of Hercules UHMW 1900 powder generally ranged from 80 microns to 300 microns,

(iii) that absolute certainty was not the correct novelty criterion, and

(iv) that the choice of the particle size distribution made according to Claim 1 amounted to a non-novel selection.

3.1.2.1 Concerning the afore-mentioned point (i) the Respondent relied on

**Evidence P2A and P2B**, submitted by the Proprietor on 3 September 1991 (pages 1 and 2 of a Memorandum, dated 18 September 1984, of Mr T. Y. Tam of Allied Fibers & Plastics to Mr Weedon),

according to which lot 90256 was admitted by the supplier Himont to be an "unacceptable transition product" (cf. P2A, paragraph in middle of page) which, by the customer Allied (i.e. the Proprietor) should be "returned for credit" (cf. P2B, point 6).

However, on page 4, 3rd paragraph of his **Declaration P8** Mr Weedon of Allied stated:

"This product was referred to as "transitional" since it was produced during the transition production time between lots of differing molecular weight. As such, there was no mistake in Himont sending this polymer to Allied initially as a lot to be evaluated. It was subsequent to this evaluation that Himont and Allied both realized that this "transitional" product should not be included in subsequent Allied orders. Himont was gracious enough to not charge Allied, Himont's good customer, for a bad lot of polymer discovered during evaluations subsequent to a plant shut down."

In the Board's judgment, this statement of Mr Weedon is convincing, because it is in agreement with the two facts

- that lot 90256 was delivered by Himont to Allied as a "normal" Hifax 1900 lot, and
- that lot 90256 exhibited an unsatisfactory performance only with respect to Allied's new development,

and is also in line with what can be supposed to be "the reality" of a normal supplier/customer relationship during the initial stages of a new development, where the supplier, in hope of future sales, is prepared to share to some extent the customer's risk (here by not charging for an unsatisfactory lot).

Hence, it cannot be concluded from evidence P1 that the polymer Hercules UHMW 1900 used according to D1 - let alone lots thereof having an intrinsic viscosity within the range specified in Claim 1 of the Main

Request ("above 15 and up to 19") - inevitably **must** have had the particle size distribution characteristics required by Claim 1 of the Main Request.

- 3.1.2.2 The same conclusion applies with respect to document D2, because there (page 82, left-hand column, last paragraph) the particle size of Hercules UHMW 1900 is only defined by the statement "The sizes generally range from 80  $\mu\text{m}$  to 300  $\mu\text{m}$ ". This range, although largely overlapping with that according to Claim 1 of the Main Request (100 to 400 microns), fails to specify whether the amount of particles within the 100 to 400 microns range is above 75% by weight and whether at least 40% by weight of the particles is retained on a No. 80 mesh sieve.

Thus, also D2 does not contain sufficient information to allow the conclusion that the polymer Hercules UHMW 1900 used according to D1 inevitably **must** have had the particle size distribution characteristics required by Claim 1 of the Main Request.

- 3.1.2.3 Furthermore, the Respondent's argument that absolute certainty was not the just criterion for novelty (cf. 3.1.2 (iii) supra), is also unconvincing. It is well established practice of the Boards of Appeal that in order to be novelty anticipated the claimed subject-matter must be directly and unambiguously derivable from the prior art (cf. T 511/92 from 27 May 1993, not published in the OJ EPO). In the present case, although the probability may be high that Hercules UHMW 1900 used according to D1 meets the particle size distribution characteristics required by Claim 1 of the Main Request, there remains a distinct margin of uncertainty. In order to overcome this insufficiency, the Respondent sought to rely on the criterion "whether the person skilled in the art would



in the light of the technical facts seriously contemplate applying the technical teaching of the prior art document in the range of overlap", as argued in point 9 of the Reasons of T 26/85 (cf. supra). However, this criterion was used in that decision in connection with a completely different situation, where the prior art expressly contained a reasoned statement dissuading the person skilled in the art to work in the range of overlap, when envisaging the specific application of the invention there under discussion (cf. point 13 of the Reasons). This situation is completely different from the present one, where the important feature of the particle size distribution is not even mentioned or suggested in D1. Thus, the skilled person was not in a position to "seriously contemplate or not" a certain selection of the particle size distribution.

- 3.1.2.4 Also the Respondent's last argument (cf. point 3.1.2 (iv) supra) fails, namely that the claimed invention amounted to a non-novel selection from the disclosure of D1, because it did not meet two out of three criteria established in T 279/89 (cf. supra) and T 198/84 (cf. supra), namely those that the selection should be narrow and sufficiently far removed from the preferred range of the prior art (cf. Section VI (ii) supra). While it may be true that quite a high percentage of Hifax 1900 (respectively Hercules UHMW 1900) lots meets the particle size distribution characteristics of Claim 1, this is not a relevant fact here.

Since the feature "particle size distribution" was not disclosed or at least suggested in the prior art to be a parameter which was at disposal, this feature did not amount to a "selection". Hence the criteria for the novelty of a "selection invention" set out in the aforementioned decisions do not apply here.

3.1.3 In an attempt to show that the particle size distribution of Hifax 1900 sold by Himont before the priority of the patent in suit met the requirements of Claim 1, the Respondent with his Notice of Opposition had filed

**Enclosure 1**, which is a copy of a telex, dated 20 August 1984, from Himont (the manufacturer of Hifax 1900) to DSM, Mr Kirschbaum.

Therein four lots are identified: 90160 (polymer "1900", intrinsic viscosity: 25); 90170 (polymer "1900 cm", intrinsic viscosity: 30); 90257 (polymer "hb312", intrinsic viscosity: 19) and 90281 (polymer "hb301", intrinsic viscosity: 12). From these lots only lot 90160 is designated as "proper" polymer (Hifax) "1900"; lot 90170 is also a Hifax "1900" lot but, as indicated by the letters "cm", modified to a certain extent. According to the Appellant, and not contested by the Respondent, the modification concerns the presence of small amounts of sodium stearate as mold release agent.

Because of their too high intrinsic viscosity, both these lots are beyond the scope of Claim 1 of the Main Request, which requires the intrinsic viscosity to be above 15 and up to 19.

Notwithstanding, the particle size distributions of these lots provide valuable information about the variation of this property of Hifax 1900.

The following particle size distributions are indicated in Enclosure 1:

mesh	microns	lot 90160 / 1900	lot 90170 / 1900cm
18		0	0
40	400 (42 mesh)	0.2	0.2
60	250	13.1	20.0
80	177	70.5	16.9
100	149	12.3	15.7
200	74	4.0	46.4
pan		0	0.8

Since the sum of the amounts retained on the 60, 80 and 100 mesh screens corresponds to the amount of particles having a size in the range of 100 to 400 microns, the feature of Claim 1 specifying that 75 to 100% of the particles should lie within the latter range is met by lot 90160 (said sum being 95,9%), but not by lot 90170 (said sum being 52,6%).

Similarly, the condition of Claim 1 that at least 40% of the particles be retained on a No. 80 mesh screen (corresponding in the present case to the sum retained on the 40, 60 and 80 mesh screens) is met by lot 90160 (the sum being 83,8), but not by lot 90170 (the sum being 37,1%).

In the Board's judgement, the difference in the particle size distributions of lots 90160 and 19170 demonstrates that it cannot be taken for granted that all lots of Hifax 1900 sold by Himont had the particle size distribution required by Claim 1 of the Main Request.

While the presence of a mold release agent in lot 19170 may have some influence on this property, it is highly unlikely that it is responsible for changes which caused the particle size distribution characteristics to be as far off the requirements of Claim 1 as they are (52,6% within the range of 100 to 400 microns, as compared to the lower limit of 75% according to Claim 1; 37,1% retained on a No. 80 mesh screen, as compared to the lower limit of 40% according to Claim 1).

Even if Enclosure 1 would thus be considered to represent typical qualities of the material Hercules UHMW 1900 used according to document D1, which is by no way established, this Enclosure 1 would not be able to prove that this polymer - let alone lots thereof having an intrinsic viscosity within the range specified in Claim 1 of the Main Request ("above 15 and up to 19") - must have had the particle size distribution characteristics specified in Claim 1 of the Main Request.

### 3.2 Document D3

This citation relates to a process for producing solutions in certain organic solvents of ultrahigh molecular weight ethylene polymers or copolymers having an intrinsic viscosity of at least 51 dl/g (cf. Claim 1).

According to Example 5 (in combination with Example 1) a solution of Hizex Million 240M of an intrinsic viscosity of 17 dl/g in decalin was spun through a spinning die, cooled, solidified and stretched (cf. page 2, lines 5 to 11; page 24, lines 18 to 30).

There is no information in D3 as to the particle size distribution of this polymer. However, both the Respondent (on **page 6 of the Notice of Opposition**) and the Appellant in his **Evidence P6** (letter from Mitsui Petrochemicals (America), Ltd. dated 16 January 1992 to Mr Weedon, Allied Fibers) submitted relevant information concerning this property.

According to the sieve analysis from April 1983 reported on page 6 of the Notice of Opposition 98.9% by weight (= 98.3% retained on 125  $\mu\text{m}$  sieve plus 0.6% retained on 250  $\mu\text{m}$  sieve) of the particles of Hizex Million 240M were between 100 and 400  $\mu\text{m}$ , thus meeting the respective requirement of Claim 1 (above 75%); however, there is no information in the sieve analysis concerning the amount of particles retained on a No. 80 mesh screen (= 177  $\mu\text{m}$ ).

According to page 1 of Evidence P6 96,7% by weight of the particles of (Hizex) Million 240M are retained on the sieves No. 80 (= 177  $\mu\text{m}$ ; 25.2%), No. 100 (= 149  $\mu\text{m}$ ; 57.1%) and No. 170 (= 88  $\mu\text{m}$ ; 14.4%). The requirement of Claim 1 of the Main Request that more than 75% of the particles range between 100 and 400 microns thus appears to be met. However, the other requirement, that more than 40% be retained on a No. 80 mesh sieve, is not met, since this amount is only 25.2%.

There was some confusion concerning the interpretation of page 2 of Evidence P6, allegedly a graphical representation of the particle size distribution results of lot 12123, the same lot whose particle size distribution was reported on page 1 of the same evidence P6. While this graph, when taken at face value, seems to show a particle size distribution

which meets both conditions of Claim 1, the Proprietor, in his submission of 12 February 1998, stated (uncontested by the Respondent) that this graphical representation was misleading and that the sieve analysis reported on page 1 of P6 was correct.

Irrespective of the afore-mentioned ambiguity, it must be concluded that the available evidence fails to prove that Hizex Million 240M used according to D3 met the particle size distribution requirements of Claim 1 of the Main Request, particularly the feature that at least 40% of the particles should be retained on a No. 80 mesh screen.

3.3 The subject-matter of Claim 1 of the Main Request is therefore novel over both, documents D1 and D3.

4. *Inventive step (Article 56 EPC)*

4.1 Closest prior art

Document D1 (cf. point 3.1 supra) discloses a process for the preparation of fibers from ultrahigh molecular weight polyethylene which differs from the subject-matter of Claim 1 of the Main Request only by the lacking characterization of the particle size distribution of the Hercules UHMW 1900 polymer.

4.2 Problem to be solved

According to page 2, lines 30 to 33 and 45 to 46 of the patent specification the claimed invention was concerned with the preparation at high rates of uniform solutions of ultrahigh molecular weight olefin polymer, which can be shaped by extrusion to i.a. fibers, films or tapes, which do not break upon drawing (cf. Example 1, page 12 to 16 and page 6,

Table V, "Comments"). From the results reported for lots No. 1 to 11 in Table I, page 3 and on page 4, lines 12 to 23 it can be inferred that the problem of fiber breakage is related to the particle size distribution; in particular lots No. 4 and 11 show that a high percentage of fine particles with less than 40% of the particles retained on a No. 80 mesh sieve caused yarn breakage upon drawing (see also Table V on page 6). Similarly, lot 8, which exhibited 42% of the particles retained on a No. 80 mesh sieve, was only marginally operable because of individual fiber breakage.

In his submissions the Proprietor repeatedly stressed the importance of the particle size distribution for the avoidance of processing difficulties, in particular fiber breakage. To that end he filed the **Declaration P8** (page 3, last paragraph) which reported the severe problems encountered by the inventors of the patent in suit when using "polyethylene polymer particles of the same average particle size, molecular weight and viscosity, manifested in a plant shutdown due to occasional plugging of the polymer dissolving transfer lines or breakage of the spinning pumps and more often broken filaments within a bundle of filaments or breakage of the entire bundle."

When starting from the teaching of document D1, the problem underlying the subject-matter of Claim 1 of the Main Request was thus the development of a reliable process for the manufacture of extruded articles, particularly fibers, from ultrahigh molecular weight polyethylene, which process avoids breakage of the fibers upon drawing.

#### 4.3 Solution of the problem

According to Claim 1 of the Main Request the aforementioned problem is to be solved by the use as starting polymer of an ultrahigh molecular weight polyethylene powder with 75 to 100% by weight of the particles having a particle size of from 100 to 400 microns and at least 40% of the particles being retained on a No. 80 mesh screen (0.177 mm).

The Board is satisfied by the results reported for Lots No. 1 to 11 of Table I (page 3 and page 4, lines 12 to 23; page 6, Table V) that the existing technical problem has effectively been solved by this selection of the particle size distribution. These results demonstrate in particular the importance for the problem to be solved (which importance was contested by the Respondent) of the feature in Claim 1 that at least 40% of the particles be retained on a No. 80 mesh screen (cf. first paragraph of preceding Section 4.2).

#### 4.4 Obviousness

There is no information in D1 or in any of the other prior art documents that the existing problem can be solved by the choice of the claimed particle size distribution. Therefore, this feature is able to confer inventive step on the subject-matter of Claim 1.

4.4.1 This conclusion is not invalidated by the following arguments of the Respondent.



4.4.1.1 Firstly, the Respondent contended that the particle size distribution feature according to the patent in suit was of importance only for the Appellant's particular process and equipment and that, thus, the conclusion of non-obviousness would not extend to the entire scope of Claim 1 of the Main Request.

In the absence of any supporting evidence this argument must be dismissed as a mere unfounded allegation. The critical importance of the particle size distribution was under discussion right from the beginning of the opposition proceedings in 1991 and there was plenty of time for the Respondent to develop this objection, which, however, was only brought forward during the oral proceedings before the Board, unsupported by any evidence.

4.4.1.2 Secondly, the Respondent argued that the satisfactory performance of polymer lots, which comply with the particle size distribution requirements according to the patent in suit, could not be taken as an indication of the non-obviousness of the subject-matter of Claim 1. From the fact that lots No. 3 and No. 10 of Table I, both having a very similar particle size distribution, but the one (No. 3) being outside the scope of Claim 1 (because of the now restricted intrinsic viscosity range of Claim 1), performed in the same satisfactory way, it had to be concluded, the Respondent contended, that an essential feature was missing in Claim 1.

Apart from the fact that this is an objection under Article 84 EPC, which is not a ground of opposition and which may only be considered under Article 102(3) EPC if related to amendments which are necessitated by proper grounds of opposition (cf. T 301/87, OJ EPO 1990, 335), which does not appear to be the case here, this objection is anyway inconclusive, because it is

not supported by the available evidence. While it is true that the particle size distribution of lots No. 3 and 10 in Table I of the patent in suit is very similar and that, therefore, such minor differences in the particle size distribution cannot explain their different processing behaviour, it is explicitly stated on page 4, lines 21 to 23 of the patent specification that the different processing behaviour "may be explained by the I.V. [intrinsic viscosity] difference, or by the fact that a nitrogen pressure blanket was used during processing of the lower I.V. particles." The person skilled in the art was, thus, aware that other parameters than those directly related to the essence of the invention - and which were within his general common knowledge - may influence the processing of high molecular weight polyethylene.

4.4.1.3 The last argument of the Respondent was that on which the decision under appeal relied, namely that the subject-matter of Claim 1 of the Main Request did not involve an inventive step, because, in view of the good results exhibited in D1, it was obvious to repeat the process disclosed in this document with the same polymer Hercules UHMW 1900.

This reasoning does not take account of an important aspect of the problem underlying the patent in suit, namely the development of a **reliable** process, i.e. a process which allows uninterrupted operation of a commercial process and can be carried out on industrial scale and which reliably yields products of high quality (no breakage) (cf. Section 4.2 supra, last paragraph).

There is no information in D1 concerning this aspect and it cannot be convincingly concluded that this requirement was met by D1 merely because it was not mentioned.

Rather Table I of the patent in suit and Evidence P1 demonstrate that different lots of ultrahigh molecular weight polyethylene 1900 (Hifax 1900 or Hercules UHMW 1900) behave differently, some of the lots (No. 4 and 11 in Table I) even providing unacceptable results. This was not denied by the Respondent. Document D1 was thus not able to offer a solution to the existing technical problem and the process according to Claim 1 of the Main Request provides a valuable contribution to the prior art which, therefore, involves an inventive step.

5. *Dependent Claims*

Owing to their dependency on Claim 1 Claims 2 to 19 of the Main Request stand in the same position, i.e. relate to novel and non-obvious subject-matter.

6. The claims of the Main Request, thus, comply with the requirements of the EPC.

7. Since the Main Request is admissible, there is no need to deal with the Auxiliary Requests.

**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 the order to maintain the patent on the basis of Claims 1 to 19 submitted as Main Request during oral proceedings, after amendment of the description.

The Registrar:



P. Martorana

The Chairman:



C. Gérardin