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Aktenzeichen / Case Number / N° du recours : T 124/87 - 3.3.1

Anmeldenummer / Filing No / N° de la demande : 79 300 004.3

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Bezeichnung der Erfindung: Ethylene copolymers with a high melt index and
Title of invention: manufacture of containers with these
Titre de l'invention :

Klassifikation / Classification / Classement : C 08 F 210/16

ENTSCHEIDUNG / DECISION

vom / of / du 9 August 1988

Anmelder / Applicant / Demandeur :

Patentinhaber / Proprietor of the patent /
Titulaire du brevet :

Du Pont Canada Inc.

Einsprechender / Opponent / Opposant :

OI BASF AG
OII Union Carbide Corporation

Stichwort / Headword / Référence : Copolymers/Du Pont

EPO/EPC/CBE Articles 54, 56 and 114

Schlagwort / Keyword / Mot clé : "Novelty of a class of compounds defined by parameters within numerical ranges (denied)"

Leitsatz / Headnote / Sommaire

I. Article 54(1) EPC does not allow what already forms part of the state of the art to be patented. When part of the state of the art is a written document, what has to be considered is whether the disclosure of the document as a whole is such as to make available to a skilled man as a technical teaching the subject-matter for which protection is sought in the claims of the disputed patent (Decisions T 12/81 "Diastereomers", OJ EPO 1982, 296, paragraph 5, and T 198/84 "Thiochloroformates", OJ EPO 1985, 209, paragraph 4, followed and explained ; see Reasons paragraph 3.2).

.../...

II. If a prior document describes a process for the production of a class of compounds, the members of the class being defined as having any combination of values of particular parameters within numerical ranges for each of those parameters, and if all the members of the defined class of compounds can be prepared by a skilled man following such teaching, all such members are thereby made available to the public and form part of the state of the art, and a claim which defines a class of compounds which overlaps the described class lacks novelty. This holds even when the specifically described examples in the prior document only prepare compounds whose parameters are outside the claimed class (see Reasons, paragraphs 3.2 to 3.5) The above does not imply any deviation from the principle of selection inventions.

III. An argument which is presented for the first time at an oral hearing, which combines particular previously filed evidence with a particular previously cited document, may not be admitted for consideration in the exercise of discretion under Article 114(2) EPC (see Reasons, paragraph 4).

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Boards of Appeal

Chambres de recours

Case Number : T 124 /87 - 3.3.1



D E C I S I O N
of the Technical Board of Appeal 3.3.1
of 9 August 1988

Appellant : Du Pont Canada Inc.
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Decision under appeal : Decision of Opposition Division of the European
Patent Office of 11 November 1986, posted on
3 February 1987, revoking European patent
No. 0 003 159 pursuant to Article 102(1) EPC.

Composition of the Board :

Chairman : K.J.A. Jahn
Members : R.W. Andrews
G.D. Paterson

Summary of Facts and Submissions

I. The mention of the grant of patent No. 0 003 159 in respect of European patent application No. 79 300 004.3, filed on 3 January 1979 and claiming priority of 6 January 1978 and 21 March 1978 from two prior applications in the United Kingdom, was announced on 19 January 1983 (cf. Bulletin 83/3) on the basis of fourteen claims. Claim 1 reads as follows:

"1. A copolymer of ethylene and at least one α -olefin having 4-10 carbon atoms, said copolymer having a density in the range of about 0.940-0.960g/cm³ characterised in that it has a melt index in the range 100-200."

II. Notices of opposition were filed on 15 October 1983 and 18 October 1983 in which the revocation of the patent in accordance with Article 100(a) EPC was requested. The oppositions were supported inter alia by the following documents:

(1) DE-A-2 408 153

(3) Kunststoff-Taschenbuch (1974), page 224, 226 and 227
and

(7) US-A-3 892 717.

III. By a decision of 11 November 1986, posted on 3 February 1987, the Opposition Division revoked the patent. The contested decision concluded that the subject-matter of Claim 1 as granted lack novelty in the light of the disclosure in document (1). Although the subject-matter of a product claim to a copolymer in accordance with the auxiliary request in which the melt index of the copolymer was limited to range of 104 to 200 was held to be novel, it was not regarded as involving an inventive step. The

Opposition Division considered that the skilled person would immediately try to solve the problem arising from the use of the commercially available ethylene/1-butene copolymer having a density of 0.959g/cm^3 and a melt index of 85 as an injection moulding resin by lowering the melt viscosity, i.e. by increasing the melt index, of the copolymer. No significance could be seen in the lower limit of 104 in view of the disclosure in document (1) of a melt index of 100 for a copolymer with a similar density. The determination of the upper limit of 200 for the melt index would be a matter of routine experimentation.

- IV. An appeal was lodged against this decision on 2 April 1987 with payment of the prescribed fee. A Statement of Grounds of Appeal was filed on 27 May 1987.

In this statement and during the oral proceedings held on 9 August 1988 the Appellant contended that the subject-matter of Claim 1 as granted was novel in the light of the disclosure of document (1) since the required combination of parameters specified in this claim was not disclosed in this document in the absence of any indication pointing the reader in the direction of this combination. The Appellant also pointed out that only two of the forty-nine Examples in this document related to ethylene/propene copolymers and that the exemplified highest melt index was 24 for an ethylene homopolymer which was obtained in poor yield. The above-mentioned ethylene/propene copolymers had a calculated amount of propene of approximately 10% by weight as compared with the range of 0.2 to 2% by weight of 1-butene referred to on page 2, lines 1 to 3 of the disputed patent. With regard to the question of novelty the Appellant referred to a decision of this Board of Appeal T 433/86 published in EPOR (1988), Volume 2, pages 97 to 104.

With respect to inventive step the Appellant argued that the object of the disputed patent was to provide polyethers of improved processability in injection moulding processes for the manufacture of thin-wall containers to solve the problem of obtaining uniformly successful results in the manufacture of such containers. The comments made in Modern Plastics, June 1983, pages 34 and 36 demonstrate that this problem is successfully solved for the first time.

The Appellant also argued that the skilled person faced with this problem and being aware of the prior use of the commercially available ethylene/1-butene copolymer containing less than 0.1% of 1-butene and having a melt index of 85 and a density of 0.959g/cm^3 would not be able to solve the problem underlying the disputed patent since:

- (a) it is not clear that this prior use was likely to form the basis of the search by the skilled person for a solution in the absence of any evidence that this copolymer was recommended for the manufacture of hollow containers and, if it was, whether it was satisfactory;
- (b) even if the skilled person were to start from the prior use he would not increase the melt index of the copolymer in view of the known deterioration of important physical properties as the melt index increases;
- (c) if the skilled person did increase the melt index of this known copolymer he would not solve the problem because the resulting copolymer would be too brittle in view of the low content of 1-butene.

In order to solve this problem it is necessary to provide ethylene/ α -olefin copolymer with melt index in a range never previously considered, combined with the specified density range.

- V. Respondent I contended that starting from the above-mentioned commercially available copolymer it was obvious to suggest the use of copolymers having melt indices of between 100 and 200 or 104 to 200 in view of the teaching of document (3).

Respondent II maintained the view that the subject-matter of Claim 1 as granted lack novelty by reason of the disclosure of document (1). Furthermore, at the oral proceedings the Respondent put forward the completely new argument that the subject-matter of the patent lacked novelty in respect of the disclosure of document (7) interpreted in the light of the results reported in the affidavit of Dr. C.T. Elston filed with the Appellant's letter dated 3 April 1984. This Respondent also considered that an invention cannot be recognised in varying the melt index of a known copolymer to correspond with the requirements of its intended use. This represents an optimisation in which a balance has to be struck between the advantages of better flowability resulting from high melt indices and the deterioration of physical properties resulting therefrom.

- VI. The Appellant requested that the decision under appeal be set aside and the patent be maintained in the form as granted. Alternatively, as an auxiliary request, the Appellant requested that the patent be maintained in amended form on the basis of Claims 1 to 14 submitted with the grounds of appeal on 27 May 1987. Both Respondents

requested that the appeal be dismissed.

Reasons for the Decision

1. The appeal complies with the requirements of Articles 106 to 108 and Article 64 EPC and is, therefore, admissible.
2. There are no formal objections under Article 123 EPC, to Claims 1 to 14 in accordance with both the main and auxiliary requests since both sets of claims are adequately supported by the original disclosure and do not extend the scope of protection conferred. In view of the later findings a detailed consideration of this is not necessary.
3. The patent in suit claims a copolymer of ethylene and an α -olefin having 4 to 10 carbon atoms the copolymer having a density of about 0.940 to 0.960g/cm³ and a melt index of between 100 and 200 (main request) or 104 and 200 (auxiliary request); and a process for the manufacture of containers with wall thicknesses of less than 0.7mm by injection moulding such a copolymer.
 - 3.1 Document (1) discloses a process for the preparation of homo- or copolymers of ethylene using a supported bis-(cyclopentadienyl)chromium II catalyst which has been modified by treatment with ammonia (cf. Claim 1).

This process is discussed in detail in the introductory pages of document (1). Then, at page 8, there is a general statement that in accordance with the invention, ethylene can be polymerised either alone or together with α -olefins having 3 to 12 carbon atoms, and a list of α -olefin comonomers is set out. Nearly all of the named comonomers have 4 to 10 carbon atoms. It is also stated

that polymers are obtained in accordance with the process, having a density of 0.945 to 0.970(g/cm³) and melt indices from "about 0.1 to 100 or over". Thereafter various Examples are set out.

- 3.2 The first question to be decided is whether the claimed invention is novel having regard to document (1).

Article 54(1) EPC does not allow what already forms part of the state of the art to be patented. When, as in the present case, part of the state of the art is a written document, what has to be considered is whether the disclosure of the document as a whole is such as to make available to a skilled man as a technical teaching the subject-matter for which protection is sought in the claims of the disputed patent. This is in accordance with the established jurisprudence of the Boards of Appeal, see in particular Decisions T 12/81 "Diastereomers", OJ EPO 1982, 296, paragraph 5, and T 198/84 "Thiochloroformates", OJ EPO 1985, 209, paragraph 4. In connection with paragraph 4 of Decision T 198/84, which appears at page 213 of the OJ, the English translation of the official German text reads:

"... whether the state of the art is likely to reveal the content of the invention's subject-matter to the skilled person in a technical teaching."

In the Board's view a better translation would read as follows:

"... whether the state of the art is such as to make available the subject-matter of the invention to the skilled person in a technical teaching."

In the present case, the subject-matter claimed in the disputed patent is a copolymer of ethylene and an α -olefin. Claim 1 defines three features of such copolymer:

- (i) the α -olefin comonomer has from 4 to 10 carbon atoms;
- (ii) the copolymer has a density in the range of about 0.940-0.960g/cm³;
- (iii) the copolymer has a melt index in the range 100-200 (104-200 in the auxiliary request).

The question is whether such a copolymer already forms part of the state of the art, having regard to the disclosure in document (1).

3.3 As to feature (i), the use of α -olefin comonomers having from 3 to 12 carbon atoms is disclosed in page 8 of document (1). Thus all the comonomers in accordance with feature (i) are here disclosed, as well as some comonomers with a number of carbon atoms just outside the claimed range.

As to feature (ii), there is an almost total overlap between the density range disclosed in page 8 of document (1) and the density range of feature (ii).

As to feature (iii), in relation to the main request, copolymers having a melt index of 100 are specifically mentioned on page 8 of document (1) as a point in the range "about 0.1 to 100 or over". In relation to the auxiliary request, which defines a melt index in the range 104-200, whether melt indices within this range are disclosed in document (1) depends upon the true meaning of the phrase "about 0.1 to 100 or over", in its context. In the Board's view, this phrase is not intended to mean that a polymer having any melt index up to infinity can be

prepared. A melt index of 100 has been chosen for specific mention. Thus, in the Board's view, the words "or over" are clearly intended to include melt indices of just over 100, i.e. certainly up to 110. On this basis, in the Board's judgement page 8 of document (1) discloses the preparation of polymers having a melt index at least of 104, which is the lower point of the claimed range in the auxiliary request.

- 3.4 The claimed invention is a class of ethylene copolymers, having a particular range of comonomers, a density within a particular range and a melt index within a particular range (see paragraph 3.2 above); this class of polymers is said to have desirable properties.

Document (1) discloses a process by which a class of ethylene polymers can be prepared. The polymers are either homopolymers or copolymers having a particular range of comonomers, a density within a particular range and a melt index within a particular range. It is clear from paragraph 3.3 above that there is almost complete correspondence between the ranges of comonomer and density in document (1) and the claimed invention, and that the ranges of melt index overlap. In other words, document (1) already discloses copolymers of ethylene and specific α -olefins having the combination of the three parameters required by Claim 1 of the patent in suit.

It is true that the specifically described Examples in document (1) do not disclose the preparation of any particular copolymers which are within the class defined in the claims of the disputed patent. It is also true that (a) a preference is expressed for ethylene homopolymers (cf. page 8, line 19); (b) the only two copolymers specifically described are prepared from ethylene and propene (cf. Examples 28 and 29); and (c) the highest melt

index reported in the Examples is 24 (cf. Example 27). However, it was accepted by the Patentee that a skilled man would have no difficulty in preparing copolymers within the class defined by the claims of the disputed patent, using the process described in document (1) in combination with his common general knowledge. In this circumstance the disclosure of document (1) is clearly not limited to the particular polymers whose preparation is described in the Examples, but extends to the general class of polymers described in page 8 of document (1). This general class of polymers has been made available to the skilled man in a technical teaching, even though only certain polymers within this class are described as having been prepared. Copolymers as defined in the claims of the disputed patent form a major part of this general class of polymers. In the Board's judgement, it follows that copolymers in accordance with the claimed invention form part of the state of the art, and that both the main requests and the auxiliary request must be refused for lack of novelty.

3.5 It is to be noted that in the present case both the prior document and the claimed invention are concerned with classes of compounds, and that the finding is therefore in this context. This case is therefore to be distinguished from cases where novelty is in question and where a prior document discloses a class of compounds and the claimed invention is concerned with the selection of a class of compounds or a particular compound within that class (as discussed for example in Decision T 7/86 "Xanthines/Draco", 16 September 1987, to be published).

3.6 This finding is also not in contradiction to the decision reached in T 433/86 (EPOR{1988}, Volume 2, pages 97 to 104) since the facts upon which the two decisions are based are different. In the present case the combination

of the three requirements of Claim 1 in accordance with the main or auxiliary requests is clearly taught in document (1), whereas in the case T 433/86, although the prior art disclosed a molecular weight of 260 to 6500 for the polyether component alone, there was no disclosure of a molecular weight range exceeding 1500 for the polyether moiety of a reaction product with diphenylmethane diisocyanate (component A) when such reaction product is combined with a component resembling component B according to that invention (cf. paragraph 9).

4. As mentioned in paragraph V above, Respondent II also submitted at the oral hearing that the claimed invention lacked novelty having regard to the disclosure of document (7). In order to substantiate this argument he relied upon evidence contained in a letter which had been filed by the Appellant in a completely different context during opposition proceedings.

In view of the Board's finding of lack of novelty having regard to document (1), it is unnecessary for the Board to consider this submission based upon document (7) any further. However, Rule 55(c) EPC requires that the notice of opposition shall contain a statement of grounds of the opposition and "an indication of the facts, evidence and arguments presented in support of these grounds". In the present case, the argument presented at the oral hearing on lack of novelty having regard to document (7) had not been indicated or foreshadowed at all, either in the notice of opposition or later. In such a case, unless the new argument is more relevant than that supporting any other grounds of opposition, the Board would refuse to consider the new argument in the exercise of its discretion under Article 114(2) EPC.

Even though the evidence relied upon had been previously

filed, this was in a different context. A fair opposition procedure requires that an argument combining particular evidence with a particular prior document, even when such evidence and such document is already in the opposition file, should be presented in writing in the notice of opposition or as soon as possible thereafter. Presentation of such an argument for the first time orally, during oral proceedings, is unfair to the opposing party and not normally allowable.

5. Even if the main product claims in accordance with the main and auxiliary requests were to be rendered novel, for example, by the inclusion of the additional feature that the ratio of weight-average molecular weight to number-average molecular weight is less than 5 (cf. present Claim 2), the subject-matter of the claims amended in this manner would be unpatentable on the ground of lack of inventive step.
 - 5.1. In the Board's view the closest prior art in respect of these claims would be the commercially available copolymer of ethylene and 1-butene containing less than 0.1% of 1-butene and having a melt index of 85 and density of 0.959g/cm^3 (cf. page 2, lines 17 to 19 of the disputed patent). However, such copolymers were considered to be unsatisfactory for the manufacture of containers having a wall thickness of less than 0.7mm by injection moulding as a result of processing problems. (In contrast, there is no suggestion in document (1) that the class of polymers therein disclosed had been considered for the purpose of injection moulding thin-wall containers).
 - 5.2 In the light of this closest prior art the technical problem underlying the patent in suit amended in the above manner may be seen in providing ethylene copolymers of improved processability in injection moulding processes.

According to the disputed patent amended in the manner as suggested above this technical problem is essentially solved by providing copolymers of ethylene and α -olefins having 4 to 10 carbon atoms with densities of about 0.940 to 0.960g/cm³, melt indices of 100 (or 104) to 200 and a ratio of weight-average molecular weight to number-average molecular weight of less than 5.

In view of results obtained in Examples III and IV of the patent in suit the Board is satisfied that the technical problem as defined above is plausibly solved.

- 5.3 The skilled person confronted with the technical problem as defined above would immediately consider increasing the melt index of the commercially available copolymer above 85 since he is aware that the processability in an injection moulding process is related to the flowability of the polymer and that the flowability of a polymer increases with increasing melt index (cf. (3), sentence bridging pages 226 and 227).

Although it is known that an increase in melt index brings about a deterioration in certain physical properties, such as, for example, tensile strength, elongation at break and shock and impact resistance (cf. (3), page 227, lines 1 to 4), it is also known that for polymers having the same melt index their toughness, which is an important property for polymers intended to be used for the fabrication of hollow containers, increases as the molecular weight distribution is narrowed. It is also preferred to use polymers with narrow molecular weight distribution in injection moulding processes (cf. (3) page 227, lines 7 to 9). Thus, the skilled person would realise that the decrease in toughness of a polymer resulting from an increase in its melt index could be compensated for, at

least to some extent, by ensuring its molecular weight distribution is narrow, i.e. the ratio of weight-average molecular weight to number average molecular weight is, for example, below 5.

As stated in paragraph 3.4 above the Appellant has acknowledged that the skilled person would know how to control the molecular weight distribution of a copolymer and how to increase its melt index by, for example, increasing the polymerisation temperature, and/or decreasing the density of the copolymer and/or increasing the hydrogen to monomer ratio in the reaction system. Further it is known that the density of a copolymer at the same melt index value, is regulated to a great extent by the amount of α -olefin having 4 to 10 carbon atoms which is copolymerised with the ethylene.

- 5.4 Therefore, it would be within the competence of the skilled person to prepare copolymers of ethylene and α -olefins having 4 to 10 carbon atoms with a narrow molecular weight distribution having various densities and melt indices and to fabricate thin-wall containers from them by injection moulding.

As a result of this routine experimentation the skilled person would be able to determine the optimum density and melt index range and ratio of weight-average molecular weight and number-average molecular weight for the copolymers in order to solve the above-defined technical problem. Therefore, in the Board's judgement the proposed solution to this technical problem is obvious in the light of the prior use of a copolymer of ethylene and 1-butene containing less than 0.1% of 1-butene and having a melt index of 85 and a density of 0.959g/cm^3 and common general knowledge.

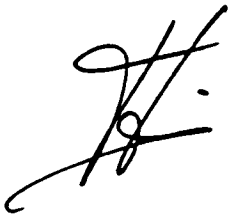
- 5.5 The Appellant's reliance upon the commercial success of the claimed copolymers as indicated by the article on pages 34 and 36 in Modern Plastics of June 1983 cannot be accepted as overcoming the reasons for lack of inventive step in the present case. In particular there is no evidence of any long-felt want to overcome the disadvantages of the closest prior art.
6. During the oral proceedings the Appellant agreed that, if the product claims were found to be unallowable, the process claim relating to the manufacture of containers having wall thicknesses of less than 0.7mm by injection moulding the claimed copolymers would also be unallowable. In the light of this statement it is not necessary to consider the patentability of independent Claim 7 in accordance with the main or auxiliary request in any detail.

Order

For these reasons, it is decided that:

The appeal is dismissed.

The Registrar:



The Chairman:



*GP
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