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Datasheet for the decision of 16 March 2010

Case Number: T 1464/06 - 3.3.06

Application Number: 94911620.6

Publication Number: 0688242

IPC: B01J 19/00

Language of the proceedings: EN

Title of invention:
Integrated chemical processing apparatus and processes for the preparation thereof

Patentee:
E.I. DU PONT DE NEMOURS AND COMPANY

Opponent:
Merck Patent GmbH
BASF SE

Headword:
Integral structure/DU PONT

Relevant legal provisions:
EPC Art. 123(2)

Relevant legal provisions (EPC 1973):
EPC Art. 56

Keyword:
"Inventive step (main and first auxiliary requests): no - arbitrary choice"
"Added matter (second and third auxiliary requests): yes"

Decisions cited:
-

Catchword:

-

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Case Number: T 1464/06 - 3.3.06

D E C I S I O N
of the Technical Board of Appeal 3.3.06
of 16 March 2010

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Decision under appeal: **Interlocutory decision of the Opposition Division of the European Patent Office posted 17 July 2006 concerning maintenance of European patent No. 0688242 in amended form.**

Composition of the Board:

Chairman: P.-P. Bracke
Members: P. Ammendola
J. Geschwind

Summary of Facts and Submissions

I. This appeal is from the interlocutory decision of the Opposition Division concerning the maintenance in amended form of European patent No. 0 688 242 granted on the European patent application 94 911 620.6 (international publication WO 94/21372).

II. Two oppositions had been filed against the patent on the grounds, *inter alia*, that the patented integral structure for chemical processing and manufacture (hereinafter CPM structure) lacked of novelty and of inventive step (Article 100(a) EPC in combination with Articles 52(1), 54 and 56 EPC).

The Opponents had referred, *inter alia*, to document

(l) DD 246257 A1.

At the oral proceedings before the Opposition Division the Patent Proprietor had filed three sets of amended claims respectively labelled as main request and first and second auxiliary requests, as well as an amended description adapted to the second auxiliary request.

III. Claim 1 of such **main request** read

"1. An integral structure for chemical processing and manufacture comprising a plurality of laminae joined together with at least one inlet port and at least one outlet port formed therein for the receipt and discharge of chemicals, said laminae comprising a material selected for compatibility with the chemical process, and at least one three-dimensionally tortuous

channel formed therethrough being precisely oriented between adjacent laminae for accommodating chemicals to be processed, wherein said channel is connected to said inlet and outlet ports and is continuous along laminae thereof and is discontinuous along other laminae thereof, and said discontinuous channel is continuously aligned between adjacent laminae to form a continuous pathway therethrough, wherein said channel measures from about 10 to about 5000 micrometers in cross-section and is configured to cooperate with means to perform at least one unit operation positioned to effect a desired control so that the chemicals are processed."

Claim 1 of the **first auxiliary request** differs from claim 1 of the main request in that the wording in this latter

"continuous along laminae thereof"

has been replaced with

"continuous along said adjacent laminae thereof".

Claim 1 of the **second auxiliary request** differs from claim 1 of the first auxiliary request in that the wording in this latter

"and is discontinuous along other laminae thereof, and said discontinuous channel is continuously aligned between adjacent laminae to form a continuous pathway therethrough, wherein said channel measures"

has been replaced with

"and is discontinuous along a first lamina thereof and discontinuous along a second lamina thereof which is adjacent to the first lamina, wherein said discontinuous channel along the first lamina comprises a first longitudinal series of straight segments, wherein said discontinuous channel along the second lamina comprises a second longitudinal series of straight segments, wherein the first and second longitudinal series of straight segments are positioned on abutting surfaces of the first and second adjacent laminae with the first longitudinal series of straight segments longitudinally offset with the second longitudinal series of straight segments, wherein the segments of the first longitudinal series alternate and intersect with the segments of the second longitudinal series, such that the first and second longitudinal series of straight segments are continuously aligned between the first and second adjacent laminae to form a continuous pathway therethrough, wherein said three-dimensionally tortuous channel measures".

IV. The Opposition Division found that the subject-matter of claim 1 according to the main request extended beyond the content of the application as originally filed because the expression *"continuous along laminae thereof"* therein would not necessarily refer to the previously cited laminae that were *"adjacent"*.

Claim 1 of the first auxiliary request was found to lack of inventive step because document (1) provided a clear indication to the partition of the reaction channel in two levels and the channel cross-sectional

size range would be an obvious possibility for the skilled man in the art.

The amended version of the patent according to the second auxiliary request was instead found to comply with the requirements of the EPC. In particular, the subject-matter claimed in this request was considered in accordance with Articles 123(2) EPC in view of the disclosure in the original patent application at page 20, line 29 to page 21, line 15, and in figures 7 and 7A. The Opposition Division rebutted the argument of the Opponents that this disclosure only referred to a mixer because, in the opinion of the First Instance, the application as a whole disclosed the embodiment described in claim 1 of such request (see point 5.2 of the decision under appeal).

V. Opponent I (hereinafter Appellant I) and the Patent Proprietor (hereinafter Appellant II) appealed against this decision.

Appellant I filed some new documents enclosed to its grounds of appeal. It then replied to the Appellant II's grounds of appeal with a letter dated 16 April 2007 also enclosing, *inter alia*, document

(19) EP-A-0484278.

Appellant II filed with a letter of 17 April 2007 a set of amended claims labelled as third auxiliary request.

On 16 March 2010 oral proceedings took place before the Board in the presence of both Appellants and of Opponent II, who is Party as of right (Article 107 EPC)

in respect of the appeal of Appellant I and Respondent to the appeal of Appellant II.

VI. Claim 1 of the **third auxiliary request** as filed by Appellant II on 17 April 2007 differs from that of the second auxiliary request (see above section III) only in that the wordings in this latter *"along a first lamina"* and *"along the second lamina"* have been respectively replaced with *"along an other first lamina"* and *"along the second laminae"*.

VII. Appellant I stated in writing and orally that the filing of document (19) was justified by its *prima facie* relevance in respect of the main and first auxiliary requests of Appellant II. At the oral proceedings before the Board it stressed that the filing of this citation was in prompt reply to the grounds of appeal of Appellant II. Moreover, this latter had only disputed the admissibility of document (19) at the hearing before the Board, i.e. almost three years after the filing of such document.

Appellant I and the Opponent II argued that the main request would violate Article 123(2) EPC for substantially the same reasons indicated by the Opposition Division in the decision under appeal.

These Parties also submitted that the terms *"continuous channel"* and *"discontinuous channel"* as used in claim 1 of the main request and in that of the first auxiliary request were undefined in the patent-in-suit and irremediably vague. They considered that these terms resulted in no understandable distinction in respect of

the prior art modular microapparatuses disclosed e.g. in document (1) or (19).

However, even if the vague term *"discontinuous channel"* would be given the restrictive meaning arbitrarily proposed by Appellant II in order to distinguish the CPM structures of the invention from the prior art, still it would not be apparent that the "vertical" changes of flow direction allegedly implied by the discontinuous nature of the channel would necessarily produce the turbulent mixing mentioned as particularly advantageous in the patent-in-suit.

Indeed, the range given for the channel cross-section in claim 1 of the main or first auxiliary request of Appellant II would be so broad to encompass capillary channels in which no turbulence was possible, but only laminar flow.

Moreover, "vertical" changes of flow directions were already occurring in the modular microapparatuses of documents (1) and (19), which described as well the possibility of creating on the lamina surface very tortuous continuous channels producing many changes of flow direction. In particular, document (19) described, e.g. in figure 14c, channels imposing a large number of direction changes to the flow of matter passing therethrough.

Hence, it was not credible that the claimed subject-matter would necessarily favour mixing more than the microapparatuses of the prior art already comprising very tortuous channels.

Accordingly, the sole technical problem possibly solved by the subject-matter claimed in the main or in the first auxiliary request was to provide an alternative to the modular microapparatuses disclosed in documents (1) or (19).

Appellant I and Opponent II stressed that the technical field of modular microapparatuses was already well-established before the filing date of the patent-in-suit and, hence, that the ease of manufacture of whatever design variation for the channels was already apparent to the person skilled in the art.

Moreover, the possibility of dividing even asymmetrically a channel on the abutting surfaces of two adjacent laminae was explicitly disclosed in document (1).

Additionally, even though document (1) and (19) did not explicitly disclose the dimensions in cross-section of the channels contained therein, such dimensions would appear to necessarily lay in the micrometer range. Nor would the patent-in-suit attribute any criticality to the dimension range given in the claims.

Hence, the subject-matter of claim 1 according to the main request or to the first auxiliary request only represented a minor arbitrary modification of the prior art, deprived of any inventive merit.

In respect to claim 1 of the second auxiliary request Appellant I raised at the oral proceedings before the Board the objection under Article 123(2) EPC already considered by the Opposition Division. In particular,

it stressed again that the definition of the *"discontinuous channel"* introduced in claim 1 of this request was not limited to the specific *"serpentine mixer"* described in figures 7 and 7A. In addition, the skilled person would have no reason to assume that only such portion of the separated channel segments present on each of the two lamina surfaces in these figure would constitute an example of the *"discontinuous channel"* of the invention, i.e. arbitrarily isolating these *"serpentine mixers"* from the other separated channel segments also present on these lamina surfaces, forming the *"manifold"*.

Appellant I considered that the same objection under Article 123(2) EPC would of course also apply to the identical wording used for defining the *"discontinuous channel"* in claim 1 according to the third auxiliary request.

VIII. Appellant II argued for the first time at oral proceedings before the Board that document (19) had been filed unjustifiably late by Appellant I and would be irrelevant to the invention claimed, since it did not disclose discontinuous channels along the laminae. It stressed to have already disputed in writing the admissibility of the documents filed by Appellant I with the grounds of appeal and, thus, that the issue of the admissibility of the documents filed by Appellant I during the appeal proceedings was already laying before the Board.

Appellant II submitted in writing and orally that the person skilled in the art would clearly understand the meaning of the terms *"continuous channel"* and

"discontinuous channel" upon reading the patent-in-suit as a whole. In particular, it has referred the conventional meanings of the terms *"continuous"* or *"discontinuous"* as given in dictionaries, as well as to column 13, lines 18 to 39, and in the corresponding figures 7 and 7A of the patent-in-suit. Hence, the skilled reader of claim 1 of the main request or of the first auxiliary request would interpret the wording *"discontinuous along other laminae thereof"* as referring to those pathways that lay in a general direction *"along"* the laminae - i.e. more or less parallel to the lamina surfaces and not going *"through"* the laminae - and that are **interrupted** in their path. The necessary continuity of flow of the chemicals passing therein was nevertheless possible since, as explicitly required in the same claim, each *"discontinuous channel"* was also *"continuously aligned to form a continuous pathway"*, i.e. the separated segments forming the interrupted channel in a given lamina surface were nevertheless connected through a properly shaped channel on the abutting surface of the adjacent lamina, as exemplified, for instance, in figures 7 and 7a. In contrast, the channel was *"continuous"* along a given lamina when orientated to form a path in a general direction along a lamina and not interrupted in its path in the given lamina.

Moreover, in the opinion of Appellant II the expression *"continuous along laminae thereof"* as present in claim 1 of the main request would necessarily refer to the previous definition of the channel in the same claim as being *"precisely orientated between adjacent laminae"*.

On the basis of such interpretation Appellant II submitted that:

(a) the subject-matter of claim 1 according to the main request encompassed no added matter;

(b) the subject-matter of claim 1 according to any of the main request or the first auxiliary request was novel vis-à-vis the disclosure of documents (1) or (19), *inter alia*, because these citations would not disclose a *"discontinuous channel"* in the sense of the invention

and

(c) the person skilled in the art starting from any of documents (1) or (19) would need inventive ingenuity in order to arrive at the subject-matter of claim 1 according to these requests.

In particular, in respect of this latter point Appellant II submitted in essence that the CPM structures of the invention provided a previously undisclosed channel design that, although easy to be manufactured and very compact, achieved improved mixing. The credibility of the superior mixing achieved would be immediately evident to the skilled reader of the patent-in-suit due to the "vertical" changes of flow direction necessarily occurring at the points of connection between the separated segments of *"discontinuous channel"* and the channels aligned therewith on the abutting surface of the adjacent lamina, so as to form a "vertical" serpentine pathway.

Since such "vertical" design option for a serpentine pathway was not suggested in any of the available citations, an inventive step was necessary to arrive at the CPM structures of the invention.

At the oral proceedings before the Board, the Appellant conceded that its own interpretation of the term *"discontinuous channel…continuously aligned between adjacent laminae to form a continuous pathway"* as used in claim 1 of the main request and in claim 1 of the first auxiliary request, implied a minimum of just two "vertical" changes of flow direction, as, for instance, in case the *"discontinuous channel"* present on one of the two abutting lamina surfaces was only interrupted in one point and the channel in the other lamina surface (connecting the separated segments of the *"discontinuous channel"* at the point of interruption) was *"continuous"*.

As to the basis for the more precise definition of the discontinuous channel present in claim 1 of the second and third auxiliary requests, Appellant II referred to the original patent application as a whole and, in particular, to the implicit but self-evident correlation existing therein between the description at page 5, lines 33 to 35, and that at page 20, line 29 to page 21, line 15 in combination with figures 7 and 7A.

IX. Appellant I requested that the decision under appeal be set aside and the patent be revoked.

Appellant II requested that the decision under appeal be set aside and that the patent be maintained on the basis of the main request or, alternatively, the first

auxiliary request both filed during the oral proceedings before the Opposition Division, or that the decision under appeal be upheld and the patent be maintained as per the second auxiliary request also filed during the oral proceedings before the Opposition Division, or that the decision under appeal be set aside and the patent be maintained as per the third auxiliary request filed with letter of 17 April 2007.

The Opponent II requested that the appeal of Appellant II be rejected.

Reasons for the decision

Procedural issues

1. Admissibility of document (19)

At the oral proceedings before the Board, Appellant II has disputed for the first time the admissibility of, *inter alia*, document (19) filed with the reply of Appellant I to the grounds of appeal of Appellant II.

In the opinion of Appellant II this citation was late filed because it only aimed at refuting the patentability of the requests already considered by the First Instance.

The Board considers however that Appellant I only upon receiving the Appellant II's grounds of the appeal was actually informed of the arguments used by Appellant II for disputing the negative finding of the Opposition Division as to the patentability of the main and of the

first auxiliary request. Hence, document (19) appears promptly filed by Appellant I in reply to the grounds of the appeal of Appellant II almost three years before the hearing before the Board.

Hence, the Board considers that document (19) is not belated and that Appellant II has had enough time to study it and to comment thereupon. Accordingly, this citation is admitted into the proceedings.

Main request

2. Interpretation of claim 1

This claim (see above section III of the Facts and Submissions) defines a CPM structure characterized in that it comprises:

(a) a plurality of laminae joined together
(b) with at least one inlet port and at least one outlet port formed therein for the receipt and discharge of chemicals,
(c) said laminae comprising a material selected for compatibility with the chemical process,
(d) and at least one three-dimensionally tortuous channel
  d1) formed therethrough being precisely oriented between adjacent laminae for accommodating chemicals to be processed,
  d2) wherein said channel is connected to said inlet and outlet ports
  d3) and is continuous along laminae thereof
  d4) and is discontinuous along other laminae thereof,

d5) and said discontinuous channel is continuously aligned between adjacent laminae to form a continuous pathway therethrough,

d6) wherein said channel measures from about 10 to about 5000 micrometers in cross-section,

d7) and is configured to cooperate with means to perform at least one unit operation positioned to effect a desired control so that the chemicals are processed.

2.1 Appellant I and the Opponent II have argued that no technically sound meanings can be attributed to the concepts of *"continuous channel"* and *"discontinuous channel"* in the above-identified vaguely worded features d3 to d5, due to the fact that the patent-in-suit provides no definition or clarification thereof.

Appellant II has refuted this objection by referring to the conventional meanings of the terms *"continuous"* or *"discontinuous"* as given in dictionaries, as well as to column 13, lines 18 to 39, and figures 7 and 7A of the patent-in-suit (respectively corresponding to the description from page 20, line 20 to page 21, line 15 and to the figures with the same numbers of the patent application as originally filed and internationally published). In its opinion, the skilled reader of the patent-in-suit (or of the application as originally filed) as a whole would necessarily conclude that, in the context of the claimed invention, the three-dimensionally tortuous channel can only go either *"through"* the laminae or *"along"* the laminae, i.e. that the overall tortuous channel is made by a sequence of pathways formed in the laminae that are either

"vertical" (i.e. orthogonal to the surfaces of the laminae) or "horizontal" (i.e. in a general direction parallel to the plane of the lamina surfaces). Accordingly, for the skilled reader of the patent in suit as a whole the *"discontinuous channel continuously aligned along adjacent laminae"* can only refer to "horizontal" pathways located on the abutting surfaces of two adjacent laminae, whereby in (at least) one of these surfaces the "horizontal" pathway is *"discontinuous"*, i.e. interrupted, made of **separated** "horizontal" segments. The necessary continuity of flow of matter through such interrupted "horizontal" pathway is nevertheless possible because, as expressly indicated in feature d5, this latter pathway is *"continuously aligned"*, i.e. connected with another "horizontal" pathway on the abutting surface of the adjacent lamina.

2.2 Appellant I and Opponent II have considered such interpretation arbitrarily narrow.

The Board finds it certainly consistent with the whole disclosure of the patent-in-suit and, thus, certainly embraced by whatever reasonable interpretation that the skilled person could possibly make of the claim features d3 to d5 in view of the disclosure of the patent-in-suit as a whole.

However, during the discussion at the oral proceedings, it has become apparent to the Board that even if the wording of claim 1 of the main request would be narrowly interpreted by the skilled person as proposed by Appellant II, still its subject-matter would remain so broad to encompass CPM structures for which no

inventive step could be acknowledged for the reasons given here below at point 3.

Hence, it has turned out unnecessary for the Board to identify which, if any, other design options could be considered by the skilled person as reasonably embraced by the wording of features d3 to d5, or to reach a decision as to the finding in the decision under appeal that such claim contained added matter and, thus, violated Article 123(2) EPC and/or as to the novelty of the claimed subject-matter.

3. Inventive step (Article 56 EPC 1973): claim 1 of the main request

3.1 It is established jurisprudence of the Boards of Appeal that the reasonable starting point for assessing inventive step is normally a prior art document disclosing subject-matter conceived for the same purpose or aiming at the same objective as the claimed invention and having the most relevant technical features in common, i.e. requiring the minimum of structural modifications.

3.2 The Board notes that the patent-in-suit mentions the problem of mixing and/or homogenizing chemicals in modular microapparatuses, such as miniaturized chemical reactors or miniaturized mixer assembly (see from column 1, line 35 to column 2, line 45). Even though the sentence at column 2, lines 43 to 45, distinguish between, on the one side, individual operation units, and, on the other side, CPM structures, it is apparent (see *"at least one unit operation"* in claim 1 in combination with e.g. claims 7 and 15 of the main

request) that the CPM structure of the invention may as well be designed to perform just one processing operation, such as only *"mixing"*, or only *"heat exchanging"*, or only *"separating"*.

Therefore, the Board concludes that the relevant prior art is to be found in the technical field embracing any sort of modular apparatus previously used for carrying at least one processing or manufacturing operation on chemical products and which is also capable of promoting mixing and/or homogenization of the chemicals passing therethrough.

3.3 Appellant I and Opponent II have considered that the most relevant prior art in this technical field could be found in documents (1) or (19), both disclosing modular microapparatuses that are compact and easy to be manufactured and that comprise three-dimensionally tortuous channel(s).

The Board concurs with these Parties that both documents belong to the relevant technical field.

However, whereas document (1) does not expressly mention mixing units within the modular microapparatus disclosed therein, documents (19) refers repeatedly to mixing chambers (see in document (19) page 2, lines 45 to 47; page 4, lines 25 to 31; page 5, lines 28 to 30). Moreover, this latter discloses microapparatuses wherein the channel is more tortuous (see e.g. figure 14c).

Hence, the Board considers the microapparatus of document (19) comprising the very tortuous channel

disclosed of figure 14c as a suitable starting point for the assessment of inventive step.

3.4 The Board concurs with Appellant II that the subject-matter of claim 1 of the main request (**when interpreted as suggested by Appellant II**) differs from this prior art in two aspects:

(a) the selected channel cross-section size range of from 10 to 5000 micrometers,

and

(b) the presence of a *"discontinuous channel"* as defined by the above-identified features d4 and d5 of claim 1.

3.4.1 As to the distinguishing feature a), it is evident to the Board that, as correctly observed by Appellant I and Opponent II and undisputed by Appellant II, the patent-in-suit does not attribute any specific advantage to the selected broad size range for the channel cross-section.

3.4.2 As to the above-identified distinguishing feature b), Appellant II has submitted that the simple consideration of the specific structure of the *"discontinuous channel"* that is *"continuously aligned between adjacent laminae to form a continuous pathway"* would render evident to the skilled person that the claimed CPM structures produce changes of flow direction also in the "vertical" direction, i.e. perpendicularly to the lamina surfaces. Instead the modular microapparatuses of the prior art can at most

produce exclusively "horizontal" changes of flow direction within the lamina surface. The possibility of producing such "vertical" changes of flow direction would allow to achieve vis-à-vis the prior art a turbulent mixing with the additional advantages that the channels producing such "vertical" changes of flow direction would be more easy to be manufactured and would result in more compact structures.

However, the Board finds this reasoning not convincing for the following reasons.

Firstly, it appears convincing that, as argued by Appellant I and Opponent II and undisputed by Appellant II, the range given in feature d6 of the claim under consideration embraces channels with very little mixing efficacy, since at least in the claimed CPM structures wherein the channels are capillary (i.e. in the lower portion of the claimed channel cross-section range) no turbulence in the flowing chemicals, but only laminar flow, can be observed.

Secondly, as also conceded by Appellant II, claim 1 allows for the presence of a single lamina surface comprising a *"discontinuous channel"* continuously aligned with a single channel segment on the abutting surface of the adjacent lamina. It is apparent therefore, that the claimed CPM structures may as well produce just two of such "vertical" changes of flow direction.

Moreover, the patent-in-suit contains no direct or indirect indication as to a possible existence of differences between "vertical" changes of direction and

"horizontal" changes of direction in terms of their efficacy in mixing or homogenizing. Nor has the Appellant II alleged the existence of any such difference.

Additionally, as observed by Appellant I and Opponent II and undisputed by Appellant II, at the valid filing date of the patent-in-suit the technical field of modular microapparatuses was already well-established and a very large number of techniques were already at the disposal of the person skilled in the art for etching, or drilling, or moulding, etc. microscopic channels of any shape and form as needed.

Finally, claim 1 of the main request imposes no limitation as to the straight, sinuous, or even three-dimensionally varying shape of the "horizontal" segments that form the *"discontinuous channel"*.

Hence, already for these reasons, it is apparent to the Board that those embodiments of the subject-matter claimed that produce a certain number of changes of flow direction of which some (possibly just two) are "vertical", are neither manifestly more effective in promoting mixing, nor necessarily more compact, nor necessarily more easy to be formed than e.g. the microapparatus of document (19) producing a similar number of changes of flow direction (although only "horizontally") in the channel of figure 14c.

3.4.3 The Board concludes therefore that, contrary to the submissions of Appellant II, the simple consideration of the specific structure of the *"discontinuous channel"* of the invention is insufficient for rendering

credible the technical advantage vis-à-vis the prior art alleged by Appellant II. The Board concurs, therefore, with Appellant I and Opponent II that the sole technical problem credibly solved by the CPM structures of claim 1 of the main request is the provision of further modular microapparatuses capable of some mixing/ homogenization of the chemicals passing therethrough, i.e. the provision of an alternative to the prior art.

3.5 Under these circumstances the assessment of inventive step boils down to the question as to whether the person skilled in the art searching for alternative design options of the microapparatuses comprising the tortuous "horizontal" channel disclosed in figure 14c of document (19) would have considered obvious to set the channel cross-section dimension in the range comprised between 10 and 5000 micrometers (compare with the difference "a)" identified above at point 3.4) and to modify such continuous tortuous "horizontal" channel into a *"discontinuous channel"* that is *"continuously aligned along adjacent laminae to form a continuous pathway"* according to the interpretation of Appellant II of this wording (compare with the difference "b)" identified above at point 3.4).

3.5.1 It appears evident to the Board that the channels of the microapparatuses of document (19), although possibly measuring e.g. 9 micrometers or less in cross-section, are also certainly meant to be possibly sized in accordance with the micrometers range of feature d6 of the claim under consideration. This is implied by the fact that the plate-like components of the modular microapparatuses disclosed in this citation are

described to form transport paths of only 5 mm, whereby the thickness of the plate-like elements may be 2 to 20 mm or about 5 cm (see document (19) page 3, lines 32 to 36).

Hence, the selection of channel cross-section falling in the range of 10 to 5000 micrometers only represents an arbitrary choice among the equally obvious alternatives for realizing embodiments of the prior art. Such an arbitrary choice is manifestly deprived of inventive merits.

3.5.2 As to the modification of the tortuous "horizontal" channel of figure 14c of document (19) required to obtain a channel complying with the features d4 and d5 of claim 1 of the main request (as interpreted by Appellant II), the Board finds that such modification is rendered obvious already by the combination of the disclosure of document (19) with that of document (1). Indeed, this latter citation discloses explicitly the possibility of **dividing asymmetrically** the channel structure along the abutting surfaces of two adjacent laminae (see in document (1) page 2, lines 31 to 34). It is apparent that such teaching embraces also the possibility of alternating entire segments of the channel along the abutting surfaces. Hence, this teaching renders obvious for a skilled person to modify the continuous "horizontal" channels laying along one of the two abutting surfaces of a pair of adjacent laminae in the prior art microapparatuses, *inter alia*, by locating whatever segment of that channel on the other abutting surface. It is apparent that such modification applied e.g. to one or more intermediate

segments of the "horizontal" channel of figure 14c of document (19) would produce a *"discontinuous channel"* as defined by the features d4 and d5 of claim 1 of the main request. Accordingly, the skilled person arrives at the claimed subject-matter by means of an arbitrary choice among the equally obvious alternatives for modifying the channel of figure 14c of document (19) according to the above-identified teaching of document (1). Hence, also the modification of the channel design of the prior art necessary for arriving to the claimed subject-matter results from an arbitrary choice deprived of inventive merits.

3.5.3 The Board concludes therefore that the subject-matter of claim 1 of the main request does not involve an inventive step and, thus, violates Article 56 EPC 1973.

3.5.4 For the sake of completeness, the Board considers it appropriate to stress that the above identified modification of the channel of figure 14c of document (19) that would have rendered that "horizontal" channel a *"discontinuous channel"* according to the features d4 and d5 of claim 1 under consideration, appears also self-evident to the skilled reader of this citation that takes also into account the common general knowledge in the field. Indeed, already the number of channel variations present in document (19), ranging from straight to tortuous "horizontal" channels, from "horizontal" channels on the upper lamina surfaces to "horizontal" channels in the lower lamina surfaces, from "horizontal" channels aligned with "vertical" passages of small diameters in an adjacent lamina to "horizontal" channels abutting on large mixing chambers, etc., is consistent with the argument of Appellant I

and of Opponent II that the modification of the prior art necessary for arriving at the *"discontinuous channel"* of the present invention, would be a design variation that, although not expressly disclosed in the prior art, would nevertheless represent a self-evident alternative design option in an technical field that was already well established at the valid filing date of the patent-in-suit.

First auxiliary request

4. Inventive step (Article 56 EPC 1973): claim 1 of the first auxiliary request

This claim differs only marginally from that of the main request (see above section III of the Facts and Submissions). Hence also the subject-matter of such claim lacks an inventive step vis-à-vis the disclosure in combination of documents (19) and (1) for the same reasons indicated above for claim 1 of the main request.

Second auxiliary request

5. Added subject-matter in claim 1 (Article 123(2) EPC).

5.1 In this claim the definition of the channel has been further restricted by requiring the presence of two *"discontinuous channels"*, one on each of the abutting surfaces of two adjacent laminae, and by introducing the wording: *"wherein said discontinuous channel along the first lamina comprises a first longitudinal series of straight segments, wherein said discontinuous channel along the second lamina comprises a second*

longitudinal series of straight segments, wherein the first and second longitudinal series of straight segments are positioned on abutting surfaces of the first and second adjacent laminae with the first longitudinal series of straight segments longitudinally offset with the second longitudinal series of straight segments, wherein the segments of the first longitudinal series alternate and intersect with the segments of the second longitudinal series, such that the first and second longitudinal series of straight segments are continuously aligned between the first and second adjacent laminae to form a continuous pathway therethrough" (see above section III of the Facts and Submissions).

5.2 Appellant II has submitted that the basis for such wording can be found in the original patent application as a whole and, in particular, in the implicit but self-evident correlation existing therein between the description at page 5, lines 33 to 35, and that at page 20, line 29 to page 21, line 15 in combination with the figures 7 and 7A.

However, the Board notes that according to the disclosure at page 5, lines 33 to 35, of the application as filed the *"discontinuous channels are continuously aligned between adjacent laminae to form a continuous pathway therethrough"*. Hence, the skilled person can only identify as representative of these *"discontinuous channels"* those channels present on the abutting surfaces of the two adjacent laminae 200 and 300 depicted in figures 7 and 7A that *"are continuously aligned between adjacent laminae to form a continuous pathway therethrough"*. In other words, the skilled

person that would, as suggested by Appellant II, consider self-evident the correlation between the description in the original description at page 5, lines 33 to 35, and that at page 20, line 29 to page 21, line 15 in combination with the figures 7 and 7A, would also necessarily conclude that the **whole group** of "horizontal" passages present on each of the two surfaces depicted in these figures, i.e. the whole *"array of mixer chambers and a distribution manifold"* described in the original specifications of the application starting from page 20, line 7, **contributes** to the formation of the *"continuous pathway"* through the laminae under consideration and, thus, **constitutes** the *"discontinuous channel"* on each lamina surface. Hence, the skilled reader of the original application would equate the *"discontinuous channel"* with the **whole array of mixers and manifold** formed between the laminae 200 and 300 of the cited figures. On the contrary, as correctly observed by Appellant I, nothing in the original application would suggests that the *"discontinuous channel"* could correspond **exclusively** to the portions of the pathways in these figures that are indicated as *"mixer array 60"* at line 33 of page 20 and depicted, among other channel portions, in figures 7 and 7A.

Already, for this reason the Board concludes that the subject-matter of claim of the second auxiliary request extends beyond the content of the application as originally filed and, thus, violates Article 123(2) EPC.

Third auxiliary request

6. Added subject-matter in claim 1 (Article 123(2) EPC).

This claim differs only marginally from that of the second auxiliary request (see above section VI of the Facts and Submissions). Hence also the subject-matter of such claim extends beyond the content of the application as originally filed for the same reasons indicated above for claim 1 of the second auxiliary request. Hence, also this request must be refused.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The patent is revoked.

The Registrar: The Chairman:

S. Sánchez Chiquero P.-P. Bracke