

**Internal distribution code:**

- (A) [ ] Publication in OJ  
(B) [ ] To Chairmen and Members  
(C) [X] To Chairmen  
(D) [ ] No distribution

**Datasheet for the decision  
of 5 April 2011**

**Case Number:** T 0238/08 - 3.3.05

**Application Number:** 03710781.0

**Publication Number:** 1474237

**IPC:** B01L 3/00

**Language of the proceedings:** EN

**Title of invention:**

Methods of making devices by stacking sheets and processes of conducting unit operations using such devices

**Patentee:**

BATTELLE MEMORIAL INSTITUTE

**Opponent:**

INSTITUT FÜR MIKROTECHNIK MAINZ GmbH

**Headword:**

Microdevice/BATTELLE

**Relevant legal provisions:**

EPC Art. 54, 56

**Keyword:**

"Novelty: (main request and first to fourth auxiliary request): no"

"Novelty: (fifth auxiliary request): yes"

"Inventive step (fifth auxiliary request): yes - technical solution not suggested by cited prior art"

**Decisions cited:**

G 0002/88, T 0840/93, T 1208/97, T 0932/99, T 1538/05

**Catchword:**

-



Case Number: T 0238/08 - 3.3.05

**D E C I S I O N**  
of the Technical Board of Appeal 3.3.05  
of 5 April 2011

**Appellant I:** INSTITUT FÜR MIKROTECHNIK  
(Opponent) MAINZ GMBH  
Carl-Zeiss-Strasse 18-20  
D-55129 Mainz (DE)

**Representative:** -

**Appellant II:** BATTELLE MEMORIAL INSTITUTE  
(Patent Proprietor) 505 King Avenue  
Columbus, OH 43201-2693 (US)

**Representative:** Zeuner Summerer Stütz  
Nußbaumstrasse 8  
D-80336 München (DE)

**Decision under appeal:** Interlocutory decision of the Opposition  
Division of the European Patent Office posted  
30 November 2007 concerning maintenance of  
European patent No. 1474237 in amended form.

**Composition of the Board:**

**Chairman:** G. Raths  
**Members:** J.-M. Schwaller  
D. Prietzel-Funk

## Summary of Facts and Submissions

I. The appeal lies from the decision of the opposition division concerning maintenance of European patent No. 1 474 237 in amended form on the basis of the third auxiliary request filed during the oral proceedings of 22 October 2007, independent claim 1 of which read as follows:

*"1. A process of making a microdevice for conducting unit operations on a fluid comprising:*

- stacking a plurality of shims, each shim having an aperture such that a continuous flow path is formed through the shims;*
- wherein the flow path extends in a direction substantially parallel to shim thickness;*
- wherein the plurality of shims comprises at least three shims through which the flow path is formed and wherein a straight, unobstructed line is present through the flow path in said at least three shims;*
- wherein the plurality of shims are configured such that a unit operation can be performed on a fluid in the flow path; and*
- bonding the shims to form a device capable of performing a unit operation on a fluid;*

*the device as a laminated device comprising a first set of microchannels wherein each microchannel has an inlet and an outlet, a header connected to the inlets of the first set of microchannels;*

*a footer connected to the outlets of the first set of microchannels; and*

*comprising a header or footer structure, wherein*

*the header has a surface that curves toward at least a portion of the inlets of the first set of microchannels, or*  
*the footer has a surface that curves toward at least a portion of the outlets of the first set of microchannels, or*  
*the footer comprises a roof, located on a side of the footer opposite the side that is connected to the outlets of the first set of microchannels, and the roof is sloped relative to the outlets of the first set of microchannels."*

II. In the contested decision the opposition division concluded that the above claim met the requirements of the EPC in view of the cited prior art, which included the following documents:

D1: DE 19 927 556 A1,

D10: EP 1 123 734 A,

D16: WO 01/35043 A1.

In particular, the opposition division held the subject-matter of the above claim 1 inventive, starting from D16 - considered as representing the closest state of the art - which disclosed a process for making a device by bonding together a stacked assembly of shims or plates with apertures forming a straight flow path in a direction parallel to the shim thickness (page 6, 2<sup>nd</sup> paragraph; Figure 1). Unit operations like packed bed catalytic reactions could be performed within this structure (D16, page 1, lines 13-14). Moreover the dimensions of the apertures in the plates (D16, page 6,

3<sup>rd</sup> paragraph) were of the same order of magnitude as the dimensions of the apertures in granted claim 8 of the opposed patent, hence the device of D16 could be regarded as a microdevice.

D16 did not disclose any one of the three alternative features defined in claim 1, and so claim 1 was novel over this document.

Any of these features solves the problem of a smoother and more uniform flow distribution at the inlet and outlet of the microdevice while reducing pressure drop and accumulation of vapour pockets.

As the cited documents neither addressed such a problem in the context of microdevices capable of carrying out unit operations, nor gave any indication of a microdevice with headers or footers as specified in claim 1 for solving such a problem, the above claim 1 could not be rendered obvious by the state of the art, and so it met the requirements of Article 56 EPC.

- III. Both the opponent and the patent proprietor lodged an appeal against the above decision.
  
- IV. In its statement of grounds of appeal dated 2 April 2008, the opponent (hereinafter "appellant I") raised objections under Article 100(a) and (b) EPC, alleging in particular a lack of inventive step over documents D1, D16 and/or D10. It also referred to decision T 1538/05 and argued that the subject-matter of claims 8 to 11 was insufficiently disclosed and so lacked the requirements of an industrial applicability under Article 57 EPC.

V. With its statement of grounds of appeal dated 3 April 2008, the patent proprietor (hereinafter "appellant II") submitted six sets of amended claims as a main request and as auxiliary requests 1 to 5, respectively.

The claims 10 of the main and of the first auxiliary requests and the claims 1 of the second and third auxiliary requests are identical with claim 1 as maintained by the opposition division.

Claim 1 of the 4<sup>th</sup> auxiliary request differs from claim 1 of the third auxiliary request by the additional feature that the microdevice further comprises *"a second set of microchannels that are adjacent to and in thermal contact with the first set of microchannels"*

The 5<sup>th</sup> auxiliary request comprises four independent claims:

- Independent claim 1 relates to process of making a microdevice according to claim 1 of the third request with the additional feature that the microdevice further comprises *"a flow path that is adjacent to either the header or the footer, wherein the flow path is separated from the header or the footer by a curved by a curved wall that has one surface facing the microchannels and one surface that faces the flow path"*;
- Independent claim 11 relates to a device formed by the process of any of claims 1 to 10;

- Independent claims 12 relates to a method of conducting a unit operation on a fluid, comprising a step of passing of fluid through the device of claim 11;
  
- Independent claim 13 relates to a method of conducting a unit operation on a fluid, comprising passing of fluid into the device of claim 11 such that the fluid passes through the flow path in said plurality of shims; and performing at least one unit operation on the fluid as it passes through the flow path in said plurality of shims.

VI. By letter dated 8 August 2008, appellant II declared that it did not agree to the introduction of the fresh ground for opposition based on Article 57 EPC. Further, it submitted a new set of amended claims as an auxiliary request 6.

VII. In a letter dated 10 October 2008 accompanied by a new document

D17: WO 00/34728 A1,

appellant I alleged lack of novelty of the main request over the content of documents D1, D16 or D17. It also alleged lack of inventive step of the auxiliary requests in the light of the disclosure of documents D16 or D17.

Appellant I held claims 2 and 3 of the main request as inadmissible in view of the jurisprudence established in T 0840/93 that special attention had to be given to

late-filed requests at the appeal stage when - alike the present case - divisional applications are pending.

- VIII. On 14 March 2011, the board informed the parties that the sets of claims submitted with the grounds of appeal appeared not to be admissible under Rule 80 EPC and under Rule 12(4) RPBA. The subject-matter of certain independent claims was further held to breach Article 123(2) EPC.
- IX. On 1 April 2011, Appellant II submitted by facsimile four sets of amended claims as a new main request and as new first, fourth and fifth auxiliary requests, respectively. The former fourth and fifth auxiliary requests dated 3 April 2008 were made second and third auxiliary request, respectively.
- X. At the oral proceedings, which were held on 5 April 2011, the issues of clarity, novelty and inventive step were extensively dealt with. Appellant I no longer pursued its objections under Article 57 and Article 100(b) EPC.
- XI. The parties' requests are established as follows:
- Appellant I/opponent requests that the decision under appeal be set aside and that the patent be revoked. Appellant II/patentee requests that the decision be set aside and that the patent be maintained on the basis of the claims filed as main request on 1 April 2011. Alternatively, it requests that the decision under appeal be set aside and that the patent be maintained on the basis of one of the sets of claims according to auxiliary requests 1 to 5, also dated 1 April 2011.



## Reasons for the Decision

### 1. *Admissibility of document D17*

D17 was submitted by Appellant I on 10 October 2008 in reaction to the filing by appellant II of diverse sets of amended claims including a multitude of new independent claims of the same category.

In the board's opinion, the content of D17 is highly relevant and appellant II had sufficient time to take the content of this document into consideration. In this context, there is no reason not to admit D17 into the appeal procedure.

### 2. *Main request - Novelty*

- 2.1 D17 (claims 1 and 2; Figures 1 to 3 - reproduced hereinafter) discloses a stacked assembly of plates, the stack having an inlet (12) and an outlet (14) for a first fluid and an inlet (24) and an outlet (34) for a second fluid, characterised in that a first portion of the length of the assembly is formed of first perforated plates (26), each first perforated plate being perforated to define a first series of slots (36) spaced across the plate and a second series of slots (46) spaced across the plate, each slot (36) of the first series being positioned between a pair of slots (46) of the second series, whereby the slots (36) define first passageways through the first portion of the length for a first fluid and the slots (46) define second passageways through the first portion of the length for a second fluid, the first series of passageways being connected to said inlet (12) and

outlet (14) for the first fluid, a second portion of the length of the assembly being formed of one or more second perforated plates (20,22), each second perforated plate being perforated to define a first (36A) and a second (46A) series of slots corresponding to the slots of the first plates so as to provide continuing passageways in line with the first and second passageways of the first portion, each slot (46A) of the second series opening at one of its two ends into a feeder slot (50) extending across the second plate and connected to the inlet (24) for the second fluid.

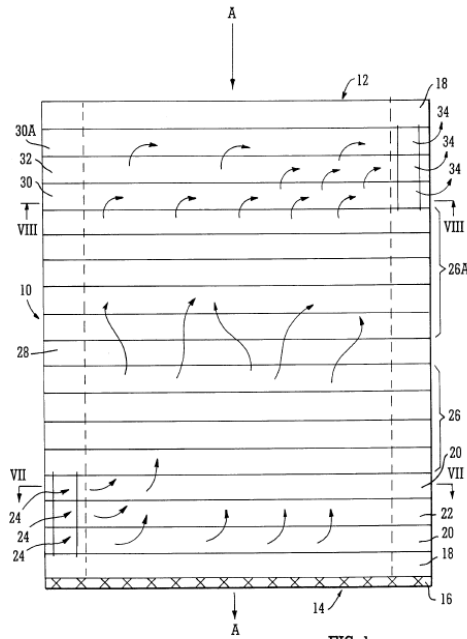


FIG. 1

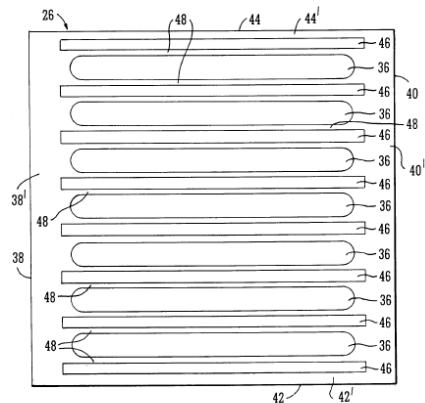


FIG. 2

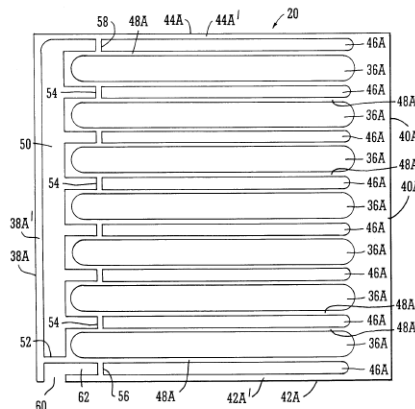


FIG. 3

2.2 Figure 1 shows that the number of plates through which the gas flow path is formed is higher than three and Figure 3 shows that the feeder slot (50) has a "surface that curves toward at least a portion of the inlets" of the passageways (46A), as required by claim 10 at issue.

2.3 Appellant II argued that the subject-matter of claim 10 was novel over document D17, because in the latter neither a microdevice nor microchannels having a diameter of 2 mm or less were disclosed.

D17 also did not disclose a header that "has a surface that curves toward at least a portion of the inlets" of microchannels, because in the header according to Figure 3 the flow path was horizontal, while in claim 10 at issue the flow path was vertical, both in the microchannels and in the header.

2.4 The board does not accept the above arguments for the following reasons:

First of all, it is to be noted that the terms "microdevice" and "microchannel" are very general and do not have a well-known recognised technical meaning in the field at issue, let alone as regards the dimensions that a microdevice or a microchannel should have.

On the one hand, it is true that the term "microchannel" is defined in the contested patent as having certain dimensions ("at least one dimension of 2 mm or less" (paragraph [0031]); "each tubular channel can have a cross-sectional diameter of preferably less

than 5 mm and more preferably less than 2 mm"  
(paragraph [0038])).

On the other hand, according to established jurisprudence (T 1208/97, point 4 of the reasons; T 0932/99, point 4.3.3 of the reasons), reading limitations derived from the description into claims in order to avoid objections based on novelty and inventive step is not acceptable. This would contravene the principle that the claims are crucial in fixing the boundaries of the protection, and for this reason, they must be clearly and unambiguously formulated in terms of the technical features of the invention (G 0002/88 OJ EPO 1990, 93) in order to ensure that there is a reasonable degree of legal security for third parties.

So, in the present situation, if a certain dimension of the microchannel or of the microdevice ought to be a novelty establishing feature, it should have been defined and included in the claim at issue. This not being the case, the board does not see any reason not to hold the device according to D17 as being a "microdevice" and the slots (36, 36A, 46, 46A) as being "microchannels" in the sense of claim 1 at issue.

As regards the flow path in the alleged invention, it can be seen in particular from Figure 6c (reproduced hereinafter)

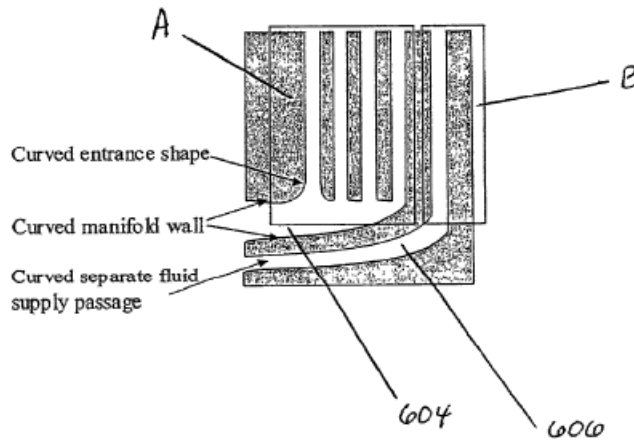


Fig. 6c

- contrary to what has been alleged by Appellant II - that the flow path is not necessarily vertical in the device, in particular the header, according to the alleged invention.

In the device according to D17, the feeder slot (50) - i.e. a header - illustrated in Figure 3 (see point 2.1 above) has a surface that curves toward the inlets of microchannels and so the device disclosed in D17 is clearly and unambiguously disclosed according to the wording of claim 10 at issue.

2.5 It follows from the above reasoning that the device according to D17 comprises all the features of claim 10 at issue. The subject-matter of claim 10 is not novel and hence does not meet the requirements of Article 54(1) and (2) EPC.

Since the main request is not allowable, there is no need to deal with T 840/93 cited by appellant I in respect of claims 2 and 3 of this request.

3. *First, second and third auxiliary requests - Novelty*

Claim 10 of the first auxiliary request and claim 1 of the second and third auxiliary requests being identical with claim 10 of the main request, the reasons for the latter apply mutatis mutandis to these claims, which are therefore also not novel under Article 54(1) and (2) EPC.

4. *Fourth auxiliary request - Novelty*

4.1 The subject-matter of claim 1 of this request differs from that of the preceding request in that the laminated device further comprises "*a second set of microchannels that are adjacent to and in thermal contact with the first set of microchannels*".

4.2 These additional features however are also disclosed in the device according to D17, the latter being described (claim 25; page 1, first two lines) as being suitable for use as a heat exchanger. As a consequence, the passageways defined by the second series of slots (46,46A) are inevitably in thermal contact with the first passageways defined by the first series of slots (36, 36A), and so the device according to document D17 anticipates the subject-matter of claim 1 of this request under Article 54 (1) and (2) EPC.

5. *Fifth auxiliary request*

5.1 *Amendments*

The amendments to the claims of this request are of a restricting nature and find a basis in the application

as filed. In particular, amended claim 1 is based on claims 1, 16, 18 and 21 as originally filed. This issue not having been contested by appellant I, the board does not see in this context any reason for calling into question the allowability of the amended claims under Articles 123(2) and (3) EPC.

## 5.2 *Sufficiency of disclosure*

This issue has no longer been contested by appellant I, and the board is satisfied that the patent specification provides the skilled person with sufficient and detailed information to allow him to perform the claimed subject-matter. Hence, there is no need to deal with T 1538/05 cited by appellant I. The requirements of Article 83 EPC are therefore fulfilled.

## 5.3 *Clarity*

Having been questioned by the board at the oral proceedings as to the meaning of the features inserted into claim 1, Appellant II explained that the subject-matter according to this request was illustrated by the device according to Figure 6c of the contested patent (also reproduced in item 2.4 hereinabove). This issue not having been contested by appellant I, the board does not see in this context any reason for calling into question the clarity of the amended claims under Article 84 EPC.

## 6. *Novelty*

6.1 Appellant I argued that the subject-matter of independent claims 1 and 11 of this request would be

anticipated by each one of the devices illustrated in Figures 20 and 22 of D17 (reproduced hereinafter).

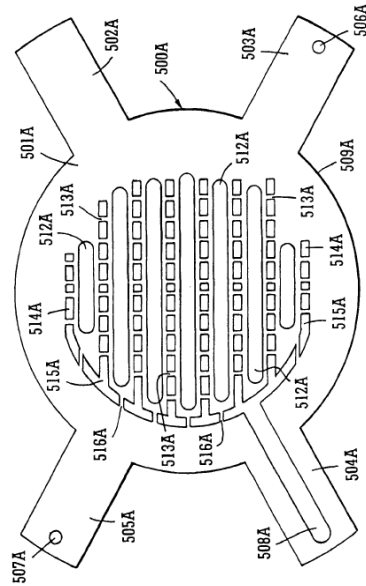


FIG. 20

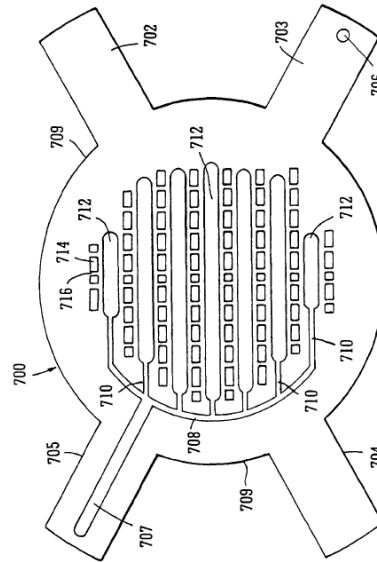


FIG. 22

The board observes that the devices illustrated above both have a first set of microchannels (514A in Figure 20; 712 in Figure 22) defining a first flow path, with the inlets of the first microchannels being connected to a header (508A in Figure 20; 707 in Figure 22) and the header having a surface (515A in Figure 20; 708 in Figure 22) that curves toward the inlets of said first microchannels.

It is correct that the above devices each comprise a second set of microchannels (512A in Figure 20; 714 in Figure 22) defining a further flow path "adjacent to the header".

However, as can be seen in the above figures, this flow path "adjacent to the header" is **not** - as in claim 1 at issue - separated from the header (508A in Figure 20; 707 in Figure 22) by a "curved wall that has one surface facing the microchannels" (514A in Figure 20;



712 in Figure 22) and "one surface that faces the flow path" - i.e. the flow path defined by the second set of microchannels (512A in Figure 20; 714 in Figure 22).

Hence, the subject-matter of claim 1 of this request is novel over the disclosure of document D17.

6.2 The board is further satisfied that none of the other documents cited in the appeal and opposition procedures discloses in combination all the features of claim 1 at issue. This issue is uncontested.

6.3 Independent claims 11, 12 and 13 relating, respectively, to a device formed by the process according to claim 1, and to methods of conducting a unit operation on a fluid comprising passing a fluid into the device of claim 11, and claims 2 to 9 depending on claim 1 and claims 14 to 26 depending on claims 12 or 13, each subject-matter of these claims is also novel.

6.4 In view of the above reasons, claims 1 to 26 of this request meet the requirements of Article 54(1) and (2) EPC.

## 7. *Inventive step*

7.1 Appellant I declared at the oral proceedings that it had no objection under Article 56 EPC to the patent in its amended version according to the request at issue.

7.2 The board is satisfied that each subject-matter of amended claims 1 to 26 is not obvious for a person skilled in the art for the following reasons:

- 7.2.1 The contested patent in its amended version relates to a method of manufacturing microdevices, to the microdevices thus manufactured as well as to methods of conducting unit operations on fluids in such microdevices.
- 7.2.2 For the board, the closest prior art is represented by document D17 discussed above (see point 2.1), since this document discloses a similar method of making (micro)devices by stacking sheets.
- 7.2.3 Starting from this closest state of the art, the technical problem can be seen - as stated by appellant II - in providing a process for making a microdevice having flexibility so as to separately supply fluids to different channels with different flow rates (see also column 13, lines 11 to 16 of the contested patent).
- 7.2.4 As a solution to this technical problem the patent in its amended version proposes the process for making a microdevice according to claim 1, characterised in that the microdevice comprises a flow path that is adjacent to either the header or the footer, with the flow path being separated from the header or the footer by a curved wall that has one surface facing the microchannels and one surface that faces the flow path.
- 7.2.5 The board is satisfied that the problem is solved by the claimed process and microdevice.
- 7.2.6 It remains to be decided whether the proposed solution is obvious in view of the state of the art.

Neither document D17, nor the other documents on file disclose the features proposed as a solution to the above problem.

So, the skilled person starting from the process for manufacturing the device disclosed in D17 and faced with the problem defined under point 7.2.3 would not arrive in an obvious manner at the subject-matter of claim 1 at issue.

- 7.3 In view of the above findings, the board concludes that the subject-matter of claim 1 and, consequently, of claims 2 to 9 dependent thereon, involve an inventive step within the meaning of Article 56 EPC.

The further claims relating to a device (claim 11) made by the process according to claim 1 and to methods of conducting a unit operation on a fluid (claims 12 to 26) comprising passing a fluid into the device of claim 11, by the same token, their subject-matter also involves an inventive step within the meaning of Article 56 EPC.

**Order**

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

1. The decision under appeal is set aside.
  
2. The case is remitted to the department of first instance with the order to maintain the patent in amended form on the basis of claims 1 to 26 according to the fifth auxiliary request filed under cover of a letter dated 1 April 2011, the figures as originally filed and a description to be adapted.

The Registrar:

The Chairman:

C. Vodz

G. Rath