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D E C I S I O N
of 13 March 2002

Case Number: T 1100/98 - 3.3.5

Application Number: 93111397.1

Publication Number: 0579234

IPC: B01J 19/30

Language of the proceedings: EN

Title of invention:
Packing element

Patentee:
NORTON CHEMICAL PROCESS PRODUCTS CORPORATION

Opponent:
Vereinigte Füllkörper-Fabriken GmbH + Co.

Headword:
Packing element/NORTON

Relevant legal provisions:
EPC Art. 123, 84, 54(1), 56

Keyword:
"Novelty - no (main request)"
"Inventive step - yes (after amendment)"
"Non-obvious alternative"

Decisions cited:
-

Catchword:
-

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Case Number: T 1100/98 - 3.3.5

D E C I S I O N
of the Technical Board of Appeal 3.3.5
of 13 March 2002

Appellant: (Proprietor of the patent)
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Decision under appeal: **Decision of the Opposition Division of the European Patent Office posted 2 October 1998 revoking European patent No. 0 579 234 pursuant to Article 102(1) EPC.**

Composition of the Board:

Chairman: R. K. Spangerberg
Members: B. P. Czech
J. H. Van Moer

Summary of Facts and Submissions

I. The appeal is from the decision of the opposition division revoking European patent 0 579 234. The sole independent claim 1 of the granted patent reads as follows:

"1. A packing element having a generally tubular structure in which the tube wall has been inwardly deformed at opposed ends of mutually perpendicular diameters to provide a cross-section with only four external lobes."

II. In the contested decision, the opposition division considered sixteen documents, including the following:

D3 = DE-C-316 497

D5 = H. Hausen, Wärmeübertragung im Gegenstrom, Gleichstrom und Kreuzstrom, 2nd edition, Springer Verlag, Berlin-Heidelberg-New York, 1976, pages 47 to 69

D6 = US-A-4 333 893 and

D8 = Prospectus of the company Fuchs-Letschert Sohn

The opposition division, considering several sets of amended claims, came to the conclusion that the claimed subject-matter lacked novelty or inventive step over the disclosures of documents D3, D5, D6 and/or D8.

III. On appeal, the appellant (patent proprietor) replaced the claims considered by the opposition division by three sets of amended claims as main, first auxiliary

and second auxiliary request. It submitted that the subject-matter of these claims was novel and inventive.

IV. Oral proceedings took place on 13 March 2002.

During the oral proceedings, the respondent presented four modified sets of claims as new main and auxiliary requests 1 to 3.

Independent claim 1 of the new main request reads as follows (amendments to claim 1 as granted are **highlighted**):

"1. A **random** packing element having a generally tubular structure in which the tube wall has been inwardly deformed at opposed ends of mutually perpendicular diameters to provide a cross-section with only four external lobes **and in which the greatest cross-sectional dimension is greater than the axial length, and in which the ratio of the lengths of the mutually perpendicular diameters is from about 1:1 to about 4:1.**"

Independent claims 1 and 2 of the first auxiliary request read as follows (additional amendments in comparison to claim 1 according to the main request are **highlighted**):

"1. A random packing element having a generally tubular structure in which the tube wall has been inwardly deformed at opposed ends of mutually perpendicular diameters to provide a cross-section with only four external lobes **and two pairs of internal convexities, wherein the radii of curvature of the two pairs of**

internal convexities are the same, but the angle subtended by the extremes of the convexities is greater for one opposed pair of convexities than for the other, and in which the greatest cross-sectional dimension is greater than the axial length".

"2. random packing element having a generally tubular structure in which the tube wall has been inwardly deformed at opposed ends of mutually perpendicular diameters to provide a cross-section with only four external lobes, **wherein the deformations at opposite ends of each diameter are of uniform amounts such that the convexity of the internal wall surface of each deformation has the same radius of curvature, wherein the deformations at opposed ends of the perpendicular diameter are also equal in the radius of curvature of the inside wall surface, which, however, is different from the radius of curvature of the deformations at the opposed ends of the other diameter,** and in which the greatest cross-sectional dimension is greater than the axial length".

V. The written and oral submissions of the parties, as far as they are relevant to the claims submitted at the oral proceedings, can be summarised as follows:

The respondent objected to the clarity of the expression "in which the ratio of the lengths of the mutually perpendicular diameters is from about 1:1 to about 4:1", especially in the light of the disclosure in column 2, lines 25 to 29 of the contested patent. It submitted that claim 1 according to the main request lacked novelty over the disclosures of documents D3 and D5, and that claims 1 and 2 of the first auxiliary

request lacked novelty over the disclosure of D5. It also argued that, if novelty were accepted, the modifications required to arrive at the claimed elements could be derived from the disclosures of D3, D5, D6 and D8, and/or were obvious in view of the common general knowledge of a person skilled in the art.

Referring to the wording of claims 1 and 4 of the application as filed, the appellant refuted the clarity objection of the respondent. It argued that the packing elements shown in the figures of D3 were not tubular, since they had open portions in their side walls, that the elements shown in Figure 20 of D5 were not random packing elements, and that the prior art relied upon by the respondent did not suggest the specific four lobed shapes as claimed. Concerning the independent claims 1 and 2 of the first auxiliary request, it argued that the "bow-tie"-shaped packing element structure as defined in these claims was not suggested by the prior art.

VI. The appellant requested that the decision under appeal be set aside and that the patent be maintained on the basis of any of the requests submitted during the oral proceedings.

The respondent requested that the appeal be dismissed.

Reasons for the Decision

1. *Main request*

1.1 Amendments to claim 1

The amendments to claim 1 consist of additional features relating to the intended use of the packing element and its morphology/dimensioning. They have not been objected to by the respondent under Article 100(c) EPC. The board is also satisfied that these amendments find a sufficient basis in the application as filed and in the granted patent.

1.2 Construction of claim 1

Considering that the expression "ratio of lengths of the mutually perpendicular diameters is from about 1:1 to 4:1" was already present in dependent claim 4 of the granted patent, and that lack of clarity (Article 84 EPC) is not a ground of opposition according to Article 100 EPC, amended claim 1 cannot be objected to on this ground. In the case of dispute, however, a claim must be interpreted to the extent necessary to decide whether the patent can be maintained. During the oral proceedings, different interpretations of the above expression were discussed. According to the appellant, this feature has to be understood as relating to the lengths, measured inside the element, of the two perpendicular distances separating the respective pairs of deformations which are obtained when deforming the tube wall "at opposed ends of mutually perpendicular diameters" according to claim 1 as granted. The respondent, pointing out that the only passage in the description of the granted patent referring to a ratio of "from about 1:1 to about 4:1" was to be found in column 2, lines 25 to 29, held that the ratio had to be understood as relating to the ratio of the radii or diameters, measured outside the element, of the curved deformations.

Although the expression under dispute is not mentioned in the description, the board cannot accept the respondent's construction, since in the application as filed, the terms "radii" and "diameters" were clearly used for designating different lengths, see e.g. page 2, last paragraph to page 3, first paragraph (column 2, lines 15 to 29 of the contested patent). Moreover, it emanates from the language used in this passage ("deformations **at opposed ends** of each diameter") that with respect to the final product as claimed, i.e. after the deformation of the tube wall, the term "diameter" is to be understood to designate the distance separating the deformations within the element. Where reference is to be made to the above ratio, the board therefore adopts the construction suggested by the appellant.

1.3 Novelty

1.3.1 Document D3 inter alia discloses packing elements consisting of superposed rings of alternatingly different shapes, see claim 1. As pointed out by the respondent during the oral proceedings, the elements may be manufactured by joining **individual** rings of different shapes, see page 2, lines 14 to 29. The side view displayed in Figure 2 appears to show an element obtained by cutting and deforming a piece of tube. Nevertheless, the cross-sectional view shows two possible ring shapes, i.e. circular and four-lobed, see reference sign "b". **Individual** rings of such a shape may be superposed and joined according to the passage on page 2, lines 14 to 16 and lines 26 to 29.

1.3.2 Like any kind of ring, and like the claimed elements, the ring "b" disclosed in Figure 2 is of generally

tubular shape with cross-sectional dimensions which are greater than its axial length. Ring "b" has four essentially identical inward deformations at opposed ends of mutually perpendicular diameters, with the ratio of the distances separating the corresponding deformations within the element being "about 1:1", and has a cross-section with only four external lobes.

1.3.3 The structures obtained by superposing and joining a plurality of such individual rings are intended to be used as packing elements ("Füllkörper"). Hence, the individual rings themselves must inherently be of a size which makes them suitable for the same purpose, and in particular suitable for a random packing of columns. This was not disputed by the appellant. The fact that, as pointed out by the appellant during the oral proceedings, D3 does not comprise a figure showing a fully isolated ring, and that the use of such isolated rings as packing elements is not addressed in D3, is irrelevant with respect to novelty considerations, since the skilled person could clearly and unambiguously gather from this document that individual rings having all the features of the presently claimed element were disclosed as isolated intermediate products in the preparation of more complex elements.

1.3.4 Claim 1 being directed to a "random packing element" per se, its subject-matter is not limited to the use of a physical entity for that purpose, but encompasses all physical entities having the claimed structural features and being suitable for the intended use, see e.g. Case Law of the Boards of Appeal of the EPO, 3rd edition 1998, I-C 6.3.2, the last two paragraphs. The ring "b" disclosed in Figure 2 of D3 shows all the

structural features of claim 1, and thus the subject-matter of this claim lacks novelty (Articles 52(1) and 54(1) EPC) in view of the disclosure on page 2, lines 14 to 29 of D3. Hence, the main request cannot be allowed.

2. *First auxiliary request*

2.1 Amendments

Unlike claim 1 according to the main request, present independent claims 1 and 2 do not comprise the contested feature "the ratio of lengths of the mutually perpendicular diameters is from about 1:1 to 4:1". The respondent did not raise any objections to these amended claims under Article 100(c). The board is also satisfied that all the amendments find a sufficient basis in the application as filed and in the granted patent. See more particularly claim 1, page 2, third paragraph for the feature "random", and page 3, third paragraph for the feature "greatest cross-sectional diameter greater than axial length" (column 2, lines 4 to 6 and lines 48 to 50, respectively, of the granted patent). Concerning the further restricting indications as to the shapes and sizes of the internal convexities (features highlighted in item IV), see page 3, lines 6 to 10 and page 2, last paragraph to page 3, line 3, respectively, of the application as filed (column 2, lines 29 to 32, and column 2, lines 15 to 25 of the granted patent). Dependent claims 3 and 4 are identical in wording to claims 3 and 4 as originally filed (claims 5 and 6 as granted).

Hence, the claims according to the first auxiliary request fulfill the requirements of Articles 123(2)

and (3) EPC.

2.2 Novelty

2.2.1 According to claim 1, each of the opposed convexities belonging to a pair of deformations subtends an angle different from the one subtended by the opposed convexities belonging to the other pair. According to claim 2, the opposed convexities belonging to one pair have a radius of curvature which is different from the one of the opposed convexities belonging to the other pair. The board cannot accept the unspecific objections as to lack of clarity raised by the respondent during the oral proceedings, and holds, in agreement with the appellant, that these additional features clearly express that **the size and shape of the one pair of deformations must be different from those of the other pair**. Consequently, the claimed packing elements have a degree of asymmetry (a "bow-tie"-like shape according to the patent in suit, column 2, line 25) which is not disclosed in any of the prior art documents cited by the opponent, as will appear from the following.

2.2.2 The board cannot accept the position of the respondent, according to which Figure 20 on page 55 of D5 (upper left embodiment shown), in combination with the sentence underneath the figure, i.e. "... schrittweise Änderung der Größe und Gestalt der Füllsteine ...", and the common general knowledge as illustrated e.g. by D8, would constitute a novelty destroying disclosure of the claimed packing elements. The upper left embodiment in Figure 20 discloses an element having a cross-section shown in front view which - irrespective of the schematic nature of Figure 20 - is symmetrical in the sense that the angles subtended by, and the radii of

curvature of the four inward deformations are apparently identical. Moreover, the board shares the view of the opposition division that the feature "greatest cross-sectional diameter greater than axial length" cannot clearly and unambiguously be taken from the perspective view of Figure 20. Although it can be accepted that D5 generally suggests the provision of elements obtainable by modifying the particular element shown, the information given in the cited sentence, i.e. the indication that it was possible to modify the shape and size of the shown elements, is not precise enough to clearly and unambiguously imply a disclosure of the **specific** packing elements according to claims 1 or 2, or of any other **specific** shape. Even if it was to be accepted in the respondent's favour that the prospectus D8 represents the general knowledge to be taken into consideration in the assessment of the disclosure of D5, a skilled person could still not gather therefrom the specific elements claimed, since an asymmetric arrangement of four convexities, as referred to above, is not disclosed in D8 (see also item 2.3.4 below).

The board is satisfied that none of the other documents cited by the opponent discloses four-lobed packing elements deformed in the same way as the claimed elements, let alone in combination with the feature "greatest cross-sectional diameter greater than axial length".

Hence, the subject-matter of claims 1 to 4 is novel (Articles 52(1) and 54(1) EPC).

2.3 Inventive step

2.3.1 Closest prior art and technical problem

Whereas the appellant considered the disclosure of D6 (Figure 8E) to represent the closest prior art, the respondent was of the opinion that the element shown in Figure 20 of D5 should be considered as the starting point in the assessment of inventive step. The board holds that some of the packing elements shown in D8 (in particular "Letschert's Reformring Modell"S", see details under item 2.3.4 below) could, in the alternative, also be considered as the closest prior art. As conceded by the appellant during the oral proceedings, the evidence on file is not suitable for demonstrating any improvement over the packing elements disclosed in the cited prior art, and the technical problem to be solved by the claimed invention is to be seen in the provision of a further random packing element.

2.3.2 In the present case, irrespective of the chosen starting point, none of the documents D3, D5, D6 or D8, taken alone or in combination, suggests the modifications required in order to arrive at the novel packing elements claimed.

2.3.3 The board holds that the skilled person, starting from D5, Figure 20, upper left embodiment, was in no way incited by the disclosure of this document to modify that element in the direction of a more rectangular shape. The sentence quoted by the respondent, i.e. "... schrittweise Änderung der Größe und Gestalt der Füllsteine ..." is too vague to suggest such a **specific** change in the shape of the element shown. Assuming in the respondent's favour that the skilled person would envisage the use of a more rectangular shape, this

measure alone would still not immediately lead to the claimed shape, as suggested by the respondent during the oral proceedings. In addition, the **shape of the convexities** would still need to be varied in order to obtain two opposed pairs, each pair having a subtended angle or a deformation radius different from the one of the other opposed pair. Such a modification of the element of Figure 20 is neither shown in connection with some other element, nor suggested by the cited passages of D5.

2.3.4 Document D8 discloses various types of random packing elements, and in particular, the three-lobed so-called "Letschert's Reformring, Modell S", which is a packing element similar to the ones claimed insofar as it is generally tubular, comprises three curved inward deformations, and has an axial length which is clearly smaller than its greatest cross-sectional dimension (see photograph and technical details on page 6). Although D8 discloses a substantial number of very differently shaped packing elements, it does not comprise any indications concerning possible modifications to the shapes of the elements disclosed. More particularly, D8 does not suggest the provision of four-lobed elements with two pairs of opposed deformations differing in their radii or subtended angles. During the written proceedings, the respondent also referred to "Fuchs' Strahlenkörper" and "Fuchs' Zwillingskörper", disclosed on pages 6 and 7 of D8. The board, however, does not consider these two particular shapes to be of relevance. Although the "Strahlenkörper" can be considered as generally "bow-tie"-shaped and ribbed, it only shows one pair of what could be considered as opposed deformations of a generally tubular wall. The "Zwillingskörper", on the

other hand, cannot be considered as being generally tubular.

2.3.5 The sole four-lobed elements disclosed in D3 and D6 show the same kind of symmetry as the element shown in Figure 20 of D5: The four inward deformations of the tubular elements represented in Figure 2 of D3 and Figure 8E of D5 provide convexities all having the same radii and subtending the same angles. D3 and D6 comprise no suggestion to vary the particular shapes shown in Figures 2 and 8E, respectively, in a way leading to the more asymmetric element of claims 1 or 2. Moreover, D6 does not suggest reducing the axial dimension of the elements shown to a value smaller than their greatest cross-sectional dimension, see e.g. Figures 2A, 2B, 5A, 5C and 8C.

2.3.6 The board is convinced, and it was not disputed, that the other documents cited by the respondent do not come closer to the invention and do not contain any more relevant information.

2.3.7 Since the subject-matter of claims 1 and 2, and consequently of dependent claims 3 and 4, cannot be derived in an obvious manner from the prior art cited by the opponent, it is based on an inventive step (Articles 52(1) and 56 EPC).

3. *Description to be adapted*

The appellant did not file a description adapted to the claims according to the first auxiliary request. In particular, as acknowledged by the appellant during the oral proceedings, the embodiment shown in Figure 1 and discussed in the description is no longer covered by

the claims according to the first auxiliary request.

Order

For these reasons it is decided that:

The decision under appeal is set aside.

The case is remitted to the first instance with the order to maintain the patent with the following documents:

1. Claims 1 to 4 (first auxiliary request).

2. Description and figures to be adapted.

The Registrar: The Chairman:

P. Martorana R. Spangenberg