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D E C I S I O N
of 5 March 1998

Case Number: T 0172/95 - 3.3.3

Application Number: 84307212.5

Publication Number: 0141597

IPC: C08F 210/16

Language of the proceedings: EN

Title of invention:
Linear ethylene copolymer

Patentee:
Mitsui Petrochemical Industries, Ltd.

Opponent:
Dow Benelux N.V.

Headword:
-

Relevant legal provisions:
EPC Art. 83, 87(1), 54, 56, 104(1)

Keyword:
"Sufficiency of disclosure (yes) - sufficient information
present, no reason to deviate from it"
"Priority (yes) - no change of character and nature of the
invention"
"Novelty (yes) - no disclosure of all claimed features in
combination"
"Inventive step (yes) - argument admitted, not late filed -
claimed subject-matter not derivable from any document or
combination of documents"

Decisions cited:
T 0039/93, T 0171/84, T 0226/85, T 1113/92, G 0004/92

Catchword:
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Case Number: T 0172/95 - 3.3.3

D E C I S I O N
of the Technical Board of Appeal 3.3.3
of 5 March 1998

Appellant: Dow Benelux N.V.
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Decision under appeal: Decision of the Opposition Division of the
                              European Patent Office posted 16 December 1994
                              rejecting the opposition filed against European
                              patent No. 0 141 597 pursuant to Article 102(2)
                              EPC.

Composition of the Board:

Chairman: C. Gérardin
Members: B. ter Laan
             A. Lindqvist

Summary of Facts and Submissions

I.   Mention of the grant of European patent No. 0 141 597
        in respect of European patent application
        No. 84 307 212.5, filed on 19 October 1984, claiming
        priority from an earlier application in Japan
        (196081/83 of 21 October 1983), was announced on
        28 February 1990, on the basis of four claims, Claim 1
        reading:

        "A copolymer of ethylene containing at least 0.5 to 40
        mole % of units of at least one C_4-C_{20} α-olefin having
        the following characteristics (A) to (J):

        (A)   it has a melt flow rate, determined by ASTM
              D 1238E, of from 0.01 to 200 g/10 min.,

        (B)   it has a density of from 0.850 to 0.930 g/cm^3,

        (C)   it has a composition distribution parameter (U),
              defined by the following equation (1)

              $$U=100 \times (Cw/Cn - 1) \qquad (1)$$

              wherein Cw is the weight average degree of
              branching, and Cn is the number average degree of
              branching, of not more than 50,

        (D)   the amount of components having a degree of
              branching of not more than 2/1000 carbons is not
              more than 10% by weight based on the ethylene
              copolymer,

        (E)   the amount of components having a degree of
              branching of at least 30/1000 carbons is not more
              than 70% by weight based on the ethylene
              copolymer,

(F)   the ratio of the average block methylene chain length to the average methylene chain length is not more than 2.0,

(G)   it has n melting points measured by a differential scanning calorimeter (DSC) (where n=1 or n≥3), in which the highest melting point (T_1) among these DSC melting points is given by the following expression (i)

$$(175 \times d - 46)°C \leq T_1 \leq 125°C \qquad (i)$$

wherein d is the density (g/cm3) of the copolymer, the difference between T_1 and the lowest melting point (T_n) among the DSC melting points is given by the following expression (ii)

$$18°C < T_1 - T_n \leq 65°C \qquad (ii)$$

and the difference between T_1 and the second highest melting point (T_2) is given by the following expression (iii)

$$0°C < T_1 - T_2 \leq 20°C \qquad (iii)$$

provided that when the number of melting points is one (i.e., n=1), only the expression (i) is applicable and the expressions (ii) and (iii) are not applicable,

(H)   when n≥3 in the characteristic (G) above, the ratio of the amount of heat of crystal fusion (H_1) at the highest melting point T_1 to the total amount of heat of crystal fusion (H_T) is given by the following expression

$$0 < H_1/H_T \leq 0.40,$$

.../...

(I)   it has a crystallinity, measured by an X-ray
       diffraction method, of from 15 to 70%, and

(J)   it has a molecular weight distribution $\overline{Mw}/\overline{Mn}$ where
       $\overline{Mw}$ is the weight average molecular weight of the
       copolymer and Mn is the number average molecular
       weight of the copolymer, measured by gel
       permeation chromatography, of from 2.5 to 10."

Claim 2 refers to a preferred embodiment of the
copolymer according to Claim 1, Claim 3 is directed to
shaped articles of copolymers according to the previous
claims and Claim 4 refers to the use of a copolymer as
claimed in Claims 1 or 2 having a density of less than
0.90 g/cm³ as a modifier for thermoplastic resins.

II.   On 28 November 1990 a Notice of Opposition against the
       granted patent was filed, in which the revocation of
       the patent in its entirety was requested on the grounds
       set out in Article 100(a) and 100(b) EPC. The
       opposition was, *inter alia*, supported by the following
       documents:

       D1:   EP-A-0 109 779,
       D2:   EP-A-0 107 967,
       D5:   US-A-4 405 774,
       D10: US-A-4 076 698.

III.   By a decision announced orally on 29 November 1994 and
       issued in writing on 16 December 1994, the Opposition
       Division rejected the opposition on the grounds that
       the claimed subject-matter was sufficiently disclosed
       to be reduced to practice by the skilled person, and
       that it was novel and inventive over the cited prior
       art. In particular it was held that

(a)   the worked examples demonstrated how to obtain the claimed products with all parameters (A) to (J), so that the requirements of Article 83 EPC were fulfilled;

(b)   priority was recognised as none of the experimental details added later constituted a significant change in the scope of the invention;

(c)   as none of the cited documents disclosed all the parameters now present in the claims and the Opponent had not provided any proof that the missing parameters were inherent in the prior art polymers, the claimed subject-matter was novel;

(d)   regarding inventive step, D1 and D2 were not to be considered. The problem to be solved by the patent in suit was to provide ethylene copolymers having a balanced combination of transparence, impact resistance, blocking property, heat resistance and low temperature heat sealability. As D5, the only document cited by the Opponent against inventive step, was silent about the latter two properties, it contained no suggestion how to modify ethylene copolymers so as to obtain the desired combination of properties. Therefore, the claimed subject-matter was inventive.

IV.   On 16 February 1995 the Appellant (Opponent) lodged an appeal against the above decision and paid the prescribed fee simultaneously. The Statement of Grounds of Appeal was filed on 26 April 1995 and contained, in addition to arguments concerning the issues dealt with in the decision under appeal, comments by Prof. Groeninckx of the Catholic University of Leuven about the procedure normally followed to determine the parameters (D) and (E). These arguments were emphasised in later submissions filed on of 12 July 1995 and

14 January 1998, which both contained a Declaration by
Prof. Groeninckx, as well as during oral proceedings
held on 5 March 1998.

The Appellant argued essentially as follows:

(a)   Sufficiency of disclosure:

(i)   The TREF-method, which was used for
        fractionation of the polymer, consisted of a
        cooling step and an elution step. As was
        demonstrated by Kemia-Kemi, vol. 1, 1976, 47 to
        51, (in particular Figures 3 and 4), which had
        been cited during the proceedings before the
        first instance and will be referred to
        hereinafter as document A, the results of the
        second step were greatly influenced by the way
        the first step was performed. Since the cooling
        rate of the first step had not been disclosed in
        the patent in suit, the results of the elution
        step would give different results depending on
        the circumstances of the first step, so that it
        was not clear how to obtain the claimed ranges
        of the parameters (C), (D) and (E), based upon
        the fractionation results.

(ii)   The skilled person would not apply the
        calculation method for the parameter (C), the U-
        parameter, as it was based upon an assumption
        (the logarithmic normal distribution) that was
        only valid for monomodal distributions and was,
        from a theoretical point of view, incorrect for
        polymers having more than one melting point.

(iii)   Although there were generally accepted methods
        to determine the parameters (D) and (E), which
        Prof. Groeninckx used for his calculations, the
        procedure described in the patent in suit was

both obscure and erroneous and was demonstrated to lead to substantially different results. The complicated method used by Prof. Norisuye - an Associate Professor at Osaka University, who submitted an Experimental Report in the Appeal case T 1113/92 of 23 February 1995 (same patent proprietor; D1 in the present case), in which the definition of an ethylene copolymer by almost the same combination of parameters had given rise to similar objections -, on whose expert opinion the Patentee relied, did not provide a fair basis for comparison. Therefore, the skilled person would not know how to determine parameters (D) and (E).

(iv)   There was no clear description how to determine the value of parameter (F). The value in the table was not in conformity with the definition of that parameter.

The Appellant concluded that in view of those unclear and incorrect instructions the skilled person was not enabled to produce a polymer as now claimed.

(b)   Priority:

(i)   The application contained information regarding the fractionation method that was not present in the priority document. That information influenced the fractionation results (see (a) (i) above), which in turn were used as the basis for the calculation of a number of parameters, so that the result was a product with different parameters, hence a different product.

(ii)   The same was valid for the added information that, for the calculation of parameters (D) and (E), rather than using the values of the

fractionation data that had actually been measured, in fact recalculated values based upon those data should be used; this also changed the value of the parameters and resulted in a different product.

(iii)   In the priority document the polymer could have one or more melting points, in the application the number of 2 melting points was excluded.

Therefore, the new information resulted in a change of the character and nature of the claimed product, so that the priority claim was not valid.

(c)   Novelty:

(i)   The product disclosed in D1, Claim 1, differed from the present product in the parameter (G)(ii). However, the product described in Comparative Example 1 disclosed a value within the range now being claimed. Although that polymer had a different U-value (parameter (C)), this parameter was unusual and should therefore not be taken into account to establish novelty. Moreover, in the description a clear allusion was made to a product having all the required values for parameter (G)(ii) as well as for the other parameters, albeit by way of comparison.

(ii)   The description of the processes to be used for obtaining the claimed products was the same both for D1 and the patent in suit. Therefore, inevitably, the products must be the same as well.

(iii)   The novelty objection based upon D2, raised during the written proceedings, was, after an interlocutory decision of the Board regarding

the validity of the priority claim, not further
pursued.

Hence, the claimed subject-matter was not novel.

(d)   Inventive step:

(i)   The issue of inventive step had been raised as
         from the beginning, D5 being indicated as a bar
         to inventive step in the Notice of Opposition.
         Before the first instance the Respondent (then
         Proprietor) had not raised any objection against
         the admissibility of the issue.

(ii)   The claimed subject-matter lacked an inventive
         step over each of D1, D2 and D5 or a combination
         thereof for the reasons mentioned in the various
         letters filed during the proceedings before the
         first instance. There, it had been argued that
         the skilled person would be encouraged to vary
         the catalyst system and polymerization
         conditions in order to optimize the balance of
         properties of the product, in which direction
         several other documents also pointed. The patent
         in suit contained no indication of exceptional
         behaviour of the films made out of the claimed
         products, so that no conclusions regarding
         special properties of the products could be
         drawn.

Therefore, the claimed subject-matter was not
inventive.

(e)   Apportionment of costs (issue raised by the
         Respondent):

         The case was based upon arguments different from
         those used in previous case T 1113/92 (supra),

and the issues were not identical. Therefore, the Respondent's request for an apportionment of costs was not justified.

V.   The Respondent's written and oral submissions can be summarized as follows:

(a)   Sufficiency of disclosure:

(i)   The Appellant's arguments regarding the fractionation method did not apply to the well-known method described in the patent specification. As could be seen from a calculation based upon Figures 3 and 4 of the Kemia-Kemi document and using the methods according to the patent, the relation between $I(w)$ and $CH_3/1000C$ was in fact not essentially influenced by the cooling rate.

(ii)   It was contested that the skilled person would question the correctness of the calculation methods indicated. The instructions in the patent specification were clear as to the assumption of a logarithmic normal distribution. On that assumption the value of parameter (C) was calculated. Reference was made to the decision taken in case no. T 1113/92 (supra).

(iii)   The crystallization/elution steps of the TREF method did not lead to fractions that contained perfectly separated characteristics, but rather resulted in mixtures of polymer components, for which, as indicated in the patent specification, a logarithmic normal distribution was assumed. Based upon that assumption, the values of parameters (D) and (E), like that of parameter (C), were calculated.

(iv)   Regarding parameter (F), the objection had not
         been part of the proceedings before the first
         instance and should be ignored.

The Respondent concluded that there was no reason why
the skilled person could not follow the instructions
given in the patent specification.

(b)   Priority:

(i)   The additional information did not lead to any
         changes in the fractionation results. As
         explained above ((a)(i)), the cooling rate did
         not play a critical role in the method described
         in the patent specification, the priority
         document and the application as filed.

(ii)   The assumption of the logarithmic normal
         distribution was already indicated in the
         priority document. The added information was a
         more precise instruction, not a different one in
         substance.

(iii)   The restriction of the number of melting points
         did not change the scope and the nature of the
         invention.

The skilled person would not apply different methods
when reading the priority document and the patent in
suit.

(c)   Novelty:

(i)   D1 differed in the value of parameter (G)(ii).
         In the description reference was made to a
         polymer having values of that parameter within
         the range as now required, but no indication was
         given that all the other parameters also fell

within the claimed ranges. As D1 did not
disclose all of the present features, it could
not damage the novelty.

(ii)   The description of the processes to be used
         provided a general background of the kind of
         conditions necessary to obtain the claimed
         products. From the examples it could be seen
         that some of the process features, in particular
         in the preparation of the catalyst, were
         actually different, so that D1 did not disclose
         identical polymers.

(d)   Inventive step:

(i)   The only document relied upon for objections
         against inventive step, was D5. However, no
         arguments were given. Therefore, any obviousness
         argument based upon D5 or any other document
         should not be admitted into the proceedings.

(ii)   In support of the presence of an inventive step,
         the Respondent pointed out the special and
         unexpected behaviour of films made out of the
         claimed polymers. They did not break, but
         instead stretched.

The Respondent concluded that the claimed subject-
matter was inventive.

(e)   Apportionment of costs:

         An apportionment of costs was considered
         appropriate because the Appellant had caused the
         Respondent to spend considerable time and effort
         by returning to a point that had already been
         decided in previous case T 1113/92 (supra), in
         particular, the arguments concerning parameters

(C), (D) and (E), which were, moreover, not raised in the Notice of Appeal. That was done to confuse the true issues involved.

VI.   The Appellant requested that the decision under appeal be set aside and the patent be revoked.

The Respondent requested that the appeal be dismissed and, if the Board would wish to alter any of the findings of T 1113/92 (supra), including but not limited to finding of facts, interpretation of the law and the nature of the skilled person, to refer to the Enlarged Board of Appeal the question whether the Board was entitled to do so. However, the latter request was withdrawn during the oral proceedings.

Reasons for the Decision

1.   The appeal is admissible.

Sufficiency of disclosure

2.   An invention is sufficiently disclosed when a skilled person can carry it out on the basis of the information provided by the patent specification in the light of common general knowledge.

2.1   It is generally accepted that "a person skilled in the art", is presumed to be an ordinary practitioner or a team of ordinary practitioners, aware of what was common general knowledge in the art at the relevant date, capable of following instructions, but not having any inventive capability (see T 39/93, OJ EPO 1997, 134, Reasons for the Decision, point 7.8.4), who is capable of recognising and rectifying errors in the description (T 171/84, OJ EPO 1986, 95 and T 226/85, OJ EPO 1988, 336). In the present case it means that

.../...

the skilled person is an ordinary polymer chemist or a team of ordinary polymer chemists familiar with the various problems encountered when producing polymers, in this case polyethylene, and knowledgeable about the standard methods used to analyse the products, who would know which analysing and calculation methods would not be correct. In view of the Appellant's objections concerning (i) the fractionation method, in particular the cooling step and (ii) the calculation methods for parameters (C), (D), (E) and (F), first the skilled person's common general knowledge on those two points has to be established and secondly, the information provided in the patent in suit, in the light of that common general knowledge, has to be analysed. Also, as the Appellant's arguments boil down to the assertion that the methods used in the patent in suit were incorrect and would not be applied to the category of copolymers with which the patent is concerned, it has to be established whether, based upon his common general knowledge and the information contained in the patent specification, the skilled person would have been inclined not to follow the instructions in the patent specification.

2.2   Regarding the fractionation method, several documents filed by the Appellant on 12 July 1995, during the written proceedings before the Board:

B: Bull. Soc. Chim. Belg., vol. 59, 1950, 476-489 (in particular 477: II. Technique opératoire),

C: J. Pol. Sc. Part A, vol. 3, 1965, 907-916 (in particular 909 to 913) and

D: J. Pol. Sc.: Pol. Phys. Ed., vol. 20, 1982, 441-455 (in particular 442),

show that the method according to which the polymer is

first coated upon a support and then eluted by stepwise
raising the temperature of the eluent and completely
dissolving the polymer at every particular temperature,
called preparative-scale temperature elution
fractionation (hereinafter P-TREF), belonged to the
state of the art and was a well-known analytical method
for polymers at the priority and filing dates of the
patent in suit. Document C (in particular Figures 4 and
5) also shows the fractionation and refractionation
results of samples of polymer, which demonstrate the
heterogeneous character not only of the polymer itself,
but also of its fractions. Also comparisons of the
theoretical values with the actually measured values
are made. The differences between P-TREF and the later
developed continuous analytical-scale temperature
rising elusion and fractionation (hereinafter A-TREF)
are also described in document D. In the light of those
documents there can be no doubt that the skilled person
was familiar with the P-TREF method and the differences
between P-TREF and A-TREF and that he would know that
the polymer fractions in themselves were not
homogeneous but, like the polymer itself, for their
part also contained a distribution of short chain
branching degrees. Therefore, the Board considers this
knowledge as belonging to the general common knowledge
of a person skilled in the field of polyethylene
polymers.

2.3   The patent specification contains the following
        information about the fractionation method (page 4,
        lines 29 to 44):

"The copolymer (10 g) is added to about 2 liters of a
mixture of p-xylene and butyl Cellosolve® (80:20 by
volume) and the mixture is heated at about 130°C in the
presence of 2,5-di-tert.butyl-4-methylphenol (0.1% by
weight based on copolymer) as a heat stabilizer. Then,
about 1 kg of diatomaceous earth (tradename Celite®

#560, made by Johns-Manville Company, U.S.A.) is added
to the resulting solution, and the mixture is cooled to
room temperature with stirring. This operation results
in coating the copolymer on diatomaceous earth. Then,
the entire mixture is filled in a jacketed cylindrical
column (diameter about 3 cm) which is set
perpendicularly. While the column is maintained at a
temperature of 30°C, a solvent having the same
composition as the above mixed solvent in the same
volume as a solution flowing from the bottom of the
column is passed (about 1 liter/hr) through the column
from its top. The solution flowing out from the bottom
of the column is collected in a receiver. To the
collected solution is added methanol in an amount twice
the volume of the collected solution to precipitate the
eluted copolymer. After confirming that upon addition
of methanol, the copolymer no longer precipitates, the
flowing of the solution is stopped. The temperature of
the column is then raised to 35°C, and the flowing of
the solution and the passing of the mixed solvent are
resumed and continued until the copolymer no longer
flows out. The foregoing operation is carried out at
intervals of 5°C until the operation is finally carried
out at 120°C. The copolymer fractions precipitated from
methanol are separated by filtration and dried to
obtain fractions."

2.3.1   From that passage it is clear that elution is carried
        out stepwise and not gradually (page 4, lines 38 to 42:
        "until the copolymer no longer flows out"), which
        supports the Respondent's argument that the method used
        is P-TREF, not A-TREF. On the basis of his common
        general knowledge (see point 2.2 above), the skilled
        person would thus be well aware of the fractionation
        method to be used for the determination of the
        parameters (C), (D) and (E).

2.3.2   As the Appellant stated, the passage does not contain
        any indication about the cooling rate during the first
        step. The Appellant argued that different cooling rates
        led to different results in the second step, which
        argument was supported by a direct reference to
        Figures 3 and 4 of document A.

        Those figures show the distribution of TREF-fractions
        as a function of elution temperature for different
        cooling rates and it cannot be denied they are
        different. That does however not mean that the
        parameters defining the presently claimed polymer are
        also different or that differences in the elution
        patterns automatically result in different values of
        those parameters. The Appellant brought no proof that
        such would be the case.

        The Respondent, however, did support its statement that
        the results obtained with P-TREF were substantially
        independent of the cooling rate in the first step, by
        submitting plots which show the relationship between
        the cumulative weight fraction and the composition
        distribution parameter (U) calculated from the data of
        Figures 3 and 4 of document A (statement of 19 March
        1996, page 4, second complete paragraph and annex).

        In the light of this evidence, the Board considers that
        the Appellant's argument that the cooling rate
        influences the results of the fractionation method in
        such a way as to change the values of the parameters
        now being claimed, is not sufficiently supported by
        evidence. Therefore, the Appellant's argument cannot be
        accepted.

2.4   According to the patent specification, the values of
        parameters (C), (D) and (E) are calculated as follows:

"The weight of each of the fractions is then measured,
and the degree of branching per 1000 carbons [C] of
each of the fractions is determined by the ^{13}C-NMR
method shown below with regard to the characteristic
(D).

Since the degree of branching per 1000 carbons [C] of
the fraction decreases as the eluting temperature
rises, the cumulative weight fractions [I(w)] are
calculated in the decreasing order of the eluting
temperature. **Under the assumption that the number of
branches per 1000 carbons [C] and the cumulative weight
fraction [I(w)] in each fractionated portion follow the
integral function of the logarithmic normal
distribution** (emphasis added), which is the following
equation (2), parameters β and C_0 equation (2) are
determined by using the method of least square.

$$I(w) = \frac{1}{\beta\sqrt{\pi}} \int_0^c \exp\left[-\frac{1}{\beta^2} (\ln C/C_0)^2 \right] d(\ln C) \qquad (2)$$

(The amendment by the Board of β2 into β^2 involves the
correction of an obvious typing error.)

β and C_0 are given by the following equations.

$\beta^2 = 2 \ln(Cw/Cn)$ (3)
$C_0^2 = Cw.Cn$ (4)

Thus, Cn and Cw can be easily calculated."
(page 4, lines 45 to 65)

and:

"The degree of branching, as used herein, denotes the
number of branches per 1000 carbons in the copolymer
chain, and is determined in accordance with the method
disclosed in G. J. Ray, P. E. Johnson and J. R. Knox,
Macromolecules, 10, 773 (1977) from the area intensity
of a signal of methylenic carbon adjacent to a branch

observed by the ^{13}C-NMR spectrum. For example, when the
comonomers of a copolymer are butene-1 and 4-
methylpentene-1, the positions of the chemical shifts
of the signals assigned to the above methylenic carbons
are respectively 33.8 ppm and 34.5 ppm with TMS
(tetramethylsilane) as a standard."
(page 5, lines 12 to 18)

and:

"The amounts of components having not more than
2 branches/1000 carbons and components having at least
30 branches/1000 carbons are determined as follows: —
The relation between the cumulative weight fractions
and the degrees of branching obtained from the
fractionation of the copolymer performed in determining
U with regard to the characteristic (C) is plotted on a
graph, and the points corresponding to two
branches/1000 C and 30 branches/1000 C on the graph are
interpolated. The cumulative weight fractions
corresponding to these points are determined based on
the results, and the above amounts can thus be
determined."
(page 5, lines 29 to 35).

2.4.1   From that information it is clear that the weight of
        each of the fractions is measured and that the degree
        of branching is determined by ^{13}C-NMR according to well-
        known methods and there can be no doubt that the
        skilled person would have known how to apply them and
        indeed would apply them. This means that the patent
        specification provides a clear teaching about how to
        perform a reliable measurement of the degree of short
        chain branching in the copolymer chain.

2.4.2   As indicated on page 4, lines 52 to 65 of the patent
        specification, the calculation methods for the
        parameters (C), (D) and (E) rely on the assumption that

the number of branches per 1000 C-atoms and the
cumulative weight fraction I(w) in each fractionated
portion follow the integral function of the logarithmic
normal distribution. This provides a clear instruction
to the skilled person not to depart from that
assumption.

Although the Appellant stated that that assumption for
most polymers was wrong and would lead to erroneous and
unreliable results, it failed to provide any proof that
such was indeed the case and that the results of
calculations based upon the assumption would not be
reproducible. As the Board can see no reason why the
results obtained according to the teaching of the
patent in suit would not be reproducible, it is
satisfied that, even if the above-mentioned assumption
would not be correct from a theoretical point of view,
the instruction is so clear and unambiguous that the
skilled person would know how to apply it and indeed
would apply it and obtain reproducible results.

2.4.3   As pointed out above (point 2.2), the skilled person
          knew that the fractions obtained by P-TREF were
          heterogeneous, or, in other words, that they did not
          contain one kind of polymer molecule with one,
          precisely defined, degree of short chain branching, but
          instead a mixture of polymer molecules having different
          degrees of short chain branching and that such a
          fraction, when measured, presented an average degree of
          short chain branching corresponding to its specific
          mixture of polymer molecules. In the light of that
          knowledge, the indication in the patent specification
          that the distribution of polymer molecules in each
          fractionated portion is assumed to follow the integral
          function of a logarithmic normal curve and that the
          calculations of the short chain branching are based
          upon that assumption (page 4, lines 50 to 52), cannot

be misunderstood and the skilled person would carry out the calculation accordingly.

2.4.4   Regarding the parameters (D) and (E) the additional information that the points corresponding to 2 and 30 branches respectively, should be interpolated (page 5, lines 29 to 33), is self-evident, since one would not expect the actual measured values of the fractions to be exactly 2 and exactly 30 branches per 1000 C-atoms, which are the basis for the definition of those parameters. Therefore, that passage does not render the instructions unclear, on the contrary, it merely reflects common general knowledge.

2.4.5   The objection against the calculation method of parameter (F) was raised for the first time only in the Statement of Grounds of the Appeal and the Respondent requested that it be ignored. The lateness of the objection in itself can, however, not be a bar to consideration by the Board, as it concerns not a new ground, nor new evidence or a new fact, but a new argument, which could be dealt with even in the absence of the other party (G 0004/92, OJ EPO 1994, 149).

The patent in suit gives the following information regarding the measurement of parameter (F):

"In the present invention, the above ratio in characteristic (F) is determined from the average methylene chain length calculated by using ^{13}C-NMR and the average block methylene chain length calculated by excluding the case where the number of methylene groups between two adjacent branches is not more than 6, and defined as the ratio of the average block methylene chain length to the average methylene chain length. The block methylene chain length is the number of methylene groups between branches determined from the signals of the third and fourth and subsequent methylenic carbons

observed when the number of methylene groups between
branches is at least 7. The positions of the chemical
shifts of the signals assigned to the third and fourth
and subsequent methylenes are 30.1 ppm and 29.6 ppm,
respectively, with TMS as a standard." (page 5,
lines 52 to 59).

In the Board's opinion, those instructions are clear
enough for the skilled person to carry them out. The
Appellant's written argument (Statement of Grounds of
Appeal, page 7, second complete paragraph) did not go
beyond the mere observation that the definition was not
well-defined and during the oral proceeding the issue
was not further substantiated, so that it is not clear
how that objection should be understood. Therefore, the
Board cannot accept the Appellant's argument.

2.5   For the above reasons, the Board concludes that the
        patent specification contains sufficient information
        regarding the measurement and calculating methods of
        the various parameters defining the claimed polymer for
        the skilled person to carry them out. Furthermore, in
        the Board's view, the skilled person would, on the
        basis of that information, in the light of his common
        general knowledge, not deviate from it, so that the
        requirements of Article 83 EPC are fulfilled.

Priority

3.   The Appellant's objections concerned the fractionation
        method, the calculation methods for parameters (D) and
        (E) and the number of melting points, which were
        different in the priority document and in the patent in
        suit (Statement of Grounds of Appeal, page 1, fourth
        paragraph).

3.1   Regarding the fractionation method, the English
        translation of the priority document reads:

"For carrying out the fractionation of the ethylene copolymer, it is dissolved in a solvent mixture (volume ratio: 80/20) of p-xylene and butyl Cellosolve in the copresence of 2,5-di-tert-butyl-4-methylphenol as a thermal stabilizer, after which the solution is coated on diatomaceous earth (tradename CELITE #560, a product of Johns-Manville Company, U.S.A.). The coated diatomaceous earth is then packed in a cylindrical column. While causing the passage and flow through the column of a solvent having the same composition as that described above, the temperature inside the column is raised from 30°C to 120°C stepwise at 5°C graduations to fractionate the ethylene copolymer. This is followed by reprecipitation in methanol, separation by filtration and drying to give the fractions."
(page 12, last paragraph to page 13 line 7).

Compared with the text of the patent in suit, a number of differences are present, of which the amounts of polymer and solvent, the temperature at which the polymer is solved and the cooling while stirring are the most important ones as they might influence the fractionation results. The other differences are mostly of editorial nature. Although the Appellant argued that the effect of those differences would result in different polymers being claimed in the priority document and in the patent in suit, no evidence whatsoever in support of that contention was provided. In particular, it has not been shown that any changes in the conditions of the first step of the P-TREF method would lead to modifications in the values of the parameters defining the claimed polymers. By contrast, as was the case with the sufficiency issue (point 2.3 above), the Respondent did provide evidence of the contrary. Therefore, the Appellant's argument has to be rejected.

3.2   Regarding the calculation methods for parameters (C),
         (D) and (E), the priority document lacks the following
         passage (page 5, lines 29 to 35 of the patent
         specification):

         "The amounts of components having not more than
         2 branches/1000 carbons and components having at least
         30 branches/1000 carbons are determined as follows: —
         The relation between the cumulative weight fractions
         and the degrees of branching obtained from the
         fractionation of the copolymer performed in determining
         U with regard to the characteristic (C) is plotted on a
         graph, and the points corresponding to two
         branches/1000 C and 30 branches/1000 C on the graph are
         interpolated. The cumulative weight fractions
         corresponding to these points are determined based on
         the results, and the above amounts can thus be
         determined."

         As stated above (point 2.4.4), that information does
         not change anything to the actual method of
         determination of the parameters (D) and (E), but merely
         specifies how on that basis a person skilled in the art
         would normally operate in order to determine the exact
         amounts of components having not more than
         2 branches/1000 carbon atoms and components having at
         least 30 branches/1000 carbon atoms. Therefore, the
         introduction of the above passage into the application
         as filed does not change anything in the definition of
         the ethylene copolymer, hence does not modify in
         substance the teaching of the priority document.

3.3   As to the number of melting points, in the priority
         document the polymer could have one or more melting
         points (feature (G) in the claim and page 16, last
         paragraph to page 7, first paragraph), whereas the
         present claims refer to one or three or more melting
         points, thus excluding the possibility of two melting

1310.D   .../...

points. Although the Appellant during the written
proceedings stated that that exclusion changed the
character and the nature of the claimed subject-matter
(Statement of Grounds of Appeal, page 2, second
paragraph), the Appellant did not explain in which way,
nor was any evidence provided that the excluded feature
was technically essential for achieving the object of
the invention. During the oral proceedings the matter
was not further argued.

A comparison of the description of both documents shows
that the objectives (page 2, lines 5 to 10 of the
patent specification; the paragraph bridging pages 3
and 4 of the English translation of the priority
document) have remained the same: copolymers having a
well-balanced combination of transparency, impact
strength, tear strength, blocking resistance,
environmental stress cracking resistance, heat
resistance and low-temperature heat-sealability for a
density of 0.90 or more. For copolymers with a density
of less than 0.90, the emphasis lies on transparency,
impact strength and low-temperature heat-sealability
and the suitability for improving the impact strength
and low-temperature heat-sealability of other polymers
in which they are incorporated.

No particular mention is made of the number of melting
points, but a number of examples present in the
priority document have been deleted. As the tables in
the priority document do not give the number of melting
points of the exemplified polymers, no conclusion
regarding that feature can however be drawn from the
deletion of some examples. In fact, according to
page 18, lines 2 to 11 of the priority document, which
corresponds to page 6, lines 16 to 21 of the patent
specification, the features which are decisive for the
desired balance of properties are not the number of
melting points, but, on the one hand, the actual value

of T_1, and, on the other hand, the differences T_1-T_n or T_1-T_2; thus, in that respect also, the definition of the copolymer in the priority document and in the patent in suit is the same. Therefore, there is no evidence that the number of melting points would play a technical role in the sense of being essential to achieve the invention's objectives. Accordingly, a change of character and nature of the invention as defined in the priority document cannot be recognised.

3.4   In view of the above, the priority of the patent in suit is validly claimed.

Prior art

4.   In the light of the valid priority of 21 October 1983 of the patent in suit, D1, which was filed on 25 October 1983 with a priority of 25 October 1982 belongs to the state of the art according to Article 54(3)(4) EPC. According to the Appellant, D2, which claims the same priority as D1, is not entitled to it. The Respondent did not contradict that statement and the Board sees no reason to deviate from those opinions. Therefore, D2 is not considered to be state of the art within the meaning of Article 54(2) or 54(3) EPC. D5 and D10 have been published before the priority date of the patent in suit, so that they form prior art under Article 54(2) EPC.

Novelty

5.   The novelty objection was based upon D1, which describes an ethylene copolymer having in combination the following characteristics (A) to (I):

        (A)   it has a melt flow rate of from 0.01 to 200 g/10 min.;

(B)   it has a density of from 0.900 to 0.945 g/cm^3;

(C)   it has a composition distribution parameter (U),
        defined by the following equation (1)

$$U=100 \times (Cw/Cn - 1) \ldots\ldots (1)$$

        wherein Cw is the weight average degree of
        branching, and Cn is the number average degree
        of branching,
        of not more than 50;

(D)   the amount of components having a degree of
        branching of not more than 2/1000 carbons is not
        more than 15% by weight based on the ethylene
        copolymer;

(E)   the amount of components having a degree of
        branching of at least 30/1000 carbons is not
        more than 15% by weight based on the ethylene
        copolymer;

(F)   an average chain length ratio of the methylene
        groups is not more than 2.0;

(G)   it has n melting points measured by a
        differential scanning calorimeter (DSC) (where
        n≥2); the highest melting point T_1 among these
        DSC melting points is given by the following
        equation

$$T_1 = (175 \times d - 46) \sim 125°C$$

        wherein d is the density (g/cm3) of the
        copolymer;

the difference between T_1 and the lowest melting point T_n among the DSC melting points is given by

$$0°C < T_1 - T_n \leq 18°C;$$

and the difference between T_1 and the second highest melting point T_2 is given by the following expression (iii)

$$0°C < T_1 - T_2 \leq 5°C,$$

provided that when there are two (n=2) melting points, the difference is in accordance with the above expression

$$0°C < T_1 - T_n \leq 18°C;$$

(H)   the ratio of the amount of heat of crystal fusion H_1 at the highest melting point T_1 to the total amount of heat of crystal fusion H_T is given by the following expression

$$0 < H_1/H_T \leq 0.40; \text{ and}$$

(I)   it is a copolymer of ethylene with at least one C_4-C_{20} α-olefin (Claim 1).

5.1   As can be seen from a comparison with present Claim 1 (point I above), a number of ranges overlap but do not have the same limits, whereas the requirement for T_1 - T_n is different over the whole range. Values of above 18°C in D1 can however be found in Comparative Examples 1 and 2 (19.2 and 19.4, respectively); according to page 12, lines 13 to 18, when T_1 - T_n is higher than 18°C, the tear strength, impact strength and low-temperature heat-sealability of the copolymer are deteriorated, and it is difficult to provide the

desired excellent properties in a well balanced combination (Tables 2 and 3).

5.2 The fact that in Comparative Examples 1 and 2 $T_1 - T_n$ falls within the range now required for characteristic (G) does not render them detrimental to novelty, since other parameters, in particular the U-parameter (Comparative Example 1:55 and Comparative Example 2:108), fall outside the scope of the present claims. The Appellant argued that the difference in the values of the U-parameter should be disregarded as it was an unusual one for which no reliable method for determination existed. In reality, as demonstrated above (point 2), the method to determine the value of U is clear and reproducible. Moreover, the U-parameter is based upon standard methods for analysing ethylene copolymers, which were also used in D1, so that it can be accepted as an indicator for differences between polymers. For those reasons, the Appellant's argument must fail.

5.3 Regarding the passage on page 12 of D1, there is no indication whatsoever that the other parameters have values within the present ranges. Not only can the values of the other parameters be outside the scope of the claimed subject-matter as the ranges do not exactly correspond (parameter (B) is 0.900 to 0.945 in D1, 0.850 to 0.930 in the patent in suit; parameter (D) is not more than 15% in D1, not more than 10% in the patent in suit), but also there is no indication that the other parameters retain their indicated values when the value of $T_1 - T_n$ is changed. On the contrary, since the catalysts actually used in the examples of D1 and in those of the patent in suit are not prepared in the same way, in view of the complex nature of those catalysts it is highly probable that they do not produce the same polymers. Anyhow, the Appellant, who as the Opponent has the onus of proof, provided no

evidence that they do. Therefore, there is no reason to assume that the values of $T_1 - T_n$ higher than 18°C mentioned in Comparative Examples 1 and 2, without any reference to the other parameters of the polymer, automatically mean that the latter, too, would fall within the ranges required according to the patent in suit. The disclosures of D2 (which is not prior art) and D10, upon which the Appellant relied to demonstrate the implicit disclosure of the comonomer percentage and parameters (A), (B), (I) and (J) of the polymers of D1, do not change anything in that respect. Accordingly, it is concluded that D1 does not explicitly or implicitly disclose all the combined features of the present polymers.

5.4   No other documents were cited against the novelty of the claimed subject-matter and the Board agrees with that view.

5.5   For those reasons, the subject-matter of Claim 1 as well as that of Claims 2 to 4 is novel.

Admissibility of inventive step objection

6.   The Respondent objected to the issue of inventive step based upon D5 being raised in the appeal proceedings, since the Appellant had not provided any arguments as to why D5 would be detrimental to inventive step (statement filed on 19 March 1996, page 6, last paragraph). However, in the Notice of Opposition, to which the Appellant referred for its inventive step objection, in point 5, page 9, second full paragraph, it was argued that the skilled person, in view of a number of other documents, would be encouraged to vary the catalyst system and polymerization conditions of D5 in order to optimize the characteristics of the polymer. Therefore, the issue of inventive step had been raised during the proceedings before the first

instance, so that no new ground is introduced at the
appeal stage. Also, D5 has been mentioned and used as a
support for that objection as from the beginning.
Therefore, there are no new facts or evidence. Since in
the conclusion of the Statement of Grounds of Appeal
the Appellant made an explicit reference to the
arguments presented in the Notice of Opposition, it
cannot be maintained that new arguments have been
introduced in the proceedings before the Board either.
Hence, the issue of inventive step is admitted into the
proceedings.

Inventive step

7.   The patent in suit concerns a linear ethylene
       copolymer.

7.1   Such copolymers are disclosed in D5, which the Board,
       like the Opposition Division and the parties, regards
       as the closest state of the art. D5 (Claim 1) describes
       a copolymer of ethylene and a minor proportion of an α-
       olefin having 4 to 10 carbon atoms, which has the
       combined properties of:

       (1)   a melt flow rate of 0.1 to 100 g/10 min.,

       (2)   a density of 0.91 to 0.94 g/cm^3 and

       (3)   a xylene absorption per unit amorphous region
               (Y) satisfying the formula:
                   $Y < - 0.80 X + 0.67$
               wherein X is the degree of crystallinity of the
               copolymer.

Although the copolymer is said to have excellent transparency, impact resistance and opening (blocking) property (column 1, lines 49 to 52; column 2, lines 5 to 11) the low temperature heat-sealability and tear strength were capable of improvement.

7.2   According to the patent specification (page 2, lines 5 to 10), the technical problem underlying the patent in suit is to be seen in providing a polymer that would have an advantageous combination of transparency, impact strength, tear strength, blocking resistance, environmental stress cracking resistance, heat resistance and low-temperature heat-sealability.

7.3   According to the patent in suit this problem is to be solved by an ethylene copolymer having the features as defined in Claim 1.

7.4   The examples and comparisons with the prior art in the patent (Tables 1 to 3) show that only some aspects of the above-defined problem are effectively solved. In particular, it has been shown that films made out of the polymers according to the patent in suit have a favourable combination of transparency, impact strength, tensile strength, blocking properties and low temperature heat-sealability. However, the examples contain no information about the environmental stress cracking resistance and heat resistance, so that it cannot be concluded that the above defined technical problem is effectively solved in respect of those properties.

7.5   Therefore, the technical problem has to be reformulated on a less ambitious basis, namely as to provide a polymer that has an advantageous combination of transparency, impact strength, tear strength, blocking resistance and low-temperature heat-sealability, which

problem, as pointed out above (point 7.4), has been effectively solved.

8.   The issue to be decided, therefore, is whether the claimed subject-matter is obvious having regard to the documents on file.

8.1   The general teaching of D5 is that ethylene copolymers having a single melting point, hence a uniform distribution of comonomers, are very suitable for producing films having good transparency, tear resistance, impact resistance and blocking property (column 5, lines 5 to 7 and 24 to 31). The importance of polymers having only one melting point is emphasised (column 4, line 67 to column 5, line 13). In that light, it was not to be expected that it would be possible also to produce polymers having three or more melting points that would exhibit an advantageous combination of the above-mentioned properties. Moreover, as D5 is completely silent about low temperature heat-sealability, there would be no incentive on the basis of the teaching thereof to consider the specific combination of features of present Claim 1 in order to arrive at a polymer having not only the above-mentioned favourable combination of properties, but also the additional advantage of low temperature heat-sealability. Therefore, D5 alone does not render obvious the definition of the polymers now being claimed.

8.2   In its Notice of Opposition, the Appellant combined the teaching of D5 with other documents, arguing that the skilled person would have been encouraged to vary the catalyst system and polymerization conditions for reasons of optimization and that each of those documents pointed to homogeneous copolymers. However, none of those documents even remotely refers to the specific combination of features of the present

copolymers. Therefore, even if the skilled person would indeed have been encouraged to vary the catalyst, there was no incentive whatsoever to vary it in such a direction as to arrive at the present polymers.

8.3   For those reasons, the Board concludes that the subject-matter of present Claim 1 cannot be derived from the documents relied upon by the Appellant, whether taken alone or in combination, and, therefore, involves an inventive step.

9.   As Claim 1 is allowable and Claims 2 to 4 relate to further embodiments, articles made of and use of the polymer according to Claim 1, their patentability is supported by that of Claim 1.

Referral to the Enlarged Board

10.   The Respondent's request to refer the case to the Enlarged Board of Appeal has not been maintained during the oral proceedings. Therefore, it needs not be dealt with.

Apportionment of costs

11.   The Respondent requested an apportionment of costs for several reasons that encompass a late filed ground of opposition, late filed arguments and an abuse of procedure.

11.1   The ground of insufficient disclosure has been argued from the very beginning of the opposition. The Notice of Opposition, filed on 28 November 1990, explicitly mentions this ground (page 1, second paragraph), so that there can be no question of a late filed ground and an apportionment of cost for this reason has to be refused.

11.2   The ground of insufficient disclosure was based on the
        description of the polymerisation conditions in D1 and
        D2 (Notice of Opposition, point 13). No mention was
        made of any difficulty in applying the calculation
        methods according to the patent in suit in the Notice
        of Opposition. Later in the proceedings that difficulty
        was explained, but only in respect of lack of novelty,
        not insufficiency. The first time the argument was
        raised in connection with insufficiency was in the
        Statement of Grounds of Appeal. Therefore, the Board
        agrees with the Respondent that the argument was raised
        at a late stage. However, according to G 0004/92
        (supra), the opponent can raise new arguments based on
        grounds, facts and evidence already present in the
        proceedings and this can be done even if the other
        party is absent. In the present case, the argument had
        been mentioned in writing before and hence it could be
        referred to later. Therefore, an apportionment of costs
        based on this reason has to be refused.

11.3   The EPC does not give a binding effect to decisions
        taken previously by the same or another Board in
        respect of different cases, even if the issues under
        discussion are exactly the same. Therefore, the
        principle of *res iudicata* does not apply with regard to
        different cases and, for that reason, there can be no
        question of abuse if the Appellant raises the same
        arguments regarding the same points in different cases.

        Moreover, in the present case, most of the issues are
        different from those of T 1113/92 (supra). In
        particular, the details of the fitting procedure for
        determining the U-parameter, which was the main issue
        in decision T 1113/92, have not been disputed in the
        present case; similarly, other points which had not
        been addressed in that decision, have been at issue in
        the present proceedings. Accordingly, the Board does
        not consider that the Appellant, in exercising its

entitlement to opposition and appeal, has committed an abuse of procedure.

11.4   Moreover, from the above considerations it is clear that the costs actually incurred by the Respondent did not go beyond the expenses a patent proprietor can normally expect to have to face when defending his patent in opposition/appeal proceedings. In particular, the issues raised by the Appellant did neither cause the Respondent to carry out additional experimental tests, nor result in additional oral proceedings taking place.
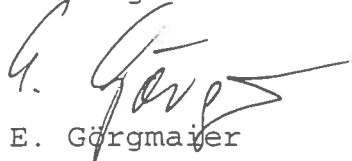
11.5   Therefore, the Board sees no reason to depart from the principle set out in Article 104(1) EPC according to which "Each party to the proceedings shall meet the costs he has incurred...". It follows that the request by the Respondent for an award of costs pursuant to Rule 63 EPC is to be rejected.

Order

For these reasons it is decided that:

1.   The appeal is dismissed.

2.   The request for an award of costs is rejected.

The Registrar: The Chairman:

E. Görgmaier   C. Gérardin

1310.D