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# D E C I S I O N
## of 4 May 1994

**Case Number:** T 0888/91 - 3.3.3

**Application Number:** 83100198.7

**Publication Number:** 0084803

**IPC:** C08J 9/22

**Language of the proceedings:** EN

**Title of invention:**
Process for preparing polyolefin foam

**Patentee:**
Kanegafuchi Kagaku Kogyo Kabushiki Kaisha

**Opponent:**
BASF Aktiengesellschaft, Ludwigshafen

**Headword:**
-

**Relevant legal norms:**
EPC Art. 56

**Keyword:**
-

**Decisions cited:**
-

**Catchword:**
-

**Case Number:** T 0888/91 - 3.3.3

**D E C I S I O N**
**of the Technical Board of Appeal 3.3.3**
**of 4 May 1994**

**Appellant:** (Proprietor of the patent)
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**Representative:** -

**Decision under appeal:** **Decision of the Opposition Division of the European Patent Office dated 26 July 1991, issued on 19 September 1991 revoking European patent No. 0 084 803 pursuant to Article 102(1) EPC.**

**Composition of the Board:**

**Chairman:** C. Gérardin
**Members:** R. Lunzer
M. Aúz Castro

**Summary of Facts and Submissions**

I. European patent No. 0 084 803 was granted on 16 March 1988 on the basis of application No. 83 100 198.7 filed on 12 January 1983, claiming a priority date of 14 January 1982 derived from Japanese application No. 4514/82 on the basis of seven claims. Independent Claims 1 and 4 of the patent as granted were in the following form:

"1. A process for preparing a polyolefin foam by heat-molding pre-expanded beads of an expandable polyolefin resin containing a foaming agent in a mold, characterized in that it comprises preparing beads having a peak expansion rate at pre-expansion equal to 1.3 to 3 times the expansion rate of beads to be packed into the mold, adjusting the beads to a pre-expansion rate depending on an expansion rate of the desired foam, and packing and molding the pre-expanded beads in the mold without any further addition to the expandability thereof."

"4. A process for preparing a polyolefin foam by heat-molding pre-expanded beads of an expandable polyolefin resin containing a foaming agent in a mold, characterized in that it comprises preparing beads having a peak expansion rate at pre-expansion equal to 1.3 to 3 times the expansion rate of beads to be packed into the mold, adjusting the beads to a pre-expansion rate depending on an expansion rate of the desired foam, packing and molding the pre-expanded beads in the mold without any further addition to the expandability thereof, and holding the resultant molding in an atmosphere whose temperature is less than the melting point of the polyolefin resin by 20° to 50°C."

Claims 2, 3, and 5 to 7 concerned preferred embodiments of these process claims.

II. On 18 August 1988 an opposition was filed on the grounds of Article 100(a) EPC and 100(b) EPC, alleging that the claimed subject-matter was neither novel (Article 54 EPC) nor inventive (Article 56 EPC) and that the patent specification did not disclose the invention in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art (Article 83 EPC). The Opponent relied mainly on (4) EP-A-32 557, which, although cited outside the nine-month time limit for filing the opposition, was admitted into the proceedings by the Opposition Division and regarded as the closest prior art.

III. By its decision given orally on 26 July 1991, and issued in writing on 19 September 1991, the Opposition Division revoked the patent. It acknowledged that the alleged invention was novel, and that the description was sufficient, but held that there was no inventive step. Its decision was based essentially on the fact that it could see no difference between the self-expandability of the beads of not lower than 1.3 times referred to on page 10, line 11 of document (4), and the ratio of expansion rates of 1.3 to 3.0 referred to in Claim 1 above, when taking into account the fact that the process steps according to the alleged invention, and those of document (4), were the same.

IV. An appeal against that decision was filed on 15 November 1991, the appeal fee was paid on the same day, and the Statement of Grounds of appeal was filed on 22 January 1992.

(i) In order to overcome the objection of lack of any inventive step which was the basis of the decision revoking the patent, and confirmed by the Board in an intermediate communication dated 22 December 1993, the Appellant (Patentee) first submitted various sets of claims by way of a main and two auxiliary requests.

(ii) An experimental report intended to demonstrate that the ratio R of the peak expansion rate of the beads, compared with the expansion rate of the beads charged into the mould in accordance with the patent in suit, was not the same as the self-expandability of the beads in accordance with document (4), was filed on 5 April 1994. The Appellant argued that the process in accordance with the alleged invention differed significantly from that of document (4) in that an essential process step was controlling the relationship between the maximum expansion rate of the beads and the size of the beads in their contracted state, when they were ready to be put into the mould. Such a control step was not foreshadowed at all in any of the cited documents.

(iii) During oral proceedings held on 4 May 1994, the Appellant submitted as its sole request an amended set of four claims. These involved the deletion of the former Claims 1 to 3 inclusive, renumbering Claims 4 to 7 as 1 to 4 while correcting their appendancy, and adding at the end of former Claim 4 (now Claim 1) the additional words, "during a time of more than 6 h."

V. The Respondent (Opponent) first maintained its objections against the patentability of the alleged invention as defined in the claims which were then the subject of the appeal, and further reiterated its request that the patent be revoked (Counterstatement filed on 3 June 1992). By a letter dated 27 April 1994 (received on 29 April) it withdrew its opposition, without commenting on the material filed earlier in the month by the Appellant, and it did not appear to the oral proceedings.

VI. The Appellant requested that the decision under appeal be set aside and that the patent be maintained on the basis of Claims 1 to 4 and the adapted description, both submitted during the oral proceedings as well as Figure 1 of the patent as granted.

**Reasons for the Decision**

1. The appeal is admissible.

2. The deletion of Claims 1 to 3 of the claims in the patent as granted, and the addition of a further feature to former Claim 4, now Claim 1, give rise to no objections under Article 123(2) or (3) EPC. The scope of Claim 1 is restricted by the added feature, which is disclosed in the application as filed on page 6, last line, corresponding to page 3, line 47 of the patent as published.

3. So far as concerns novelty, having reviewed all the cited documents, the Board is satisfied that none of them discloses a process having all the features now defined in Claim 1. Therefore the subject-matter of

Claim 1 is considered to be novel within the meaning of Article 54 EPC. Novelty being uncontested at the appeal stage, more detailed reasons are unnecessary.

4. *Inventive step*

4.1 The substantial issue on appeal was whether the alleged invention could be inventive in the light of the disclosure of document (4), which the Appellant, in common with the Board, regarded as being the closest prior art. Although that document is directed to the use of expanded cross-linked polyethylene particles having an expansion ratio of 20 to 40 times, each having an outer skin of not less than three times the thickness of the average thickness of the cell membranes, and there is a description in Example 1a (pages 33 and 34) of a way of achieving this relationship of outer skin thickness to membrane thickness, nevertheless document (4) includes on page 10, lines 1 to 13 a teaching with regard to what is there termed, "the self-expandability", of the particles. That property must not be lower than 1.3 times. That disclosure was regarded in the decision under appeal as being equivalent to a disclosure of the expansion rate (R = 1.3 to 3.0) of the patent in suit (Reasons for the decision page 6, centre paragraph).

4.2 In an attempt to overcome that finding, the Appellant included with its letter of 5 April 1994 an experimental report showing that the self-expandability values referred to in document (4) and the R values of the patent in suit were not the same. Taking into account those experiments, and also the detailed disclosure of document (4), the Board is satisfied that those two measures are not the same, and that, whatever may be intended by the term "self expandability" in document

(4), as to which the Board remains in some doubt, it is nonetheless satisfied that the ratio defined in Claim 1 in suit is not intended.

4.3 Another feature of the teaching of document (4) is that although a stated objective of its disclosure is to enable mouldings to be made from pre-expanded particles without the need for additional expandability, such as is conventionally provided by organic propellants or by retaining the foamed particles under pressure in an inorganic gas (see page 8, lines 19 to 27 and page 15, lines 22 to 29), it is accepted on page 24, lines 15 to 22 that added expandability is needed for moulding products of difficult shapes. In contrast thereto, in accordance with the alleged invention, additional expandability is not required at any time, and the moulding process can thus be simplified (page 3, lines 1 and 2).

4.4 In the light of that contrast, the problem solved by the alleged invention can be seen as residing in providing a system which is capable of producing consistently satisfactory mouldings of expanded particles, without the need for added expandability. Although Comparative Example 1 of the patent in suit is intended to demonstrate that, when working outside the limits of R = 1.3 to 3, the products are unsatisfactory, either in that there is shrinkage deformation, or there is insufficient fusion, the effectiveness of the alleged invention in terms of producing satisfactory products has not been challenged, and the Board sees no reason to doubt that the above problem is solved effectively by the introduction of the control step of adjusting the pre-expansion rate of the foam beads as defined in Claim 1 above.

4.5 Thus the sole question to be answered is whether any pointer can be found in document (4) towards the introduction of such a control step. Although the description alone runs to some 65 pages of typewritten text, the Board is unable to find any suggestion of a need to find a balance between the initial expansion of the beads and their capacity for expansion in the mould. All that is taught on page 10, lines 1 to 13 mentioned above is that the mould cannot be filled unless the particles possess a certain minimum degree of expandability, a proposition which may well be regarded as self-evident to workers in this art.

4.6 Furthermore, in accordance with the description on page 3, lines 38 to 47, the aging step which is now an essential feature of Claim 1 has the desirable effect that the resultant foam mouldings have a smooth creaseless surface, and a good yield, provided that the aging is effected within the temperature limits specified. If the temperature is more than 50°C below the melting point of the resin, diffusion is too slow, whereas if it is less than 20°C below, the resin may become too soft, and the moulding may be too deformable.

4.7 In the light of these considerations, the Board concludes that the invention as defined in Claim 1 is not obvious having regard to this prior art, and therefore accepts that an inventive step is involved.

5. *Conclusion*

Claim 1 being allowable, the same applies to dependent Claims 2 to 4, which are directed to preferred processes according to Claim 1, and whose inventiveness is supported by that of the main claim.

**Order**

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

1. The decision under appeal is set aside.

2. The case is remitted to the first instance with the order to maintain the patent on the basis of Claims 1 to 4 and the adapted page 2 of the description, both filed during the oral proceedings, as well as pages 3 to 6 of the description and Figure 1 of the patent as granted.

The Registrar: The Chairman:

E. Görgmaier C. Gérardin