BESCHWERDEKAMMERN DES EUROPÄISCHEN PATENTAMTS

BOARDS OF APPEAL OF THE EUROPEAN PATENT OFFICE

CHAMBRES DE RECOURS DE L'OFFICE EUROPEEN DES BREVETS

A		B		C	X

File Number: T 555/89 - 3.3.3

Application No.: 82 108 863.0

Publication No.: 0 075 897

Title of invention: Process for producing pre-foamed particles of polyolefin resin

Classification: C08J 9/18

D E C I S I O N
of 23 September 1992

Proprietor of the patent: Japan Styrene Paper Corporation

Opponent: BASF Aktiengesellschaft

Headword:

EPC Articles 54(3) and 56

Keyword: "Novelty - implicitly lacking (main request); - affirmed (auxiliary request)"
"Inventive step - denied"

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Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number : T 555/89 - 3.3.3

D E C I S I O N
of the Technical Board of Appeal 3.3.3
of 23 September 1992

Appellant : (Proprietor of the patent)
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Decision under appeal :
Decision of Opposition Division of the European Patent Office of 14 April 1989, issued on 26 June 1989 revoking European patent No. 0 075 897 pursuant to Article 102(1) EPC.

Composition of the Board :

Chairman : F. Antony
Members : R. Young
F. Benussi

Summary of Facts and Submissions

I. The grant of European patent No. 0 075 897 in respect of European patent application No. 82 108 863.0 filed on 24 September 1982 and claiming a JP priority of 28 September 1981 (JP 153230/81) was announced on 7 May 1986 (Bulletin 86/19).

II. A notice of opposition was filed on 12 December 1986 by BASF AG on the ground of Articles 100(a) and 100(b) EPC.

The opposition was supported inter alia by

(1) EP-B-0 053 333, interpreted as intended to refer to EP-A-53 333;

and the late-cited, but admitted

(4) JP-A-1 344/1981 (English translation).

III. By a decision which was given at the end of oral proceedings held on 14 April 1989 and issued in writing on 26 June 1989 on the basis of the respective single claims of a main request filed on 31 March 1989 and an auxiliary request filed at those proceedings, the Opposition Division held that the claimed subject-matter was sufficiently disclosed, but revoked the patent because it found the claim of the main request to lack novelty in the light of the disclosure in document (1), and the claim of the auxiliary request to lack inventive step in view of the teaching of document (4).

IV. The claim of the main request was as follows:

"In a process for producing pre-foamed particles of a polyolefin resin which comprises impregnating a volatile

blowing agent into particles of a polyolefin resin while dispersing the resin particles and the blowing agent in a liquid dispersing medium under heat in a closed vessel, opening one end of the vessel and releasing the resin particles and the dispersing medium simultaneously into an atmosphere kept at a lower pressure than the inside pressure of the vessel; the improvement wherein the polyolefin resin is used in form of a non-crosslinked polyethylene resin or a non-crosslinked polypropylene resin and in combination with a dispersing agent, and the pressure of the inside of the vessel after opening its one end is maintained at a substantially constant pressure which fluctuates within 4 kg/cm^2, which is at least 0.7 times the vapor pressure of the blowing agent before opening the end of the vessel, and which constant pressure is maintained for at least the time required to obtain two-thirds of the pre-foamed particles."

The claim of the auxiliary request was as follows:

"In a process for producing pre-foamed particles of a polyolefin resin in form of a non-crosslinked polyethylene resin or a non-crosslinked polypropylene resin and in combination with a dispersing agent, which comprises impregnating a volatile blowing agent into particles of a polyolefin resin while dispersing the resin particles and the blowing agent in a liquid dispersing medium under heat in a closed vessel, opening one end of the vessel and releasing the resin particles and the dispersing medium simultaneously into an atmosphere kept at a lower pressure than the inside pressure of the vessel; the improvement wherein the pressure of the inside of the vessel after opening its one end is maintained at a substantially constant pressure which fluctuates within 4 kg/cm^2 and is 0.7 to 1.0 times the vapor pressure of the blowing agent before opening the end of the vessel, and which constant

pressure is maintained for at least the time required to obtain two-thirds of the pre-foamed particles."

V. As regards the main request, where the lack of novelty was disputed only for certain features, the Opposition Division found that the example of (1) implicitly disclosed (a) the substantially constant pressure requirement since the claim permitted a deviation of ±4 kg/cm^2 and, on a true construction of the disclosure, also (b) the period of time to obtain two-thirds of the pre-foamed particles, there being a virtual identity of disclosure with the patent in suit in this respect. The explicit mention of maintaining the pressure of the inside of the vessel (P_1) higher than the vapour pressure of the blowing agent (P_0) moreover anticipated the condition (c) for P_1 to be at least 0.7 P_0.

The claim of the auxiliary request was found to be novel over (1), but distinguished from the disclosure of (4) only by the feature of the limitation of the pressure in the vessel after opening to 0.7 - 1.0 times the vapour pressure of the blowing agent (P_1 = 0.7 - 1.0 P_0). A comparison, however, between examples of the patent in suit which themselves differed only by this feature, showed that the alleged effect of enhanced expansion ratio was not obtained, so that the technical problem was not solved and there was consequently no inventive step. The request of the Appellant (Patentee) to file comparative data was refused.

VI. On 24 August 1989 a notice of appeal against the above decision was filed, together with payment of the prescribed fee.

In the Grounds of Appeal filed on 26 October 1989 and in subsequent letters, as well as during the oral proceedings

held before the Board on 23 September 1992, the Appellant argued:

- in relation to novelty of the main request, that (a) the fluctuation of ±4 kg/cm^2 was not a "permitted" but a "required" occurrence, such a considerable variation not being taught in (1) or in (4), and (b) the cited disclosures gave no teaching as to the pressure after opening the vessel, an act which might last much longer than the fraction of a second presupposed by the Opposition Division; furthermore, the relevant Examples 5 and 6 of (4) could not be read as including a dispersant; the claim according to the main request was therefore novel;

- in relation to inventive step, the process offered the possibility of working effectively, as demonstrated by Example 2, at pressures P_1 down to 0.7 P_0, and the lower pressures in any case gave the benefits of easier and cheaper working;

- in relation to the auxiliary request furthermore, the claim was distinguished from (4) not only by the one feature relied upon by the Opposition Division; it had been unjustified to refuse an opportunity to provide comparative data over the relevant examples of (4), which differed additionally by the absence of a dispersant.

VII. The Respondent (Opponent), on the other hand, with regard to novelty, pointed (a) to the preferred fluctuation range of ±3 kg/cm^2 in the patent and in relation to the example of (1), and (b) to wording in (1) which could not have been read as meaning that the pressure is maintained only during the instant of opening the vessel.

The Respondent furthermore calculated that the vapour pressure of the blowing agent, although unstated in the example of (1) would, to an approximation lying within the limits of ±4 kg/cm^2, be equal to the inside pressure of the vessel and consequently be novelty destroying for the auxiliary request also.

In relation to inventive step, the Respondent regarded the absence from Examples 5 and 6 of (4) of a dispersant as inappropriate to refute the reasoning of the Opposition Division, since the use of such a substance was already recommended in the same document.

VIII. The Appellant requests maintenance of the patent in amended form on the basis of the main request as filed on 31 March 1989, or, alternatively, on the basis of the auxiliary request filed at the oral proceedings before the Opposition Division held on 14 April 1989.

The Respondent seeks dismissal of the appeal.

Reasons for the Decision

1. The appeal is admissible.

2. Main request

2.1 It was not disputed by the parties that (1) represented prior art within the meaning of Article 54(3) EPC and disclosed, in combination, all the features specified in the claim down to the words "dispersing agent" (see section IV above).

2.2 At issue was, however, whether the remaining features were in substance disclosed in (1). These features have been

listed by the Appellant, and will be considered by the Board, as follows:

(a) The pressure of the inside of the vessel after opening its one end is maintained at a substantially constant pressure which fluctuates within 4 kg/cm^2;

(b) This constant pressure is maintained for at least a time required to obtain two-thirds of the pre-foamed particles;

(c) This constant pressure is at least 0.7 times the vapour pressure of the blowing agent before opening the end of the vessel.

2.3 As regards (a), although the existence of pressure fluctuations on opening the end of the vessel is evidenced in the patent in suit by the pairs of different values of pressure given in the results of the table on page 4 (see third vertical column from the right), it is clear from the text of the application as originally filed that the pressure variations of ±4 kg/cm^2 were presented only in terms of a formal definition qualifying the term "substantially constant pressure" (see originally filed application page 5, first paragraph).

The argument of the Appellant, that provided the pressure was held to within the tolerance limits given (±4, preferably ±3 kg/cm^2), the claimed advantages would be obtained, but that some fluctuation was nevertheless necessary, is self-contradictory.

The absence of any statement of a lower limit for such fluctuations, or their significance for the claimed solution, or indeed of any provision for ensuring that certain fluctuations occur, merely tends to reinforce the

Board's view that the term "substantially constant pressure" means exactly what it originally said, with the phrase "which fluctuates within 4 kg/cm^2" importing the sole qualification that a limit is placed on the maximum extent of any fluctuation.

2.4 According to the example of (1), the resin particles were dispersed in water and then, "while maintaining the pressure of the inside of the vessel at about 30 kg/cm^2.G, one end of the vessel was opened to release the resin particles and water simultaneously into the atmosphere." (see page 6, penultimate paragraph).

2.4.1 In the Board's view, the skilled person would understand the quoted phrase as meaning that the pressure should be maintained as close as feasible, i.e. as close as practically possible, to the figure given. Thus the word "about" would not include any substantial pressure variation.

2.4.2 In the decision under appeal, the 13% pressure deviation represented by the limits of ±4 kg/cm^2 at 30 kg/cm^2 was regarded as "a considerable pressure variation", so that a prior art in which the pressure was maintained at about 30 kg/cm^2 would certainly, by implication, fall within its scope (see point 7 of the decision under appeal). A "considerable pressure variation" must be understood in this context as a "substantial pressure variation".

2.4.3 None of the submissions by the parties have led the Board to suppose that this assessment by the first instance was erroneous. Indeed, it is in accord with the Appellant's own assertion that no pressure fluctuations were disclosed in (1) (see Grounds of Appeal, page 3, first complete

paragraph). Consequently the Board shares the view of the Opposition Division that feature (a) is implicitly disclosed in (1).

2.5 With regard to feature (b), which was not further commented upon by the Appellant in the oral proceedings before the Board, the latter is satisfied, in view of the statement in (1) that "the contents of the vessel are released ... while maintaining the pressure of the inside of the vessel higher than the vapor pressure of the blowing agent", and of the further similarity of wording between the relevant parts of (1) and the patent in suit, that the position is clear beyond reasonable doubt, and this feature also is implicitly disclosed by (1) (cf. (1), page 4, last paragraph; page 6, penultimate paragraph; patent in suit, column 4, lines 44 to 48).

2.6 As regards the feature (c), although the example of (1) does not state what the vapour pressure (P_0) of the blowing agent is, it is clear from the repeated general teaching of the document that the pressure (P_1) of the inside of the vessel must be maintained above the vapour pressure of the blowing agent (see page 2, lines 29 to 31; page 4, last paragraph; Claim 4). Consequently, reading the document as a whole, the requirement that the pressure (P_1) be greater than or equal to 0.7 x the vapour pressure (P_0) is considered to be implicitly fulfilled in the example.

The value for P_0 subsequently calculated in the example by the Respondent, which has not been challenged by the Appellant, is consistent with this view (cf. submission dated 10 January 1990, page 3).

2.7 Thus the Board concurs with the finding by the Opposition Division of lack of novelty in the light of (1). In view

of this conclusion it is not necessary to consider whether the main request is novel in the light of (4), or whether it could have involved an inventive step.

3. Auxiliary request

This claim differs from that of the main request in that, apart from a slight rearrangement of the wording, an upper limit of 1.0 times the vapour pressure of the blowing agent (P_0) is placed on the pressure (P_1) inside the vessel after opening its end.

3.1 Novelty in the light of (1)

Although the stated value of 30 kg/cm^2 for the inside pressure (P_1) in the example of (1) is only slightly above the Respondent's unrefuted calculated value of the vapour pressure (P_0) of 28.2 kg/cm^2, this is in line with the teaching of (1) that P_1 must be > P_0. Furthermore, the teaching of (1) has been interpreted in this decision as making no particular requirement for any pressure "fluctuations" after opening of the one end of the vessel (cf. sections 2.4 and 2.6 above).

In the patent in suit on the other hand, the Appellant has argued that the fluctuation range of + or - 4 kg/cm^2 in P_1 on opening the end of the vessel will in practice not be "around" the value of P_0, but below it - an assertion which has not been refuted by the Respondent (see Grounds of Appeal, page 6, third paragraph; submission dated 5 June 1990, page 2, paragraph 3). Thus P_1 could never exceed P_0 according to the auxiliary request.

Consequently, accepting the calculation of the Respondent, (1) would not disclose $P_1 = P_0$ by reason of the acknowledged difference of 1.8 kg/cm^2 by which P_1 exceeds

P_0 in the example. Hence the auxiliary request is novel over (1), as correctly found by the Opposition Division.

3.2 Novelty in the light of (4)

The Board accepts, as did the Opposition Division in the proceedings before it, that in spite of the statement in the worked procedure of (4) (cf. page 6, second complete paragraph) that the interior space of the container is maintained at a pressure "not lower than" the vapour pressure of a blowing agent, this statement applies to the situation prior to temperature adjustment (= heating), only. It cannot therefore be assumed that this condition still applies to the pressure under which the system is maintained while releasing the particles. The reason for this is that, although it can be expected that both P_1 and P_0 will rise as a result of the intervening temperature adjustment, document (4) does not disclose what the final relationship P_1/P_0 will be.

Consequently, the Board is prepared to recognise novelty in the subject-matter of the auxiliary request over the disclosure of (4).

3.3 Inventive step

Since (1) belongs to the state of the art as defined by Article 54(3) EPC, it has no significance in relation to inventive step.

3.3.1 There is general agreement that, for the purpose of investigating inventive step, the closest prior art is represented by Examples 5 and 6 of (4). Document (4) relates to a process for pre-expanding polymer particles by placing an aqueous dispersion of the particles containing a volatile blowing agent into a container,

heating the dispersion at a temperature not lower than the softening point of the particles while maintaining the interior of the container at the vapour pressure of the blowing agent or higher pressure, and thereafter releasing the particles and the water at the same time into an atmosphere of low pressure by opening one end of the container below the water level (see page 2, second paragraph).

To obtain expanded particles with more uniform quality, optionally a small amount of a dispersing agent is used for dispersing the expandable particles in water (page 5, first paragraph).

According to Example 5, non-crosslinked particles of ethylene-propylene random copolymer containing 9 mole% ethylene component (100 pbw) and the blowing agent dichlorodifluoromethane (23 pbw) were dispersed in water (250 pbw) within a closed container, heated to 135°C with stirring and maintained for one hour. While maintaining the internal pressure of the container at about 30 kg/cm^2 G, a valve at a lower portion thereof was thereafter opened to simultaneously release the expandable particles and water into an atmosphere of normal pressure and room temperature. The pre-expanded particles obtained were composed substantially of closed cells, had an expansion ratio of 35 times and a density of 0.026 g/cm^3 and were free of any thermal adhesion to one another.

3.3.2 While the use of a dispersing agent is disclosed in (4) as a whole, it is missing in Examples 5 and 6 representing the specific prior art with which the alleged invention is to be compared when deciding on inventive step.

3.3.3 Compared with this state of the art, the problem underlying the invention prima facie would appear to be an

improved process for producing pre-foamed polymer particles characterised by an enhanced expansion ratio in combination with an improvement in uniformity of cell diameter and expansion ratio.

The solution was to be seen in (i) the limitation of the pressure P_1 to a range from 0.7 to 1.0 x P_0 in combination with (ii) the use of a dispersing agent.

3.3.4 The Board notes that, in the Grounds of Appeal, the Appellant announced that proof of this would be provided as soon as possible. No data has, however, been supplied in the period of almost three years which have passed since then.

As regards the aspect of enhanced expansion ratio, this was in any case a new effect, thus the onus was on the Appellant to demonstrate it by means of a proper comparison. This has not been done.

As far as the aspect of enhanced uniformity of cell diameter and expansion ratio is concerned, this was admittedly mentioned qualitatively in the introduction of the patent as granted, but the Board cannot concur with the Appellant that the only remaining example according to the auxiliary request (Example 2), when compared with Example 5 of (4), provides an adequate demonstration of it. Even accepting the assurance of the Appellant that the polymer used is in each case the same (its precise nature being unspecified in either case), the clear differences in the concentrations of the polymer and of the blowing agent and, above all, in the temperature - where a minor difference can have a disproportionately large effect - mean that no reliable comparison can be made.

Under these circumstances, the Board disregards the alleged effect. Consequently, the technical problem as stated above cannot be regarded as credibly solved.

3.3.5 In contrast to the statement in point 17 of the decision under appeal, it would not necessarily follow from this that there is no inventive step. Rather, the problem actually solved is the provision of another process for producing pre-foamed polymer particles, which process may or may not be inventive (cf. Decision T 52/90 of 8 January 1992; not published in OJ EPO).

3.3.6 To assess the question of inventive step on this basis, it is necessary to consider whether the skilled person, starting from (4) would have considered combining features (i) and (ii) in the expectation of achieving a feasible alternative process for obtaining pre-foamed polymer particles.

3.3.7 As regards feature (i), in view of the unrefuted calculation of the Respondent (section 3.1 above) the pressure P_1 used in Example 5 of (4) may indeed have lain very close to the vapour pressure P_0 of the blowing agent. Even if it had not, however, the teaching in (4) (cf. page 2, second paragraph) of maintaining the interior of the container at the vapour pressure of the blowing agent or higher pressure (emphasis added by the Board) means that the use of a pressure P_1 substantially equal to the pressure P_0 is one of the options to which the attention of the skilled person is specifically directed in carrying out the teaching of (4); lower pressures P_1 in any case being more attractive from an economic point of view. Thus, it would be obvious from the teaching of (4) to maintain a pressure $P_1 = P_0$ on opening the end of the container.

3.3.8 In view of the further teaching in (4) according to which "When a small amount of dispersant is used for dispersing expandable particles in water, it is possible to obtain expanded particles with more uniform quality" (see page 5, first paragraph) the skilled person seeking an alternative process would certainly expect no disadvantage from following this general recommendation and adding dispersing agent, regardless of the ratio P_1/P_0 used. Incidentally, one of the dispersing agents suggested in (4) includes calcium carbonate, which is also one of those listed as usable in the patent in suit (cf. column 2, line 36). Thus the feature (ii) is also an obvious measure for the skilled person to adopt in solving the technical problem.

3.3.9 Since the application of feature (ii) is not affected by the pressure P_1 used, the adoption of both measures (i) and (ii) in combination for carrying out the teaching of (4) would also be obvious for the skilled person.

In view of the above, the claimed solution does not involve an inventive step.

4. The main request is therefore not allowable for lack of novelty (Article 54(3) EPC), and the auxiliary request for lack of inventive step (Article 56 EPC). Thus neither of the Appellant's requests meets the requirements of Article 52(1) EPC.

Order

For these reasons, it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

E. Görgmaier F. Antony