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Bezeichnung der Erfindung: Process for making polyurethane foam
Title of invention:
Titre de l'invention :

Klassifikation / Classification / Classement : B29C 67/20; C08J 9/14//A47C 7/18 (C08J 9/14, C08L 75/04)

ENTSCHEIDUNG / DECISION

vom / of / du 24 August 1989

Anmelder / Applicant / Demandeur :

Patentinhaber / Proprietor of the patent / Titulaire du brevet : BP Chemicals Limited

Einsprechender / Opponent / Opposant : BASF Aktiengesellschaft
Bayer AG
The Dow Chemical Company

Stichwort / Headword / Référence :

EPÜ / EPC / CBE Articles 54, 56, 100(b) EPC

Schlagwort / Keyword / Mot clé : "Novelty (yes)"
"Inventive step (yes)"

Leitsatz / Headnote / Sommaire

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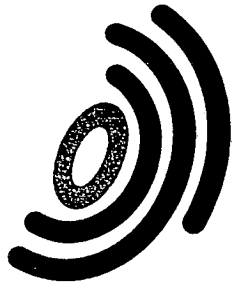

Case Number : T 420/87 - 3.2.2

D E C I S I O N
of the Technical Board of Appeal 3.2.2
of 24 August 1989

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Decision under appeal : Decision of Opposition Division of the European Patent Office dated 29 September 1989 revoking European patent No. 68 820 pursuant to Article 102(1) EPC.

Composition of the Board :

Chairman : G. Szabo
Members : H. Seidenschwarz
W. Moser

Summary of Facts and Submissions

I. European patent No. 68 820 comprising twelve claims was granted on 11 September 1985 in response to European patent application No. 82 303 294.1 filed on 24 June 1982.

II. Claim 1 as granted reads as follows:

"The process for the production of a flexible polyurethane foam article with zones of different hardness which process comprises introducing into a mould a first foam formulation and a second foam formulation, the two formulations giving foams of different hardness and prepared by mixing together a polyol stream and an isocyanate stream in a mixer, characterised in that the process comprises first introducing the first formulation to give a relatively soft foam and then introducing the second formulation to give a relatively hard foam, the second foam formulation being introduced directly on to the first formulation at a time corresponding to a volume expansion of the first foam formulation in the range +100% to +2300% so as to form one or more relatively hard zones within a relatively soft foam."

III. Oppositions were filed against the European patent requesting that it be revoked due to a lack of patentability with regard to Articles 52 to 57 EPC (i.e. Article 100(a) EPC), and in particular lack of inventive step.

IV. The Opposition Division revoked the European patent No. 68 820 by its decision dated 29 September 1987 on the grounds that the subject-matter of Claim 1 did not involve an inventive step in view of the teaching disclosed in

DE-A-2 938 231 or its equivalent US-A-4 190 697, and in DE-A-2 127 582 or its equivalent GB-A-1 387 922.

V. The Appellant (Proprietor of the patent) lodged an appeal against the decision on 20 November 1987, paying the appeal fee on the same date. The Statement of Grounds was also received on 20 November 1987. One of the grounds was that the Opposition Division failed to hold oral proceedings, but this ground was withdrawn at the oral proceedings before the Board of Appeal which took place on 24 August
1989.

(i) As announced in writing nobody was present on behalf of the Respondent III (Opponent III), who had been duly summoned pursuant to Rule 71(1) EPC. The proceedings, therefore, could continue without him (Rule 71(2) EPC).

(ii) The Appellant contested the arguments of the Respondents I and II (Opponents I and II) and was of the opinion that the subject-matter of Claim 1 was novel and that it also involved an inventive step, having regard to the teaching known from US-A-4 190 697 and GB-A-1 387 922 or DE-A-2 127 582 respectively.

(iii) The Respondent I argued that the subject-matter of Claim 1 was not novel with respect to DE-A-2 127 582 and referred to the Claims 1, 2, 6, 8 and 9 in connection with the Tables 2 and 4 in the description (pages 13 and 20) of said document.

(iv) The Respondent II supported the opinion of the Respondent I by referring to the pages 5 (paragraph 2), 6 (lines 14 to 25) and 7 (lines 1 to 11) of DE-A-2 127 582.

Furthermore, with regard to the inventive step, he added that

- the passage on page 2 (lines 12 to the end of the page) of DE-A-2 127 582, which has already been submitted as relevant in the decision of the Opposition Division, would suggest to the person skilled in the art to perform the process as claimed in the patent in suit, as well as

- the teaching known from EP-A-0 056 939 in combination with the teaching known from DE-A-2 523 527 or US-A-4 190 697 would lead the person skilled in the art to the subject-matter as claimed.

The Respondent II further submitted that the invention of the patent in suit was not disclosed sufficiently clear to perform the claimed process.

VI. The Appellant requested that the decision under appeal be set aside and that the patent be maintained as granted.

The Respondents I and II requested that the appeal be dismissed.

According to his letter of 11 April 1988, the Respondent III requested the rejection of the appeal.

Reasons for the Decision

1. The appeal is admissible.

2. **Novelty**

2.1 In the opinion of the Respondents I and II, DE-A-2 127 582 represents the state of the art which anticipates novelty of the subject-matter of Claim 1.

According to the findings of the Board of Appeal, the process for the production of an article of plastic known from this document constitutes actually the closest prior art with respect to the subject-matter of Claim 1. Indeed, in the cited process, a polyurethane foam article is produced by introducing into a mould a first formulation to give a relatively soft foam and then introducing the second formulation to give a relatively hard foam (cf. Claim 1 in combination with Claim 9 as well as Tables 2 and 4).

The second foam formulation is, however, introduced into a closed mould **forming a layer on the first foam formulation** when this is expanded and has at least attained a state which is puncture-proof and cross-linked but still plastic (cf. Claim 1). Furthermore, the second foam formulation is introduced into the closed mould **under pressure** in such a way as to **compress** the already prefoamed and at least partly hardened charge (cf. Claim 2). This means that the conditions require a specific interplay between the two kinds of foams within the confined space available in the mould.

The volume or mass of the second foam formulation is equal to or less than the unfoamed volume or mass of the first foam formulation (cf. Claim 6). According to Claim 8 of the cited patent, the volume or mass of a non-foam formulation is sufficient for the formulation of a continuous thin layer if this non-foam formulation is introduced after the foam formulations. The overall result is the formation of hard and soft foam regions side by side.

The description of the known process on page 5, paragraph 2, to page 7, paragraph 1 supports the claims as cited above. On page 7 (lines 3-9) of the same document, it is expressis verbis stated that the second foam formulation, which gives the hard foam, forms a "unilateral coating" instead of a "partial or complete casing" for the part moulded from the first foam formulation, which gives the soft foam.

It results clearly from the above that the polyurethane foam article produced by the known process consists of layers of different hardness.

2.2 Consequently, the subject-matter of Claim 1 of the patent in suit differs from the known process in the sense

- that the second foam is introduced directly onto the first foam formulation, at a time corresponding to a volume expansion of the first foam formulation in the range of +100% to +2300%, so as to form one or more relatively hard zones within a relatively soft foam, without using the confined conditions of the aforementioned prior art.

2.3 None of the other documents, including the earlier European application No. 82 100 120.3 (EP-A-0 056 939), cited in the proceedings before the European Patent Office discloses a process according to Claim 1. To give reasons in detail is unnecessary since the Respondents did not dispute the novelty with respect to this state of the art.

2.4 Hence, the subject-matter of Claim 1 is novel within the meaning of Article 54 EPC.

3. Inventive step

3.1 It follows from the discussion of the closest state of the art known from DE-A-2 127 582, that the problem to be solved by the invention is to provide a process for the production of a flexible polyurethane article having discrete zones of hard foam surrounded by soft foam, which article is suitable to be used as a car seat and gives support to the seated person under static and dynamic conditions which change continuously and quickly.

3.2 According to the teaching of Claim 1, this problem is solved by introducing the hard foam formulation into the soft foam formulation at a specified point in time so as to form hard zones within the soft foam without the requirement for a closed cavity and expansion of the second foam against the expanded first foam having attained a cross-linked and hardened stage which is puncture proof. The Examples given in the description of the patent in suit demonstrate the existing differences between the soft and hard foams as regards compression force deflection (CFD) hardness and density values.

3.3 US-A-4 190 697 describes a method for making a multidensity foam article by introducing polyurethane formations of different hardness in a sequential order. The product has a sag factor of about 3.0 to about 4.5 which makes it suitable for the use as a cushion for vehicle seats like snowmobiles or mobile pieces of heavy industrial equipment. This article is made by first adding to a mould a polyurethane formulation which yields a firm foam and then adding to the mould a second formulation which yields a soft foam. The addition is performed after a slight time delay which allows the first formulation to start to cream, foam and rise to about 10% to 80% of its total potential. This results in a reduction of the

specific gravity of the first foam formulation. The second foam formulation is then of higher specific gravity than the first foam formulation so that the second foam formulation passes through the first. The first foam formulation then floats on the centre and top of the second formulation. A flexible foam article containing a soft layer and a firm layer is produced. The layers are bonded and knitted together at their common boundary during the curing process. If required, the composition is then turned upside down to provide a soft flat cushion with a hard layer at the bottom of the centre as a support.

3.4 From the description (column 1, line 65 to column 2, line 13 of US-A-4 190 697) it is also clear that

- if the second (soft) foam formulation is added too late it will merely float on top of the first (hard) foam formulation,

- if the second foam formulation is added too early both formulations will co-mingle and form a single foam article of intermediate hardness, and

- if only the second foam formulation is added at the correct time the resulting foam article has the desired stratified layers of foams of different densities.

Consequently, from the aforementioned document, the teaching of Claim 1 of the patent in suit, namely, to reverse the sequence of addition of the two foam formulations in such a way that instead of forming stratified layers of different hardness discrete zones of hard foam are formed within a soft foam in any area of the article including along the edges, cannot be derived. In addition to being unsuitable to provide the desired effect

looked upon as essential for the patent in suit, the document contains no information as to the specific conditions for the choice of time for introducing the hard foam into the soft ones. As shown above, the introduction time in the cited prior art is controlled by different considerations in view of the reverse order of operation.

3.5 As regards the further state of the art described in the introduction of DE-A-2 127 582 (page 1, second paragraph, to the end of page 2), it discloses a process for the production of an article with a porous core, in which process the introduction of the foamable plastic into the mound cavity is deferred until the second injection. According to this method, the plastic is mixed into the non-foamable plastic injected beforehand, so that the latter is inflated in the manner of a balloon and shaped to form the outer layer surrounding the porous core. This known process is, therefore, based on a concept which is already wholly different to those processes which are claimed in DE-A-2 127 582 or in US-A-4 190 697.

3.6 DE-A-2 523 527 concerns a process for the production of a foam article of different hardness, in which process a mixture producing harder foam is introduced into a recess in a mould corresponding to the side portions of the seat while a mixture producing softer foam is fed into the centre of the mould. The foam formulations are kept apart initially.

This document, as well as the other documents cited in the proceedings before the European Patent Office, gives likewise no hint of the subject-matter of Claim 1. Their teaching could, therefore, neither per se nor in combination with the teachings of the documents discussed in the foregoing paragraphs lead the skilled person to the process according to Claim 1.

3.7 The document EP-A-0 056 939 cited by the Respondent II (see point V(iv) of this decision), was published on 10 November 1982, i.e. after the date of filing (24 June 1982) of the patent in suit. This earlier application within the meaning of Article 54(3) EPC is, therefore, not to be considered in deciding whether there has been an inventive step: cf. Article 56 EPC.

3.8 Hence, the subject-matter of Claim 1 involves an inventive step within the meaning of Article 56 EPC.

3.9 Claims 2-12 concern particular embodiments of the process according to Claim 1 and thus are not open to objection.

4. **Sufficiency**

Although the Respondents submitted arguments concerning lack of clarity in consequence of insufficient disclosure (pursuant to Article 100(b) EPC), they failed to submit any evidence showing that the skilled person would be unable to carry out the invention on the basis of the disclosure.

5. The statement made by the Appellant concerning the position of the expression in brackets "(after 4 sec)" in line 54 on page 9 of the description as granted is correct, i.e. the position of said expression should be between the words "started" and "twice". This can be derived from the description, lines 57-59, on the same page in combination with Claim 1. Such a clarification is, however, a matter of Article 84 EPC and no ground in itself for amending the patent as granted.

6. Consequently, the patent can be maintained with the Claims 1-12 and the description in the wording as granted.

Order

For these reasons, it is decided that:

1. The decision of the first instance is set aside.

2. The European patent is maintained as granted.

The Registrar: The Chairman:

S. Fabiani G. Szabo