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**DECISION**  
of 16 June 2004

**Case Number:** T 0412/02 - 3.3.3

**Application Number:** 94106059.2

**Publication Number:** 0611780

**IPC:** C08F 210/18

**Language of the proceedings:** EN

**Title of invention:**

Polyolefin containing an alpha-olefin/polyene copolymer and products comprising this polyolefin

**Patentee:**

mitsui chemicals, inc.

**Opponent:**

Basell Polyolefine GmbH

**Headword:**

-

**Relevant legal provisions:**

EPC Art. 54, 76(1), 84, 123(2), 123(3)

**Keyword:**

"Clarity (no) - unclear characterization by parameters"

**Decisions cited:**

T 0301/87, T 0988/02

**Catchword:**

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Case Number: T 0412/02 - 3.3.3

**DECISION**  
of the Technical Board of Appeal 3.3.3  
of 16 June 2004

**Appellant:**  
(Proprietor of the patent) MITSUI CHEMICALS, INC.  
2-5, Kasumigaseki 3-chome,  
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**Representative:**  
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**Respondent:**  
(Opponent) Basell Polyolefine GmbH  
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**Representative:**  
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**Decision under appeal:** Decision of the Opposition Division of the  
European Patent Office dated 8 February 2002  
posted 22 February 2002 revoking European  
patent No. 0611780 pursuant to Article 102(1)  
EPC.

**Composition of the Board:**

**Chairman:** R. Young  
**Members:** C. Idez  
E. Dufrasne

## Summary of Facts and Submissions

- I. The grant of the European patent No. 0 611 780 in the name of Mitsui Chemicals, Inc. in respect of European patent application No. 94 106 059.2, filed on 14 August 1992 and claiming priority from four earlier patent applications in Japan was announced on 2 June 1999 (Bulletin 1999/22) on the basis of 14 claims.

Independent Claims 1, 8, 9, 10, 11, 12, 13, and 14 read as follows:

"1. An alpha-olefin/polyene copolymer-containing olefin polymer comprising:

(i) an alpha-olefin/polyene copolymer obtainable by copolymerization of an alpha-olefin and a polyene compound having 7 or more carbon atoms which has an olefinic double bond at both terminals, in which constituent units derived from the alpha-olefin is in an amount of 99.999 to 70% by mol, and constituent units derived from the polyene compound is in an amount of 0.001 to 30% by mol; and

(ii) an olefin polymer.

8. A vacuum molded product or an air-pressure molded product comprising the alpha-olefin/polyene copolymer-containing olefin polymer as claimed in claim 1 or claim 2.

9. A blow molded product comprising the alpha-olefin/polyene copolymer-containing olefin polymer as claimed in claim 1 or claim 2.

10. A foamed product comprising the alpha-olefin/polyene copolymer-containing olefin polymer as claimed in claim 1 or claim 2.

11. A calendered product comprising the alpha-olefin/polyene copolymer-containing olefin polymer as claimed in claim 1 or claim 2.

12. An inflation film comprising the alpha-olefin/polyene copolymer-containing olefin polymer as claimed in claim 1 or claim 2.

13. An extruded product comprising the alpha-olefin/polyene copolymer-containing olefin polymer as claimed in claim 1 or claim 2.

14. A stretched product comprising the alpha-olefin/polyene copolymer-containing olefin polymer as claimed in claim 1 or claim 2."

Claims 2 to 7 were dependent claims.

II. On 2 March 2000, a Notice of Opposition was filed by Targor GmbH (later Basell Polyolefine GmbH) in which revocation of the patent in its entirety was requested on the grounds of lack of novelty and lack of inventive step (Article 100(a) EPC).

The objections were supported by the following documents:

E1: WO-A-91/17194;

E2: US-A-4 295 991;

E3: US-A-5 021 382;

E4: US-A-3 351 621;

E5: Derwent abstract of the Japanese patent application JP-A-44-6275; as well as the later filed but admitted

E6: Chemical Abstract No. 71:15417 referring to the Japanese patent publication JP-B4-44020751, and

E6A: JP-B4-44020751 (English translation).

III. By a decision announced orally on 8 February 2002 and issued in writing on 22 February 2002, the Opposition Division revoked the patent.

The decision of the Opposition Division was based on granted Claims 1 to 14 as main request, on Claims 1 to 14 submitted at the oral proceedings of 8 February 2002 as first auxiliary request and on Claims 1 to 7 submitted at the oral proceedings of 8 February 2002 as second auxiliary request.

In its decision, the Opposition Division held that the subject-matter of Claims 1 and 2 of the main request was not novel over documents E5, E6, and E6A. It further stated that Claim 1 of the first auxiliary request did not meet the requirements of Article 123(2) EPC, and that Claim 1 of the second auxiliary request lacked novelty in view of E5, E6 and E6A.

IV. A Notice of Appeal was filed on 22 April 2002 by the Appellant (Patentee) with simultaneous payment of the prescribed fee. With the Statement of Grounds of Appeal filed on 2 July 2002, the Appellant submitted a set of 14 claims representing its new main request.

Claim 1 reads as follows:

"An alpha-olefin/polyene copolymer-containing olefin polymer comprising:

(i) an alpha-olefin/polyene copolymer obtainable by copolymerization of an alpha-olefin and a polyene compound having 7 or more carbon atoms which has an olefinic double bond at both terminals, in which constituent units derived from the alpha-olefin is in an amount of 99.999 to 70% by mol, and constituent units derived from the polyene compound is in an amount of 0.001 to 30% by mol; and

(ii) a polypropylene;

wherein

when the alpha-olefin/polyene copolymer (i) is ethylene/polyene copolymer, the melt tension (MT) and the melt flow rate (MFR) of the alpha-olefin/polyene copolymer containing olefin polymer satisfy the following relation:

$$\log[\text{MT}] \geq -0.8 \log[\text{MFR}] + 0.3; \text{ and}$$

when the alpha-olefin/polyene copolymer (i) is a copolymer of alpha-olefin of 3 or more carbon atoms and polyene the melt tension (MT) and the melt flow rate

(MFR) of the alpha-olefin/polyene copolymer containing olefin polymer satisfy the following relation:

$$\log[MT] \geq -0.8 \log[MFR] + 0.30."$$

Independent Claims 8 to 14 correspond to independent Claims 8 to 14 as granted. Claims 2 to 7 are dependent claims.

The Appellant also argued essentially as follows:

(i) Concerning Articles 123(2) and 123(3) EPC.

(i.1) Claim 1 was based on the combination of Claim 1 as granted with the paragraphs [0183] and [0184] of the patent specification. It was also supported by original Claim 1 and the passage from line 16 on page 56 to line 4 on page 57 of the application as originally filed.

(i.2) Claims 2 to 14 corresponded to Claims 2 to 14 as granted, indicating polypropylene as olefin polymer (ii) and propylene as olefin to be polymerized.

(ii) Concerning the novelty of the subject-matter of the new main request:

(ii.1) Document E5 related to a transparent polypropylene polymer obtained by copolymerizing propylene with a small amount of ethylene and 1,7-octadiene in a three step process. Propylene containing 3% ethylene was polymerized for five minutes in the first step in presence of a Ti/Al containing catalyst, 6% octadiene was then added to the polymerization

solution in a second step, and the polymerization was continued for 5 hours under the same conditions as step 1.

(ii.2) Thus, the polymer of E5 contained a propylene/ethylene segment and a propylene/ethylene/1,7-octadiene segment and could not anticipate the subject-matter of Claim 1.

(ii.3) Furthermore E5 was totally silent on the melt flow rate and the melt tension of the copolymer.

(ii.4) Documents E6/E6A related to the block polymerization of propylene by combining three successive polymerization steps, i.e. homopolymerization of propylene, copolymerization of propylene, ethylene and 1,7 octadiene, and final addition of ethylene to obtain an ethylene homoblock segment.

(ii.5) The content of each segment was 70 to 98% for the propylene homoblock, 1 to 29% for the terpolymer block and 1 to 29% for the ethylene homoblock, but these documents did not disclose the amount of polyene in the terpolymer block.

(ii.6) Furthermore E6 and E6A were totally silent on the melt flow rate and the melt tension of the obtained block copolymer.

(ii.7) Thus, the subject-matter of the main request was novel over E5, and E6/E6A.



(iii.2) Concerning inventive step

There was no indication in the cited documents that by specifically controlling the relation between melt flow rate and melt tension of the polymers produced, it would have been possible to obtain olefin polymers having excellent rigidity, mechanical strength, impact strength and transparency.

V. The arguments presented by the Respondent in its letter dated 10 January 2003 may be summarized as follows:

(i) Articles 84 and 83 EPC:

(i.1) The reference made to the ASTM D 1238 in the patent in suit for the method of determination of the melt flow rate was not sufficient since the temperature and the load at which the measurement should be carried out were not indicated. These conditions varied with the polymer to be tested. This rendered Claim 1 unclear.

(i.2) Furthermore the skilled person would not know how to determine the melt flow rate. Thus, it could not carry out the claimed invention.

(i.3) It was unclear how the melt tension should be determined. According to page 20, line 9 of the patent in suit, a stress was determined but according to lines 1 to 2 on the same page, the melt resistance was expressed as a mass in gram.

(i.4) It was further unclear in which units the MFR and the MT should be expressed and thus, how the relations

between MT and MFR set out in Claim 1 should be calculated.

(ii) Novelty:

(ii.1) E5 disclosed a composition comprising an ethylene-propylene copolymer and an ethylene-propylene-1,7-octadiene terpolymer.

(i.2) This composition comprised 1.8% ethylene and 1.8% 1,7-octadiene.

(i.3) Having regard to the respective polymerisation time of the propylene copolymer (5 minutes) and the terpolymer (300 minutes), the composition of the terpolymer was practically the same as that of the composition. Thus the terpolymer met the requirements set out in Claim 1 for the polyene content.

(i.4) E6/E6A related to a composition comprising a polypropylene homopolymer, an ethylene, propylene, 1,7-octadiene terpolymer, and an ethylene homopolymer.

(i.5) The terpolymer of Example 1 of E6A contained about 3% by weight of 1,7-octadiene.

(i.6) Since the relation between the MT and the MFR indicated in Claim 1 of the main request was meaningless, E5, and E6/E6A were novelty destroying documents for Claim 1.

VI. With its letter dated 5 May 2004, the Respondent informed the Board that it would not attend the oral proceedings scheduled on 16 June 2004.

VII. Oral proceedings were held on 16 June 2004 in the absence of the Respondent.

At the oral proceedings the discussion focussed on considerations under Article 84 EPC in view of the relation between the melt tension (MT) and the melt flow rate (MFR) set out in present Claim 1.

In that respect, the Appellant argued essentially as follows:

(i) The parameters MFR and MT were well known in the art and the skilled person would know how to determine these parameters. Reference was also made to document E1 in that respect (cf. E1, page 5, line 34 to page 6, line 2).

(ii) Furthermore, the patent in suit disclosed a method for determining the MT (cf. page 20 paragraph [0192]) and made reference to the standard ASTM 1238 (cf. page 18, paragraph [0180]) for the determination of the MFR.

(iii) The skilled person would know which temperature and which load should be applied for determining the MFR according to ASTM 1238.

(iv) The relation set out in Claim 1 between the MT and the MFR amounted to a functional limitation and it aimed to reflect the specific block structure and the specific amount of chain branching of the claimed polymer.

In that respect, the Appellant, having conceded that a block polymer defined only by the structural features indicated in Claim 1, i.e. an olefin polymer containing a copolymer (i) and a polypropylene (ii) was known from Working Example 1 of document E6A, further submitted that it was the relation between MT and MFR indicated in Claim 1 which distinguished the claimed subject-matter from the prior art.

- VIII. The Appellant requested that the decision under appeal be set aside and that the patent be maintained on the basis of the request filed with letter dated 2 July 2002 or, in the alternative, that the case be remitted to the first instance for examination of inventive step.

The Respondent requested that the appeal be dismissed.

### **Reasons for the Decision**

1. The appeal is admissible.

#### *Procedural matters*

2. As mentioned above in paragraph VI, the Respondent indicated with its letter dated 5 May 2004 that it would not be represented at the oral proceedings. In accordance with Rule 71(2)EPC, the proceedings continued without the Respondent.

*Main request*

3. *Article 76(1) and 123(2) EPC*

3.1 No objection under Article 76(1) and 123(2) EPC has been raised by the Respondent in its letter dated 10 January 2003 against the set of Claims 1 to 14 submitted by the Appellant with its letter dated 2 July 2002.

3.2 The Board is also satisfied that the requirements of Article 123(2) EPC are met by all the claims, since Claim 1 is supported by Claim 1 as originally filed, read in combination with the passage from page 18, line 44 to page 19, line 4 of the published application, and since Claims 2 to 14 are supported by Claims 2 to 14 as originally filed, respectively.

3.3 The same is further true for the requirements of Article 76(1)EPC, since Claim 1 finds its support in the published parent application EP-A2-0 534 119 in view of the combination of Claim 21 with Claim 29 read in association with the passage on page 16, lines 32 to 38 and the passage from page 18, line 51 to page 19, line 4 thereof. Claims 2 to 14 are supported by Claims 22 to 27 and 30 to 36, respectively, of the published parent application.

4. *Article 123(3) EPC.*

4.1 It is, in the Board's view, evident that the amendments in Claim 1 in respect to granted Claim 1, i.e. the limitation of the component (ii) to a polypropylene and the incorporation of the relation between melt tension

and melt flow rate inevitably result in a restriction of the scope of protection in respect to granted Claim 1. One also comes to the same conclusion for Claims 2 to 14 which are directly or indirectly related to Claim 1.

4.2 Thus, the Board is satisfied that the requirements of Article 123(3) EPC are met by all the claims.

5. *Article 84 EPC*

5.1 As stated in decision T 301/87 (OJ EPO 1990,335) when amendments are made to a patent during an opposition, Article 102(3) EPC requires consideration as to whether the amendments introduce any contravention of any requirement of the Convention, including Article 84 EPC.

5.2 In the present case Claim 1 differs from granted Claim 1, in particular, in that it contains the features that, when the alpha-olefin/polyene copolymer (i) is an ethylene/polyene copolymer, the melt tension (MT) and the melt flow rate (MFR) of the alpha-olefin/polyene copolymer containing olefin polymer satisfy the following relation:

$$\log[\text{MT}] \geq -0.8 \log[\text{MFR}] + 0.3;$$

and that, when the alpha-olefin/polyene copolymer (i) is a copolymer of alpha-olefin of 3 or more carbon atoms and polyene the melt tension (MT) and the melt flow rate (MFR) of the alpha-olefin/polyene copolymer containing olefin polymer satisfy the following relation:

$$\log[\text{MT}] \geq -0.8 \log[\text{MFR}] + 0.30.$$

5.3 Thus, it follows, that these amendments are susceptible, as submitted by the Respondent in its letter dated 10 January 2003, to objections being raised under Article 84 EPC and that it must be checked whether these amendments made in granted Claim 1 comply with Article 84 EPC.

5.4 In this connection, the Appellant has submitted that the mathematical relation between the melt tension and the melt flow rate which has been incorporated in Claim 1 reflects structural properties of the claimed alpha-olefin/polyene copolymer containing olefin polymer, i.e. a specific block structure and a specific chain branching which, in its opinion, cannot be adequately defined in any other way. Furthermore, according to the Appellant, the incorporation of this feature aims to distinguish the claimed alpha-olefin/polyene copolymer containing olefin polymer from the cited prior art, in particular document E6A.

5.5 It can thus be deduced from the arguments submitted by the Appellant that this mathematical relation is the only characterizing feature of Claim 1 relied on for a distinction over the prior art, and that its role in indicating the limits of the claimed subject-matter, or, in other words, in defining the matter for which protection is sought, is a crucial one.

5.6 According to Article 84 EPC, the claims shall define the matter for which protection is sought (first sentence) and for this purpose they shall, *inter alia*, be clear and supported by the description (second

sentence). This implies that the claims must be clear in themselves when being read with the normal skills, but not including any knowledge derived from the description of the patent application (cf. decision T 0988/02 of 30 October 2003, not published in OJ EPO; Reasons point 3.3.1).

5.7 As indicated above in paragraph 5.5, the characterizing feature of Claim 1 is the mathematical relation between the parameter MFR and the parameter MT. In the Board's view, the unambiguous characterization in a claim of a product by parameters or by a mathematical relation between parameters necessarily requires that each parameter can be clearly and reliably determined. It thus follows that the knowledge of the method and conditions of determination of the parameter is necessary for the unambiguous definition of the parameters and, by way of consequence, for the unambiguous definition of a mathematical relation between them.

5.8 Thus, in order to allow the matter for which protection is sought to be defined, it must be clear from the claim itself when being read by the person skilled in the art exactly how the parameters should be determined.

5.9 This would, as a rule, imply that the method of determination and the conditions of measurement which might have an influence on the value of the parameter should be indicated in the claim, either expressly or, if appropriate, by way of reference to the description according to Rule 29(6) EPC. Such indication would only become superfluous, provided it could be shown that the skilled person would know from the outset which method



and conditions to employ because, for instance, this methodology was the methodology commonly used in the technical field, or that all the methodologies known in the relevant technical field for determining this parameter would yield the same result within the appropriate limit of measurement accuracy.

- 5.10 In the present case, Claim 1 contains no indication concerning the determination of the MFR parameter but the Appellant has submitted that the determination of this parameter is well known in the art. In that respect, it has pointed to the reference made in the patent specification to the standard ASTM D 1238 for the determination of the melt flow rate (cf. page 18, paragraph [0180] and to the reference to the same standard in document E1 (page 5, line 32 to page 6, line 2).
- 5.11 While it can be accepted, in the Board's view, that the standard ASTM D 1238 which relates to the measurement of the rate of extrusion of molten resins through a die of a specified length and diameter under prescribed conditions of temperature, load, and piston position as the timed measurement is being made, is a method commonly used in the art for the determination of the melt flow rate, it is however conspicuous to the Board that the ASTM D 1238 prescribes neither a unique temperature at which nor a unique load under which the test must be carried out. On the contrary, it clearly mentions a number of different standard test conditions (load, temperature) and it indisputably requires that the indication of the flow rate value be supplemented by the indication of the temperature and load selected for carrying out the particular test. It must therefore

be concluded that the value of the melt flow rate is inevitably dependent on the temperature and the load at which the test is run, and that, therefore, the knowledge of the exact conditions of its determination (temperature, load) is essential to a clear and reliable determination of this parameter, and hence, to the unambiguous definition of the parameter. The Board further notices that, contrary to document E1 which clearly defines the conditions under which the melt flow rate of the polymers disclosed therein should be determined (i.e. 230°C, 2.16 kg; cf. page 6, lines 1 to 2), the patent in suit is totally silent on the temperature and the load which should be applied for the determination of the melt flow rate of the claimed polymers in the framework of the method disclosed in ASTM 1238.

5.12 Thus, the question of the unambiguous characterization of the claimed product by the use of the parameter MFR boils down to the question of whether the skilled person would inevitably know which measurement conditions (temperature and load) should be applied for determining the MFR of the claimed polymer in the framework of the standard ASTM D 1238.

5.13 In that respect, while the ASTM D 1238 might suggest that some conditions have been found satisfactory for known kinds of polymers such as polypropylene or polyethylene, it is immediately evident that the ASTM D 1238, even read in combination with the general technical knowledge of the skilled person, cannot give any indication on such satisfactory conditions for the alpha-olefin/polyene copolymer containing olefin polymers according to Claim 1, since, as submitted by

the Appellant, they represent a new kind of polymer for which consequently no general technical knowledge is available.

5.14 This conclusion cannot be altered by the fact that component (ii) has been restricted to polypropylene. In the Board's view, this would not imply that the melt flow rate of the claimed polymer should be determined under conditions usual, if any, for polypropylene, since Claim 1 encompasses polymers which contain an overwhelming proportion (up to 99% by weight; cf. page 18, lines 37 to 38) of an alpha-olefin/polyene copolymer such as butene/1-9 decadiene, 1-eicosene/1,9 decadiene or 4-methyl-1-pentene/1-9 decadiene (cf. patent in suit, page 15, lines 28 to 29), and which cannot therefore be considered as exhibiting physical, structural or rheological similarities with polypropylene polymers.

5.15 Consequently, the Board can only come to the conclusion that there is a lack of information regarding the exact conditions, in particular the temperature and the load, under which the parameter melt flow rate is to be determined.

5.16 This lack of information results in uncertainty as to the definition of the parameter MFR and hence in uncertainty in the mathematical relation between the MFR and the MT set out in Claim 1.

5.17 This uncertainty is aggravated by further uncertainty in the definition of the melt tension (MT), for the following reasons:

5.17.1 Claim 1 contains no indication concerning the determination of the MT parameter but the Appellant has submitted that the determination of this parameter is well known in the art. It has further pointed to the paragraph [0192] of the patent specification which in its opinion gives a definition of the melt tension.

5.17.2 Independently of the fact that Claim 1 contains no reference to this passage of the description, it is noted by the Board that this paragraph which refers to using "a MT measuring machine (produced by Toyo Seiki Seisakusho K.K.)" gives no details which would specify the machine used precisely, especially as regards piston size, orifice size, and the force applied stress vs. mass.

5.17.3 Even if one would consider that the test machine and its dimensions would be known to the skilled person and that he would understand the units of the results to be expressed as mass force rather than as a simple mass in grams, as indicated in the examples (cf. Tables 1, 2 and 3), it is in any case evident that that the value of the melt tension is dependent on the temperature at which it is determined. This implies that the knowledge of the exact temperature at which the test should be carried out is essential to the clear and reliable determination of this parameter, and hence to its unambiguous definition.

5.17.4 Thus, the question of the unambiguous definition of the parameter MT also depends on whether the skilled person would know which temperature should be applied for the determination of the MT of the polymers according to Claim 1.

5.17.5 In this connection, it is evident that the skilled person cannot rely on common general knowledge on that issue, since, as submitted by the Appellant, the claimed polymers represent a new kind of polymer for which consequently no common general knowledge is available.

5.17.6 This lack of information in the claim concerning the exact temperature at which the MT of the claimed polymers should be determined cannot even be compensated by a reference in the claim to the description, since paragraph [0192] does not disclose the temperature at which this test should be carried out for the claimed polymers, since it merely mentions that the cylinder of the MT measuring machine should be kept at "a melting temperature" of the polymer without, however, defining it. This deficiency cannot further be repaired by the fact that this paragraph indicates the temperature at which this test should be carried for polypropylene (i.e. 230°C), firstly, since it is not clear whether the "melting temperature" referred to is the melting point, or some other temperature arbitrarily above the melting point, and secondly, since this cannot be understood as applicable to the polymers according to Claim 1 for the reasons set out in Section 5.14 above.

5.17.7 Thus, the Board can only come to the conclusion that there is a deficiency of information regarding the exact conditions, in particular the temperature, under which the parameter melt tension is to be determined.

5.18 Consequently, with uncertainty in both the relevant parameters MFR and MT for the reasons given above, it is not clear what limitation, if any, is implied by the mathematical relationship between them for the subject-matter of Claim 1.

5.19 In particular, it is evident that the mathematical relationship cannot limit the claim in any clear way to specific structures as submitted by the Appellant at the oral proceedings, or indeed represent any other clear limitation. In other words, the claim is not clear as required by Article 84 EPC.

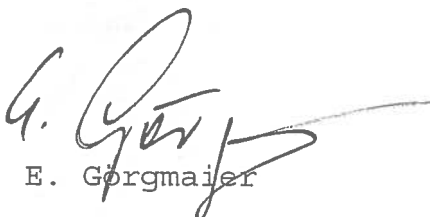
5.20 Since Claim 1 does not comply with Article 84 EPC, the main request must be refused.

**Order**

**For these reasons it is decided that:**

The appeal is dismissed.

The Registrar:

  
E. Gorgmaier

The Chairman:

  
R. Young