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**Datasheet for the decision
of 13 November 2013**

Case Number: T 1695/10 - 3.3.06

Application Number: 96926288.0

Publication Number: 846023

IPC: B01D63/02

Language of the proceedings: EN

Title of invention:

Vertical skein of hollow fiber membranes and method of
maintaining clean fiber surfaces

Patent Proprietor:

Zenon Technology Partnership

Opponent:

MEMCOR AUSTRALIA PTY LTD.

Headword:

Skein/ZENON

Relevant legal provisions:

EPC Art. 52(1), 54, 56, 84, 114(2), 123(2), 123(3)
RPBA Art. 12(4), 13

Keyword:

Admissibility of new claim requests (no) - subsidiary requests 4 and 5

Amendments - allowable (no) - subsidiary requests 1 and 2

Novelty - (yes)

Inventive step -

(no) - obvious solution - main request and subsidiary request

3 - (yes) - non-obvious improvement - subsidiary request 6

Decisions cited:

T 0824/05

Catchword:



**Beschwerdekammern
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Chambres de recours**

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Case Number: T 1695/10 - 3.3.06

**D E C I S I O N
of Technical Board of Appeal 3.3.06
of 13 November 2013**

Appellant:
(Patent Proprietor)

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Decision under appeal:

**Decision of the Opposition Division of the
European Patent Office posted on 7 June 2010
revoking European patent No. 846023 pursuant to
Article 101(3) (b) EPC.**

Composition of the Board:

Chairman: B. Czech
Members: G. Santavicca
U. Lokys

Summary of Facts and Submissions

- I. The appeal lies from the decision of the Opposition Division revoking European patent N° 0 846 023, posted on 7 June 2010.
- II. The original grounds of opposition were lack of novelty and inventive step (Article 100(a) EPC 1973), insufficiency of the disclosure (Article 100(b) EPC 1973) and added subject-matter (Article 100(c) EPC 1973). The prior art relied upon included:
D1: US 4 786 006;
D2: JP 63 143 905 A (English abstract and translation);
D3: US 5 248 424 A, and
D8: WO 93/02779 A1.
- III. In earlier Decision T 1404/05 of 24 May 2007, handed down in the prosecution of the present case, the claims of the then pending Subsidiary Request (filed during the oral proceedings held on 24 May 2007) were found to overcome the grounds of opposition under Article 100, paragraphs (b) and (c), EPC 1973, and to also comply with Article 123, paragraphs (2) and (3), EPC 1973 as well as with Rule 57a EPC 1973. The case was remitted to the opposition division for further prosecution on the basis the claims according to said Subsidiary Request.
- IV. Claim 1 according to this request reads as follows:
*"1. A microfiltration membrane device, for withdrawing permeate essentially continuously from a multicomponent liquid substrate, said membrane device including:
- a multiplicity of hollow fiber membranes, or fibers, unconfined in a shell of a module, said fibers being swayable in said substrate, said fibers being subjectible in use to a transmembrane pressure*

differential in the range from about 0.7 kPa (0.1 psi) to about 345 kPa (50 psi);

- a first header and a second header disposed in vertically spaced-apart relationship with said second header within said substrate with opposed faces at a fixed distance;*
- said first header and said second header having opposed terminal end portions of each fiber sealingly secured therein with potting resin, all open ends of said fibers open to a permeate-discharging face of at least one header;*
- permeate collection means to collect said permeate, sealingly connected in open fluid communication with a permeate-discharging face of at least one of said headers; and,*
- means to withdraw said permeate;*
- said fibers, said headers and said permeate collection means together forming a vertical skein wherein said fibers are essentially vertically disposed;*
- each of said fibers having substantially the same length between said opposed faces of the headers, said length being from 0.1% to less than 5% greater than said fixed distance so as to permit restricted displacement of an intermediate portion of each fiber, independently of the movement of another fiber; wherein said fibers of each said header are spaced apart to a desired lateral spacing between fibers by said potting resin which extends over only each terminal portion of said fibers near their ends, so as to maintain said ends in closely spaced apart relationship."*

V. As regards said request (main request before the opposition division), the only grounds dealt with in the decision under appeal were those under Article

100(a) EPC 1973, namely lack of novelty and inventive step. According to the decision under appeal, the patent was revoked because:

- a) The subject-matter of Claim 1 of the main request then on file, although novel over D1, lacked novelty over D2.
- b) As regards the subsidiary requests submitted before the opposition division, it was held that their claimed subject-matter:
 - i) lacked clarity (Article 84 EPC 1973) and/or did not comply with Article 123(2) EPC;
or
 - ii) did not involve an inventive step (Article 56 EPC 1973) over D2 (closest prior art) in combination with D3 (*inter alia* subsidiary request AR2bis4).

- VI. With its statement setting out the grounds of appeal, the appellant (patent proprietor) submitted new documents, numbered D11 to D18 by the Board. Among them, only the following two documents, acknowledged in the patent in suit and in D3, are of relevance here:
- D13: Yamamoto et al, *Direct Solid-Liquid Separation Using Hollow Fiber Membrane in an Activated Sludge Aeration Tank*, Wat. Sci. Tech, Vol.21, Brighton 1989, pages 43-54; and,
- D14: Chiemchaisri et al, *Organic Stabilization and Nitrogen Removal in Membrane Separation Bioreactor for Domestic Wastewater Treatment*, pre-print of a talk at the Conference in "Membrane Technology in Wastewater Management", held in Cape Town, South Africa, on 2-5 March, 1992.

Then, in its letter of 30 March 2011, the appellant enclosed the fifteen sets of claims making up its main request and subsidiary requests 1 to 14.

- VII. In its response to the statement setting out the grounds of appeal, the respondent (opponent) maintained the objections concerning lack of novelty over D1 and D2 as well as lack of inventive step having regard to the combinations D2-D3, D2-D8, and D8-D2. Moreover, the respondent raised objections under Article 123(2) EPC against claim 1 of subsidiary request 6.
- VIII. In response to a communication of the Board issued in preparation for the oral proceedings:
- a) the appellant (with its letter of 10 October 2013) submitted amended versions of subsidiary claim requests 1 to 5, 8 and 10; and,
 - b) the respondent (in its letter of 21 October 2013) *inter alia* maintained novelty objections having regard to D1 and D2, and inventive step objections also having regard to D3 as the closest prior art in combination with D2. It also raised formal objections against several auxiliary requests. As concerns subsidiary request 6, it only stated that the subject-matter of claim 1 thereof was not inventive for the reasons given in the decision under appeal.
- IX. Oral proceedings were held on 13 November 2013. The debate focussed on novelty and inventive step over D2 (main request and subsidiary request 3), allowability of the amendments (subsidiary requests 1 to 3), admissibility into the proceedings of subsidiary requests 4 and 5, and inventive step over D3 (subsidiary request 6).
- X. The appellant (patent proprietor) requested that the decision under appeal be set aside and the patent be maintained on the following basis:

The main request submitted with letter dated 30 March 2011 or, in the alternative, on the basis of one of the subsidiary requests 1 to 5 submitted with letter of 10 October 2013, or one of the subsidiary requests 6 and 7 submitted with letter dated 30 March 2011, or subsidiary request 8 submitted with letter dated 10 October 2013, or subsidiary request 9 submitted with letter dated 30 March 2011, or subsidiary request 10 submitted with letter dated 10 October 2013, or one of subsidiary requests 11 to 14 submitted with letter dated 30 March 2011.

- XI. The respondent requested that the appeal be dismissed.
- XII. The respective Claims 1 according to each of subsidiary requests 1 to 5 and Claims 1 to 3 according to subsidiary request 6 read as follows (amendments to Claim 1 according to the Main Request - point IV *supra* - being made apparent):

Subsidiary request 1

Compared to Claim 1 according to the Main Request (see IV *supra*), Claim 1 according to Subsidiary request 1 comprises additional features (highlighted by the Board) and reads as follows:

"... for withdrawing permeate essentially continuously from a multicomponent liquid substrate **in a reservoir open to the atmosphere** ... means to withdraw said permeate **connected to a source of suction** ...".

Subsidiary request 2

Compared to Claim 1 according to subsidiary request 1, Claim 1 according to subsidiary request 2 comprises the following amended phrase:

"... for withdrawing permeate essentially continuously from a multicomponent liquid substrate **at ambient pressure ...**".

Subsidiary request 3

Compared to Claim 1 according to subsidiary request 2, Claim 1 according to subsidiary request 3 comprises the following amended phrase:

"... means to withdraw said permeate **connected to a pump providing suction...**".

Subsidiary request 4

Claim 1 according to subsidiary request 4 differs from claim 1 according to the Main request by the appended features "**and, wherein every permeate-discharging face of the microfiltration membrane device is connected to a permeate collection means that is submersed in said substrate**".

Subsidiary request 5

Compared to Claim 1 according to subsidiary request 4, Claim 1 according to subsidiary request 5 comprises, like Claim 1 according to subsidiary request 3, the additional features "**at ambient pressure**" and "**connected to a pump providing suction**".

Subsidiary request 6

"1. **Use of** a microfiltration membrane device, for withdrawing permeate essentially continuously from a multicomponent liquid substrate, said membrane device including:

- a multiplicity of hollow fiber membranes, or fibers, unconfined in a shell of a module, said fibers being swayable in said substrate, said fibers being subjectible in use to a transmembrane pressure differential in the range from about 0.7 kPa (0.1 psi) to about 345 kPa (50 psi);
- a first header and a second header disposed in vertically spaced-apart relationship with said second header within said substrate with opposed faces at a fixed distance;
- said first header and said second header having opposed terminal end portions of each fiber sealingly secured therein with potting resin, all open ends of said fibers open to a permeate-discharging face of at least one header;
- permeate collection means to collect said permeate, sealingly connected in open fluid communication with a permeate-discharging face of at least one of said headers; and,
- means to withdraw said permeate;
- said fibers, said headers and said permeate collection means together forming a vertical skein wherein said fibers are essentially vertically disposed;
- each of said fibers having substantially the same length between said opposed faces of the headers, said length being from 0.1% to less than 5% greater than said fixed distance so as to permit restricted displacement of an intermediate portion of each

fiber, independently of the movement of another fiber;

wherein said fibers of each said header are spaced apart to a desired lateral spacing between fibers by said potting resin which extends over only each terminal portion of said fibers near their ends, so as to maintain said ends in closely spaced apart relationship,

the membrane device being combined with a gas distribution means that is associated with the vertical skein, the gas distribution means being connected to a source of pressurized gas and having though [sic] passages for discharging bubbles through or near the lower header such that during use bubbles contact the fibers as the bubbles rise through the substrate while filtering the substrate to withdraw permeate".

"2. Use of a gas-scrubbed assembly comprising, a microfiltration membrane device in combination with a gas-distribution means to minimize build-up of particulate deposits on the surfaces of hollow fiber membranes or fibers in said device, and to recover permeate from a multicomponent liquid substrate while leaving particulate matter therein, said membrane device comprising:

- a multiplicity of fibers, unconfined in a shell of a module, said fibers being swayable in said substrate, said fibers being subjectible to a transmembrane pressure differential in the range from about 0.7 kPa (0.1 psi) to about 345 kPa (50 psi);

- a first and second header disposed in vertically spaced-apart relationship within said substrate with opposed faces at fixed distance, each header being formed with a potting resin cured in a resin-confining means;

- said first header and second header having opposed terminal end portions of each fiber sealingly secured therein, all open ends of said fibers open to a permeate-discharging face of at least one header;
 - permeate collection means to collect said permeate through at least one of said headers sealingly connected in open fluid communication with a permeate discharging face of each of said headers;
 - means for withdrawing said permeate; and
 - said fibers, said headers and said permeate collection means together forming a skein wherein said fibers are essentially vertically disposed;
 - said gas distribution means is located within a zone beneath said skein, said gas-distribution means having through-passages therein adapted to have sufficient gas flowed therethrough to generate enough bubbles flowing in a column of rising bubbles between and around said skein fibers, to keep surfaces of the fibers awash in bubbles **while filtering the substrate to withdraw permeate;**
 - each of said fibers having substantially the same length between said opposed faces of the headers, said length being from at least 0.1% greater to less than 5% greater than said fixed distance so as to permit restricted displacement of an intermediate portion of each fiber, independently of the movement of another fiber;
- wherein:
- said first header is upper and disposed in vertically spaced-apart relationship above said second header at a fixed distance;

- said fibers of each said header are spaced apart to a desired lateral spacing between fibers by said potting resin which extends over only each terminal portion of said fibers near their ends, so as to maintain said ends in closely spaced-apart relationship; and
- said through-passages discharge in use a cleaning gas in an amount in the range of 0.47 - 14 cm³/sec per fiber in bubbles which rise vertically substantially parallel to, and in contact with said fibers, movement of which is restricted within said column;
- whereby said permeate is essentially continuously withdrawn while concentration of said particulate matter in said substrate is increased."

"3. A process for maintaining the outer surfaces of hollow fiber membranes essentially free from a build-up of deposits of particulate material while separating a permeate from a multicomponent liquid substrate in a reservoir, said process comprising:

- submerging skein fibers in essentially vertical configuration within said substrate said fibers being unconfined in a modular shell and securely held in vertically opposed, upper and lower headers spaced apart at a fixed distance, said fibers having substantially the same length between opposed faces of the headers and from at least 0.1 % greater, to about 5% greater than said fixed distance, said fibers being independently swayable in said substrate from side-to-side within a vertical zone of movement and having a transmembrane pressure differential in the range from about 0.7 kPa (0.1 psi) to about 345 kPa (50 psi);

- *flowing a fiber-cleansing gas through a gas-distribution means proximately disposed relative to said skein, within a zone beneath said skein, and contacting surfaces of said fibers with sufficient physical impact of bubbles of said gas to maintain essentially the entire length of each fiber in said skein awash with bubbles and essentially free from said build-up;*
- *maintaining an equilibrium flux initially obtained after commencing operation of said process;*
- *collecting said permeate in said collection means; and,*
- *withdrawing said permeate.*
- *introducing said cleansing gas in an amount in the range from 0.47–14 cm³/sec per fiber to generate a column of said bubbles alongside and in contact with outer surfaces of said fibers;*
- *restricting movement of said fibers to said vertical zone defined by lateral movement of outer fibers in said skein;*
- *said fibers' outside surfaces are vertically gas-scrubbed with bubbles which flow upward in contact with said surfaces; and,*
- *withdrawing said permeate simultaneously, essentially continuously, while increasing the concentration of said particulate material in said substrate."*

XIII. The appellant's arguments of relevance here can be summarised as follows:

Main request

Interpretation of the claims

- a) As established in several decisions of the Boards of appeal, before addressing novelty, it was necessary to interpret Claim 1, in particular to convey the meaning of the term "*vertical skein*" defined therein, as the decision under appeal did not give any weight to the feature thereof. According to Claim 1, as well as page 1, lines 9-16, of the application as filed, said vertical skein was made up of the defined fibres, headers and permeate collecting means. From several passages and embodiments described in the application as filed (e.g. Figure 12), it was apparent that upon operation said vertical skein had to be entirely submerged in a substrate open to the atmosphere, such that the level of the substrate in which the skein was submerged was well above the entire vertical skein, prior to operation. Thus, the skein always included headers, fibres and permeate collecting means to be submersed in operation.
- b) Questioned by the Board on the meaning of the feature "*unconfined in a shell of a module*", the appellant first answered that there was agreement with the decision under appeal on this issue (i.e. it was not contested that such a feature made no distinction over D2), then argued that Skirt 21 in Figure 5 of D2 was a confinement, finally argued that not Skirt 21 but Casing 1 in Fig 5 was such a confinement; in other words, that the high pressurised vessel of D2 was a module with a complete enclosure (shell), which could clearly not be open to the atmosphere. Instead, in the patent in suit, "*pressurised*" related to the (high) liquid head which was present in a reservoir open to the atmosphere, in which the

skein was submersed. The reasons why the claimed skeins were not confined in a shell were explained in D3.

Procedural aspects - Late filed evidence

- c) Documents D11 to D18 were filed in reaction to the decision under appeal, in order to illustrate existing prejudices and the knowledge of the person skilled in the art, which had not been taken into account. Since they were relevant in the assessment of inventive step, they should be admitted and considered.

Novelty

- d) Since the hollow fibres of the apparatus disclosed in D1 were taut to allow vibration, these fibres could not have the length specified in Claim 1, the subject-matter of which was consequently novel over D1.
- e) As regards D2, even though the claimed skein could contain further parts, it was nevertheless not connected to other parts as were the apparatuses of D1 and D2. In fact, Figure 5 of D2 showed a complete assembly, in which there was nothing resembling the claimed apparatus. The permeate collecting means according to D2 (Figure 5) were represented by Processing Chamber 1b, which was integrated with Reactor 1, and divided therefrom by Plate 3, so which could not be submersed in the reactor. The substrate never went to the level of Processing Chamber 1b of D2, i.e. neither the skein, if any, nor the upper collector were entirely submersed. Thus, D2 did not disclose any

entirely submersed skein which was an integrated assembly of header, fibres and collecting means as described in the patent in suit.

- f) Moreover, D2 did not disclose the spacing apart of the fibres in the headers. From a passage of D2 (Page 7, right at the bottom) mentioning 1000 pieces of hollow yarns, it was apparent that Figures 1 and 2 were schematic drawings, from which nothing could be inferred as regards the spacing of the fibres as potted. Said 1000 fibres could be totally compressed, i.e. in touching relationship, rather than spaced apart. So Figure 1 and 2 of D2 did not show any spacing, nor could any spacing unambiguously be derived therefrom. The argument that a closely spacing apart was common general knowledge was contested, despite the disclosure of D3. In fact, the issue was novelty, not inventive step. Thus, D2 did not directly and unambiguously disclose any close spacing of the ends of the fibres in the headers.

Inventive step

- g) The claimed apparatus dispensed with forming a module in which the fibres were confined, i.e. the vertical skein was a free-standing unit ready to be deployed in any kind of vessel, even not structured as a pond or stream. D3 disclosed a completely free-standing, frameless skein that could be deployed in any vessel. The apparatus according to D2 comprised a specialized pressure vessel, which was not simple and effective in large systems. Also, D2 did not address any fibre spacing in the potted section but was concerned with improving the gas backwashing. To attain this

object, D2 proposed the use of restrictedly swayable fibres. So D3, which addressed the same problem as the patent in suit, rather than D2, was the closest prior art document. As D3 dealt with particular embodiments, not common general knowledge, it could not obviously be combined with D2. Therefore, the claimed subject-matter was not obvious.

Subsidiary requests 1 and 2

Amendments

- h) The added feature "*connected to a source of suction*" had a basis in the application as originally filed, which mentioned a preference for pumps but also mentioned other sources of suction such as a siphoning effect. The skilled person was acquainted with sources of suction, and thus had no problem to understand the feature "*means to withdraw said permeate connected to a source of suction*". Hence, the amendment consisting in the incorporation of said feature into claim 1 did not contravene the requirements of Article 123(2) EPC.

Subsidiary request 3

Amendments

- i) Claim 1 of subsidiary request 3 contained the more specific feature "*connected to a pump providing suction*", which was clearly based on the application as filed. Hence, the objection under Article 123(2) EPC was overcome.

Inventive step

- j) If D2 were nevertheless considered as the closest prior art document, the arguments submitted for the main request applied *mutatis mutandis* to Claim 1 of subsidiary request 3. The apparatus of D2 was not suitable for withdrawing permeate at ambient pressure, which required a pump. Also, there was no reason to provide a vacuum pump to Line 20 of the apparatus of D2, and this possibility was not disclosed by D2. Thus, neither the suitability for withdrawing permeate from a liquid at ambient pressure nor the possibility of providing a suction pump therefor were part of the disclosure of D2. D3 would not be combined with D2. The claimed apparatus was not obvious.

Subsidiary requests 4 and 5

Amendments

- k) Claim 1 of each of subsidiary requests 4 and 5 contained the appended further features "*wherein every permeate-discharging face of the microfiltration membrane device is connected to a permeate collection means that is submersed in said substrate*". These features further distinguished the claimed subject-matter from the apparatus of Figure 5 of D2, which could not operate under water, i.e. in a "submersed" mode. The late submission of these claim requests presented for the first time was to be seen in relation to the expected difficulty of the oral proceedings.

Subsidiary request 6

Amendments

- 1) Subsidiary request 6 corresponded to subsidiary request AR2bis4 dealt with in the decision under appeal, where it was held to comply with Articles 84 EPC and 123(2) EPC.

Inventive step

- m) As also apparent from the documents submitted to show the relevant knowledge of the skilled person at the filing date of the patent in suit, D3 rather than D2 disclosed the closest prior art. D3 addressed the same problem as the patent in suit, namely to improve the use taught by D3 in order to obtain a more effective cleaning, thus a high flux maintained over longer periods, while the fibres were gas-scrubbed. The solution provided was in particular characterised by the use of an apparatus, the fibres of which were vertically oriented and swayable between the vertically oriented headers, due to the excess length of the fibres with respect to the distance between the headers. This solution was not obvious, as both the prior art of Yamamoto (D13), acknowledged in D3, and D3 itself taught away from vertically oriented fibres with restricted swayability. Nothing in D3 suggested to abandon the arcuate configuration for the fibres. D3, to improve the flux, required a pump. D2 was not combinable with D3, as it aimed at increasing the backwash efficiency, by bubbling gas, not the flux. Also, there were many further structural and functional differences between D2 and D3, so that they were

mutually not combinable. Hence, the claimed use involved an inventive step.

XIV. The respondent's arguments of relevance here can be summarised as follows:

Main request

Interpretation of the claims

- a) The wording of Claim 1 was clear as regards the definition of the "vertical skein", so there was no need for adopting a more limiting interpretation of this expression. What had been stated by the appellant was not what was claimed. The skein was not a mechanically-integrated vertical assembly of 3 elements (fibres/headers/collection means), as Claim 1 did not define any mechanical integration, let alone a free-standing skein. This was apparent from Figure 10 of the patent in suit, in which, without a wall of the container of the substrate, there was no mechanical integration, nor free-standing skein. Thus, the mentioned parts had only to be functionally integrated or linked in the skein. Also, any device capable to collect permeate was a permeate collection means. Since the invoked feature "submersed" was not defined in Claim 1, it could not be a feature distinguishing the claimed subject-matter from the prior art.

- b) As concerns the feature "unconfined in a shell of a module", the application as filed did not disclose what it meant. Furthermore, the use of the claimed skein in pressure vessels was not excluded but explicitly acknowledged in the patent

in suit (page 5, line 46, was referred to). Also, still in the patent in suit, the term "confined" (e.g. page 3, line 27 to 28) was used to define the zone in which the fibres freely swayed. Skirt 21 of D2 was not a vessel, let alone of a module. D2 did not claim a module in a vessel. Since the meaning of the feature "unconfined in a shell of a module" was not clear enough, it could not distinguish the claimed apparatus from the apparatus according to D2.

Procedural aspects - late filed evidence

- c) There were no objections against the admission of D13 and D14, as both were acknowledged in the patent in suit, D13 also being dealt with in the decision under appeal. However, D11, D12 and D15 to D18 should not be admitted in view of their late filing and of their non-relevance.

Novelty

- d) A skein as defined in Claim 1 of the patent in suit was disclosed in Figure 5 of D2. The skein was made up of the following parts: Fibres 2, Support Member 4, Bonding Sections 6, Bundle Securing Means 7, Connecting Tube 8, space under the fibres shown in Figure 2, which was connected to Connecting Tube 8.
- e) As to the second alleged distinction, namely the spacing among the fibres in the potting sections, D2 taught (page 4, third paragraph, was referred to) that the substrate could not reach the interior of too densely packed fibres. Thus, the skilled person would pack the fibres so that the

substrate could reach the interior surfaces of the fibres. This was also apparent from Figures 1 and 2 of D2, in which, contrary to the arguments of the appellant, the fibres, represented by single lines, were shown to be spaced-apart (which spacing apart made visible the shown bubbles). The ratio between diameter of the fibres and their length derivable from those figures confirmed this interpretation. Hence, spaced-apart fibres, as represented by lines, were unambiguously disclosed in D2. It was apparent from D3 (column 3, lines 13-18) that this was also common general knowledge.

Inventive step

- f) If the feature "*closely spaced apart*" were acknowledged as a difference over the apparatus of D2, the claimed subject-matter would be obvious. D2, which addressed the problem of avoiding densely packed fibres, was the closest prior art. The problem to be solved was how to bundle the hollow fibre membranes of D2 in the potting sections. D3 disclosed a way of closely spacing apart the membranes, as in the patent in suit. As the "*closely spaced apart*" feature was a known potting option, it was readily available to the skilled person starting from D2 and aiming at providing a further hollow fibre membrane filter apparatus. Thus, the claimed apparatus was obvious.

Subsidiary requests 1 and 2

Amendments

- g) The added feature "*connected to a source of suction*", in Claim 1 according to subsidiary requests 1 and 2, was not clear (Article 84 EPC). In particular, it was not clear what part of the apparatus should be connected to what source of suction, nor whether the source of suction was part of the apparatus. The alleged use of a siphoning effect raised further questions concerning *inter alia* the mechanical parts, if any, actually disclosed (pump and/or siphon pipe). Since the application as originally filed only disclosed a pump as a source of suction, the amendment added subject-matter contrary to Article 123(2) EPC.

Subsidiary request 3

Amendments

- h) Having regard to the new feature "*connected to a pump providing suction*", it was still not clear whether such a pump was part of the claimed apparatus, nor how it was connected.

Inventive step

- i) The arguments submitted against the main request applied *mutatis mutandis*. Since the apparatus of D2 too was suitable for withdrawing permeate at ambient pressure, and since a source of suction was a known means of known filtration devices, as shown e.g. in D3, the claimed subject-matter still lacked an inventive step over D2.

Subsidiary requests 4 und 5

Amendments

- j) The addition of the features defining permeate-discharging faces connected to permeate collection means that is "*submersed*" in the substrate was an amendment that had not been not filed during the opposition proceedings, thus not dealt with in the decision under appeal. Hence, these amendments presented a fresh case raising further questions under Articles 123 and/or 84 EPC, not dealt with before and which could not be dealt with during the oral proceedings, for instance questions concerning the basis for the amendments and/or their clarity (e.g. what parts of the apparatus were submersed). Therefore, subsidiary requests 4 and 5 should not be admitted, otherwise remittal should be considered.

Subsidiary request 6

Amendments

- k) As initially submitted in writing, the features of Claim 1 "*associated with*", "*through or near the lower header*" and "*during use bubbles contact the fibres*", in combination with the remaining features, introduced new matter, for which the parts of the application as filed (page 14, line 16, to page 15, line 11) invoked by the appellant during the opposition proceedings did not represent a sufficient basis. For instance, the invoked description mentioned only a profusion of ascending bubbles in a column "*above and in close proximity to upper face of the lower header*". Moreover, further limitations described in the invoked description parts and concerning e.g the

kind of substrate, the number of fibres, the vertically adjustable spacer means had been omitted in Claim 1. Thus, amended Claim 1 contravened the requirements of Article 123(2) EPC.

Inventive step

- 1) The claimed use lacked an inventive step over D3, considered as the closest prior art, in combination with D2, as well as over D2, considered as the closest prior art, in combination with D3, for the reasons given in the decision under appeal (subsidiary request 6 corresponded to subsidiary request AR2bis4).

Reasons for the Decision

1. The appeal is admissible.

Procedural aspects - late-filed evidence

2. Documents D11 to D18 were filed for the first time with the statement setting out the grounds and were thus, apart from D13, not dealt with in the decision under appeal.
 - 2.1 The justification offered for the late filing was that the decision under appeal allegedly did not take into account existing prejudices and knowledge of the skilled person at the affective filing date of the patent in suit.
 - 2.2 The admissibility of D13, which, albeit not filed, was dealt with in the decision under appeal, is not in dispute. It is also not in dispute that D14, which is,

as D13, acknowledged in the patent in suit and in D3 as well, constitutes the background art acknowledged in the closest prior art document D3 (*infra*), and is of *prima facie* relevance for e.g. the assessment of inventive step. The respondent expressly consented with the admission and consideration of late-filed documents D13 and D14 by the board pursuant to Article 114(2) EPC and Articles 12(4) and 13(1)(3) RPBA).

- 2.3 However, the respondent disputed in writing the admissibility of documents D11, D12 and D15 to D18 in view of their late filing. Since, however, these documents did not *prima facie* appear to have a potential bearing on the questions and considerations debated at the oral proceedings, no need arose to decide on their admissibility.

Main request

Claim 1 - Meaning of the terms used

3. The parties did not agree as regards the meaning to be given to some of the features contained in claim 1, in particular the features "*vertical skein*" and "*unconfined in a shell of a module*".

3.1 Vertical skein

- 3.1.1 It has to be decided whether Claim 1 requires, in particular having regard to the definition of the skein, an interpretation as regards its structure and function.

- 3.1.2 The Board observes that Claim 1 at issue concerns an apparatus, a physical entity, and not its use.

3.1.3 According to Claim 1 (see the features: "*said fibers being swayable in said substrate*", "*with said second header within said substrate*" and "*said fibers, said headers and said permeate collection means together forming a vertical skein*"), the swayable fibres and the second header are, in use, "*within said substrate*". Claim 1 does not, however, define what length ("*intermediate portion*") of the swayable fibres is, in use, within the substrate, let alone that also the first header and/or the permeate collection means are, in use, within the substrate.

3.1.4 Hence, for the Board, Claim 1 does not define a submersible, let alone an entirely submersed, vertical skein.

3.1.5 The wording of Claim 1 defining the "*vertical skein*" is clear, i.e. no need arises for a restricting interpretation of this feature in the light of the description. The Board acknowledges that the application as filed discloses embodiments, such as that of Figure 12, in which the whole skein (i.e. including the permeate collection means) is submersed within the substrate. However, Claim 1 is not restricted to this particular embodiment of the patent in suit in use.

As established e.g. in previous decision T 1404/05 (*supra*), if a proprietor wishes to argue for a narrow scope of the claim, this should be on the basis of the wording of the claim, and not on the basis of something appearing only in the description, as the proprietor has the possibility, subject to meeting the requirements of e.g. Article 123(2) EPC, of restricting the wording of the claim to reflect the meaning he is contending.

3.2 Unconfined shell of a module

3.2.1 Until the oral proceedings before the Board, no need for interpretation of the feature "*unconfined shell of a module*" arose in the appeal proceedings, since not even the appellant appeared to consider it as distinguishing the claimed subject-matter from the apparatus of D2.

3.2.2 During the oral proceedings before the Board , the appellant made multiple attempts to give restricting definitions to this feature. For instance, the appellant considered that either Container 1 or protecting Tube 21 of Figure 5 of D2 could be considered as a "*shell of a module*" in the sense of claim 1 at issue. This course of action suggested that even for the appellant and patent proprietor the feature "*unconfined in a shell of a module*" appeared to be somewhat ambiguous or indeterminate in meaning.

3.2.3 Therefore, for the Board, this feature cannot impart any clear distinction over, for instance, the apparatus disclosed in D2.

Novelty - Claim 1

4. Novelty of the apparatus of Claim 1 was, during the oral proceedings before the Board, only challenged having regard to the disclosure of D2. D1 was only invoked in writing against the novelty of the claimed subject-matter of claim 1 according to the main request.

4.1 Novelty over D1

4.1.1 According to most relevant disclosure of D1 concerning the fibres (Figure 3; paragraph bridging columns 4 and 5), "*the injected air bubbles vibrate the fibres to facilitate the removal of the particles caked on the fibre surface*" and "*the bundles 1a are not tightly stretched between the upper and the lower bundle plates 2 and 3 so as to allow vibration to occur when subjected to air scrubbing*".

So D1 does not disclose the amplitude of the oscillation, if any, of its fibres, let alone that its fibres are from 0.1% to less than 5% longer than the distance of plates 2 and 3. Therefore, D1 does not directly and unambiguously disclose all the features of Claim 1 of the main request. The Board has no reason to deviate from the decision under appeal (page 6, point 4) in this respect.

4.2 Novelty over D2

4.2.1 D2 (Claim) concerns a "hollow yarn membrane filter in which multiple pieces of hollow yarn are bundled, the filling and securing with bonding agent being performed in such a way that both bundled ends open, a bundle securing member is installed and secured at the outer circumference of the bonding agent filling sections filled with the aforesaid bonding agent, and the aforesaid bonding agent filling sections at both ends are connected across a specified length; ... the length (L1) of the hollow yarn between the aforesaid two bonding agent filling sections is set so that there is a specified excess length (ΔL) with respect to the gap (L2) between the aforesaid two bonding agent filling sections, and this excess length (ΔL) satisfies the following conditions:
 $0.01 \leq (\Delta L/L1) \leq 0.04$

where

L1: The length of hollow yarn arranged between two bonded sections,

L2: The gap between the two bonding agent filling sections

ΔL : L1-L2."

4.2.2 The hollow yarn membrane filter of D2 is shown in Figures 1 and 2 of D2, wherein the reference signs respectively represent the following parts:

2: hollow yarn membrane filter,

2a: hollow yarn,

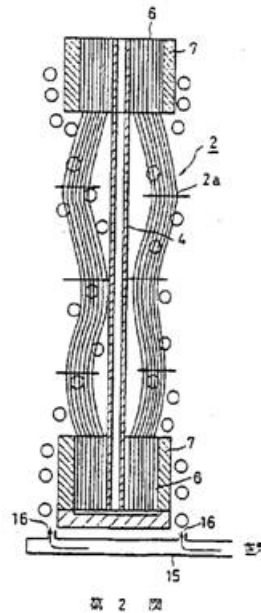
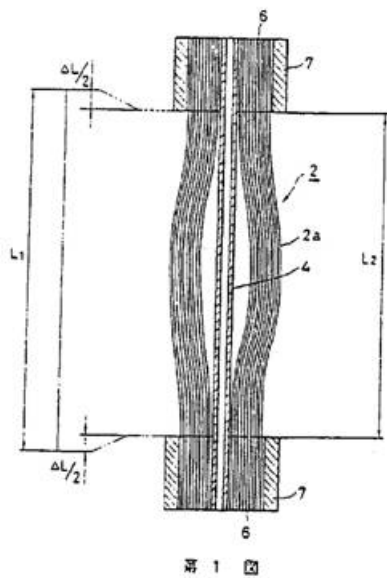
4: support member,

6: filling sections,

7: bundle securing member,

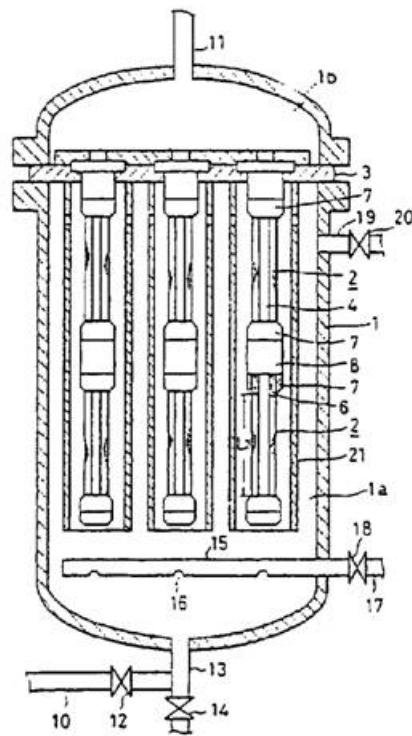
15: gas pipe,

16: bubble holes.



4.2.3 The hollow yarn membrane filter of D2 can be mounted in a container of a filtration apparatus, as shown in Figure 5 of D2, wherein additional reference signs respectively represent the following parts:

- 1: container main unit,
- 1a: filtration chamber,
- 1b: processing chamber,
- 3: diaphragm,
- 8: connecting tube,
- 11: processing fluid discharge pipe,
- 21: protecting tube.



第 5 图

4.2.4 Parts 1b, 2, 2a, 3, 6, 7, 8 and 11 are, at least in use, functionally and structurally connected among them thereby permitting filtrating the substrate present in filtration chamber 1a on membranes 2, in order to produce a permeate, which flows along the lumens of the hollow fibre membranes 2a up to the openings in the filling sections 6, through the space between parts 6 and 7 (see bottom header shown in Figure 2), then within hollow support 4 and connecting tube 8, to the upper bundle of hollow fibres, up to chamber 1b,

finally out from discharge pipe 11. The set of parts (depicted in assembled form in Figure 5, and detailed in Figures 1 and 2) comprising hollow fibres 2,2a, headers 6,7, space between 6 and 7 (*supra*) and permeate collection means 4,8 is a vertical skein as defined in Claim 1 at issue.

- 4.2.5 It is not in dispute that hollow fibres 2,2a are suitable for microfiltration and that may be subjected in use to a transmembrane pressure of e.g. 0.7 kPa or higher.
- 4.2.6 For the board, the fibres of the apparatus of D2 are, as required by claim 1 at issue, "*unconfined in a shell of a module*". For the board, Skirt 21 is not a shell, as it is open and perforated, let alone a shell of a module, the latter expression being indeterminate (see points 3.2, *supra*).
- 4.2.7 As this was the key issue in dispute, it remains to be decided whether D2 also discloses the last features of Claim 1, namely:
"wherein said fibers of each said header are spaced apart to a desired lateral spacing between fibers by said potting resin which extends over only each terminal portion of said fibers near their ends, so as to maintain said ends in closely spaced apart relationship".
- 4.2.8 In this respect, D2 schematically shows how the membranes are fixed in the filling sections 6 (Figures 1 and 2). However, no "*closely spaced apart relationship*" can be gathered from such a sectional view, which, for the board, does not show a number of fibres corresponding to the high total number of fibres actually used according to D2 ("about 1000" hollow

fibre membranes are mentioned on page 6, second paragraph, first sentence).

4.2.9 D2 (page 4, points 2) and 3)) also discloses that if the hollow yarn membrane filter is bundled "in a condition in which multiple pieces of hollow yarn 2a are densely arranged, and the excess length is decreased, the effects are such that the fluid to be processed does not flow efficiently between the respective pieces of hollow yarn 2a, and, therefore, only the hollow yarn 2a which is positioned at the outer circumference of the hollow yarn membrane filter is provided for filtration. This is also undesirable from the standpoint of filtration efficiency, as it results in a phenomenon by which solid portion adheres only to the hollow yarn 2a positioned at the outer circumference". Also, "when backwashing is executed, there is a problem in that the solid portion which has been separated by said backwashing accumulates among the pieces of hollow yarn 2a, and removal of the separated solid portion is not performed effectively, This is because, ultimately, the flow characteristics among the pieces of hollow yarn 2a are poor because the hollow yarn 2a is densely arranged ..., and the excess length is short".

However, for the Board, also these indications in D2, which imply at least two different configurations, namely "dense arrangement and short excess length" and "dense arrangement and long excess length", and which do not deal with the spacing of the fibres in the potting sections, do not directly and unambiguously disclose a "*closely spaced apart relationship*" as defined in Claim 1.

4.2.10 It follows from the foregoing that D2 does not directly and unambiguously disclose all the features of Claim 1 at issue either.

4.2.11 The subject-matter of Claim 1 according to the main request is thus novel over documents D1 and D2 (Articles 52(1) and 54(1)(2) EPC).

Inventive step

The invention - Claim 1

5. In one aspect, the invention relates to a hollow fibre microfiltration apparatus.

5.1 The patent in suit (see paragraphs [0003] and [0009]) addresses to need to provide a microfiltration apparatus in which the hollow fibre membranes do not get entangled and do not abrade each other excessively, as is likely to happen in the arcuate configuration of the array of fibres of D3 (*infra*).

5.2 Moreover, it is indicated in the patent in suit that the use of vertically suspended fibres in the direct treatment of activated sludge (see paragraphs [0004] to [0007], referring to D13 and D14) is not satisfactory. Finally, the Patent in suit (paragraph [0002]) mentions the aim to provide a microfiltration apparatus which dispenses with forming a module in which the fibres are confined. However, the definition of the invention in Claim 1 (see the feature "*a transmembrane pressure differential in the range of from 0.7 kPa to 435 kPa*") and the indications in the patent in suit (page 5, paragraph [0017], lines 45-46: "*up to about 10 bar in a pressurized vessel*") clearly express that the apparatus of Claim 1 may also be used within pressure vessels,

even if the skein is not confined within the shell of a module.

Closest prior art

6. For the Board, document D2 is to be considered as the closest prior art in view of the following.
 - 6.1 D2 (*supra*) (page 2, "*industrial field of usage*") concerns hollow yarn membrane filters used in water treatment, i.e. pertains to the same technical field of the patent in suit. D2 addresses the damages occurring upon twisting and bending of vertically arranged fibres having an excessive length between their bonding sections (paragraph bridging pages 3 and 4). In order to solve these problems, D2 proposes the use of a slight excess length of the fibres between said bonding sections (from 1 to 4%) (page 2, first paragraph).
 - 6.2 D3, acknowledged in the patent in suit (paragraph [0001]), also relates to hollow fibre membrane filters for water treatment. D3 addresses (column 2, lines 36-43) problems associated with the operation of a moduleless and frameless array of hollow fibre membranes and proposes (column 2, line 44, to page 3, line 5) to dispose buoyantly the moduleless and frameless array of long fibres in the substrate to be filtered and to scrub them with bubbles of gas. The buoyant disposition of the fibres is for instance obtained by the arcuate configuration as shown in Figures 3 to 11. It is apparent therefrom, that the fibres are not vertically disposed in use. According to D3 (e.g. column 2, lines 57-62), by avoiding use of high flow at high pressure and by allowing free movement (buoyancy) to the fibres, also the damages to the fibres are thereby minimized.

- 6.3 It follows from the foregoing that D2 and not D3 addresses problems as mentioned in the patent in suit and proposes a solution similar to the apparatus of the invention in that the hollow fibres membranes are disposed vertically. D3 proposes to go away from the vertically suspended fibres of D13 and D14. Hence, D2 represents the most suitable starting point for assessing inventive step as regards claim 1 at issue.

Technical problem according to the Appellant

7. At the oral proceedings, the Appellant referred to page 28, lines 26-28, of the application as filed and considered that starting from D2 (Figures 1, 2 and 5) as the closest prior art, the technical problem could be seen in providing a microfiltration apparatus optimised in the sense that a maximum surface area per unit volume of substrate was provided without adversely affecting the circulation of substrate through the skein, nor the scrubbing action exerted by the air provided within the skein.

Solution

8. As a solution to the technical problem, the patent in suit proposes the apparatus according to Claim 1 which is in particular characterised by the features:
"wherein said fibres of each said header are spaced apart to desired lateral spacing between fibers by said potting resin which extends over only each terminal portion of said ..., so as to maintain said ends in closely spaced apart relationship").

Success of the solution

9. The board considers it plausible that potting the fibres in close proximity to each other in the potting zone of the header will indeed provide a high available filtering surface, whilst keeping a small distance between them provides a sufficient circulation path for the substrate and the scrubbing air bubbles. Hence, the board can accept that said technical problem is indeed effectively solved.

Obviousness

10. It remains to be decided whether or not the skilled person starting from D2 and trying to solve the technical problem posed would obviously arrive at an apparatus falling under the terms of claim 1.
- 10.1 Document D2 (Points 4, *supra*) discloses all the features of Claim 1 of the main request except for the features "*desired lateral spacing between fibers by said potting resin which extends over only each terminal portion of said ..., so as to maintain said ends in closely spaced apart relationship*".
- 10.2 These features relate to the potting of hollow fibre membranes in order to form potting sections of fibre bundles. The primary function of potting is to hold the hollow fibre membranes together in the potted sections (structural function). Also, the potted section normally ensures the formation of a seal (operational function), which separates filtration and permeate chambers, otherwise no proper filtration can be carried out.

- 10.3 For the board, it is plausible that by potting the hollow fibre bundle into the header in fibre-to-fibre contact, a risk is run that structural integrity is impaired and that a tight seal around each fibre is not achieved. The latter consideration is, for instance, expressly mentioned in D3 (column 3, lines 16-18).
- 10.4 Moreover, document D2 itself (see points 4.2.9, *supra*) teaches that with a too close arrangement of the hollow fibres, the fluid to be filtered may not flow efficiently between the fibres, which is undesirable from the standpoint of filtration efficiency, as solid portion adheres only to the hollow yarn positioned at the outer circumference.
- 10.5 It follows from the foregoing that for the skilled person starting from the teaching of D2 and trying to provide an apparatus of optimised efficiency would use a high number of fibres per bundle but would obviously avoid a too dense packing of the fibres, as suggested in D2. Also, in order to ensure physical integrity and prevent any impairment of the working of the filtration system, when potting the fibres of D2, he would certainly opt for avoiding fibre-to-fibre contact in the potting sections based on considerations as mentioned in D3.
- 10.6 In so doing, the skilled person would obviously arrive at a "*closely spaced apart* relationship" among the fibres in the potted sections, as required by Claim 1 at issue.
- 10.7 Therefore, the subject-matter of in Claim 1 at issue does not involve an inventive step. (Articles 52(1) and 56 EPC).

10.8 At the oral proceedings before the Board, the appellant also held that D3 and not D2 was the closest prior art, and that, when starting from D3, the claimed subject-matter was not rendered obvious, as D2 could not be combined with D3. However, as indicated under Points 6, *supra*, the Board did not see any reasons for not considering D2 as the closest prior art document, and this approach led to the conclusion that the claimed subject-matter is obvious. Therefore, D2 rather than D3 qualifies as best starting point for the assessment of inventive step (see e.g. decision T 0824/05 of 28 September 2007, reasons point 6.2). Consequently, this argument of the appellant is not convincing.

10.9 Therefore, the main request is not allowable.

Subsidiary Requests 1 to 3

Admissibility of the requests

11. Subsidiary requests 1 to 3 were filed one month before oral proceedings, i.e. after the issuance of the summons to oral proceedings.

11.1 Compared to subsidiary requests 1 to 3 previously on file, the claims according to subsidiary requests 1 to 3 at issue contain amendments made in reaction to objections under Article 84 EPC 1973 and Rule 80 EPC, raised in the Board's communication issued in preparation for oral proceedings.

11.2 Said amendments did not raise any additional complex issue, and the respondent did not object to the late filing of said claim requests.

11.3 Therefore, the board decided to admit subsidiary requests 1 to 3 despite their late filing (Article 114(2) EPC and Article 13(1), (3) RPBA).

Subsidiary requests 1 and 2

Allowability of the amendments

12. Compared to Claim 1 according to the main request, the respective claims 1 of subsidiary requests 1 and 2 *inter alia* contain the additional feature "*connected to a source of suction*".

12.1 The application as originally filed *inter alia* discloses that the permeate can be withdrawn "*under gravity*" (page 11, line 27), or with a "*conventional non-vacuum pump*", or, if an adequate "*liquid head*" is provided, "*a pump which generates minimal suction may be used*", whereby "*once the permeate flow is induced by a pump, the permeate will continue to flow under a siphoning effect*" (paragraph bridging pages 15 and 16).

The Board observes that none of these passages specifies whether, where and how any such pump, if present, is connected to the means for withdrawing the permeate.

12.2 It follows from the foregoing that, the new feature "*connected to source of suction*" is not disclosed as such, i.e. in this generality, in the application as filed. The added features now encompass "*sources of suction*" beyond the originally mentioned non-vacuum pump and pumps which generate minimal suction. As a case in point, ejectors and vacuum pumps are now encompassed by Claim 1. Hence, the quite general feature "*source of suction*" represents an intermediate

generalization which finds no fair basis in the application as filed.

Since the respective claims 1 at issue define subject-matter which extends beyond the content of the application as filed, the amendments made do not meet the requirements of Article 123(2) EPC.

12.3 Subsidiary requests 1 and 2 are thus not allowable.

Subsidiary request 3

Allowability of the amendments

13. Compared to Claim 1 of the main request, Claim 1 at issue differs by the inclusion of the following additional features:

- (a) "at ambient pressure"; and,
- (b) "connected to a pump providing suction".

13.2 The appellant only objected that having regard to the new features (b), as it was still not clear whether such a pump was part of the claimed apparatus, nor how it was connected.

13.2.1 As regards features (a), the application as originally filed *inter alia* discloses that "the skein preferably operates in a substrate held in a reservoir at atmospheric pressure" (page 10, lines 20-21), "under (essentially) ambient pressure" (page 10, lines 30-31; page 11, line 27), "by operating at ambient pressure" (page 11, line 2), "in a large tank under atmospheric pressure" (page 11, lines 18-19).

13.2.2 As regards features (b) the application as originally filed *inter alia* discloses that the permeate can be

withdrawn with a "conventional non-vacuum pump", or, if an adequate "liquid head" is provided, "a pump which generates minimal suction may be used", whereby "once the permeate flow is induced by a pump, the permeate will continue to flow under a siphoning effect" (paragraph bridging pages 15 and 16).

13.2.3 For the Board, the amendments consisting in the incorporation of features (a) and (b) into claim 1 thus find a fair basis in the application as filed.

13.3 Since the means to withdraw the permeate are part of the claimed apparatus, and since the pump providing suction "is connected" to said means, the pump too is unambiguously part of the claimed apparatus (Article 84 EPC, Clarity).

13.4 Thus, the Board is satisfied that claim 1 of subsidiary request 3 complies with the requirements Article 123(2) and 84 EPC.

Inventive step - Claim 1

14. The subject-matter of claim 1

14.1 The subject-matter defined in Claim 1 of the subsidiary request 3 comprises the purposive feature amended (emphasis added) to read "*for withdrawing permeate essentially continuously from a multicomponent liquid substrate at **ambient pressure***". This feature merely specifies the suitability of the claimed apparatus for withdrawing permeate from (i.e. not necessarily in) substrates held at ambient pressure, such as ponds. Of course, this ambient pressure refers to the pressure on the surface of the substrate, as any point inside it,

- depending on its depth, is also under the relevant hydrostatic pressure (liquid head).
- 14.2 Hence, these features of Claim 1 neither require that the claimed apparatus be submersed in a substrate whose surface is open to the atmosphere, nor that the pressure on one side of the membrane be atmospheric. The latter is apparent from e.g. Figure 12 of the patent in suit, where only the surface of the basis is at atmospheric pressure, not the submersed membranes.
- 14.3 The first amendment cannot further distinguish the claimed apparatus from that of D2, even if the filtration apparatus of D2 were considered as such, as also the apparatus of D2 (Figure 5) is suitable for withdrawing permeate essentially continuously from a multicomponent liquid substrate at ambient pressure. As a case in point, the apparatus of D2 as such (i.e. Figure 5 without any modification) may be located close to a pond (which contains water as a substrate at ambient pressure), at a lower level than the surface of the pond, so that liquid substrate flows by gravity inside the filter, from where, upon application of suction on the inner parts of the membranes (a usual operation in this field), liquid permeate is withdrawn essentially continuously. Hence, the suitability defined in Claim 1 at issue obviously pertains to the apparatus of D2 too.
- 14.4 As regards the second amendment (i.e. "*means to withdraw said permeate connected to a **pump providing suction***"), D2 (e.g. page 3, first paragraph, last sentence) does not specify whether the liquid to be filtered is pumped inside the vessel and through the membranes or whether the permeate is withdrawn by creation of a lower pressure at the permeate side of

the membranes. Since however these are generally known ways of operating filters, and since D2 does not exclude the use of suction pump connected e.g. to its line 11 (Figure 5), a connection between means for withdrawing permeate and suction pump is obviously compatible with the teaching of D2.

15. Therefore, said amendments to claim 1 neither require a change of the closest prior art document (still D2) nor of the technical problem effectively solved (points 6 and 7-9, *supra*).

15.1 As regards the obviousness of the claimed solution, the board observes that the use of a pump for providing suction, connected to the means for withdrawing the permeate, is a known option, as illustrated e.g. by D3 (column 22, lines 1-3, and figure 8). Hence, starting from the apparatus described in document D2, the skilled person trying to solve the technical problem posed, would inevitably contemplate implementing this very common, and hence readily available option, and would thereby arrive in an obvious manner at a microfiltration apparatus falling within the terms of claim 1 at issue.

15.2 Consequently, the apparatus of Claim 1 of subsidiary request 3 does not involve an inventive step (Articles 52(1) and 56 EPC).

15.3 Subsidiary request 3 is thus not allowable either.

Subsidiary Requests 4 and 5

Admissibility of the requests

16. Subsidiary requests 4 and 5 were submitted with letter dated 10 October 2013, i.e. after issuance of the summons to oral proceedings. They do not correspond to any of the claim requests which were dealt with before the Opposition Division, but were presented for the first time in the appeal proceedings.
- 16.1 The respective claims 1 according to both requests comprise the newly added features: "*wherein every permeate-discharging face of the microfiltration membrane device is connected to a permeate collection means that is submersed in said substrate*".
- 16.2 The allowability of these amendments is *prima facie* questionable under both Article 84 and Article 123(2) EPC, for the following reasons:
- 16.3 As to clarity (Article 84 EPC), the expression "... *is connected to a permeate collection means ...*" *prima facie* appears to be ambiguous, since it does not clearly express whether there is only one permeate collection means or one for each permeate discharging-face, let alone whether only the permeate collection means or both headers, or the entire skein, is supposed to be submersed in the substrate. Moreover, the feature "*submersed*" appears to relate to the intended use of the apparatus, which is not necessarily suitable for distinguishing the claimed apparatus from that of e.g. D2, in which the permeate collection means disposed at the (lower) ends of the fibres are also submersed.
- 16.4 As regards the basis for the amendment in the application as filed, the Board notes that in particular the second part of it, namely the added features "*permeate collection means that is submersed in said substrate*", independently from whether there is

one or there are two permeate collections means, do not *prima facie* appear to have a fair basis in the application as originally filed (see e.g. page 5, lines 8-10; page 10, lines 16-20), not even in the specific embodiment shown in Figure 12, illustrating operation of the system, which shows only one permeate manifold 46u connected to the upper header.

16.5 It follows from the foregoing that the amendments to the claims according to the two requests at issue are not clearly allowable, and raise questions not dealt with in the decision under appeal, thus increasing the complexity of the case, rather than contributing to the convergence of the debate.

16.6 Therefore, the Board decided not to admit late filed subsidiary requests 4 and 5 into the proceedings (Article 114(2) EPC and Articles 12(4) and 13(1)(3) RPBA).

Subsidiary request 6

Admissibility of the request

17. The clean-typed claim set according to subsidiary request 6 was filed with letter of 30 March 2011, i.e. long before the parties were summoned to oral proceedings. Moreover, it had already previously been announced in the statement setting out the grounds of appeal. The set of claims according to subsidiary request 6 is almost identical to the one according to subsidiary request AR2bis4 dealt with in the decision under, the only difference being, that the feature of Claim 1 (lines 10-12) according to claim request AR2bis4 reading "*said first header and said second header having opposed terminal end portions ... at*

least one of said headers" was replaced by the feature in Claim 1 (lines 13-14) according to subsidiary request 6 reading "*said first header and said second header having opposed terminal end portions ... at least one header"* The admissibility of subsidiary request 6 was not disputed by the respondent.

The Board thus admitted this request (Article 114(2) EPC and Articles 12(4) and 13(1) RPBA).

Amendments

18. According to the decision under appeal (page 8, point 4), the opponent (now respondent) had conceded that the claims according to claim request AR2bis4 were not open to formal objections under Articles 84 and 123(2) EPC and the opposition division also took this view.
19. The Board has no reason to take a different stance regarding subsidiary request 6, for the following reasons:
 - 19.1 The objections against the claims at issue raised by the respondent under Article 123(2) EPC in its reply to the statement of grounds of appeal were no longer pursued in the subsequent proceedings. In particular, at the oral proceedings before the Board, the allowability under Articles 84 and 123(2), (3) EPC of the amendments resulting in claims 1 to 3 at issue was not contested.
 - 19.2 Compared to the claims according to the main request, the amendments made essentially consist in the conversion of apparatus Claims 1 and 2 according to the main request into use claims and in the inclusion of

the further features concerning the construction and use of associated gas-distribution means.

- 19.3 The objections under Article 123(2) EPC raised initially by the respondent against claim 1 were substantiated only by pointing out that the passages indicated by the proprietor in a letter submitted during the opposition proceedings did not provide a fair basis for the amendments.
- 19.4 Such a reasoning is not, for the Board, sufficient to establish a breach of the requirements of Article 123(2) EPC since it does not take into account the whole disclosure of the application as filed.
- 19.5 The Board is, moreover, satisfied that the amendments in Claim 1 are fairly based on the most general disclosure of the application as filed. Reference is made in particular to page 4, lines 3 to 17 and 20; Figure 8; Figure 10 and the general description on page 8, lines 8 to 15; paragraphs bridging pages 10 and 11; pages 14 and 15 (see "*The gas-Scrubbed Assembly*"); page 23, lines 8 to 11; and page 32, lines 5-8. The Board concludes that the subject-matter defined by the amended combinations of features according to claims 1 and 2 is not extending beyond the content of the application as filed. The change of category from apparatus to use in Claims 1 and 2 was never in dispute and the Board has no reason to call into question the allowability of said amendment under Article 123(2), (3) EPC.

Novelty

20. Novelty of the claimed subject-matter of claims 1 to 3 at issue is acknowledged in the decision under appeal

(Point 5, page 9, first sentence, of the reasons, "The distinguishing features ..."). This finding was not contested by the respondent.

- 20.1 The board is satisfied that the subject-matter of claims 1, 2 and 3 is novel over the prior art relied upon by the appellant. Since novelty of the claimed subject-matter was not questioned by the respondent, further details need not be given here. The features distinguishing the claimed subject-matter from the prior art become apparent from the following assessment of inventive step.

Inventive step - Claims 1 to 3

The invention

21. The invention as defined in the claims relates to microfiltration. More particularly, the three independent claims (see wording under section XII *supra*) are of the use (claims 1 and 2) or process category (claim 3). They thus relate to activities which involve using and operating device(s) having in common some specific constructional features under some specific operational conditions, in particular the use of gas for scrubbing vertically oriented hollow fibres which are swayable within the substrate to be filtered, while filtering the substrate to withdraw permeate.

The board observes that patent in suit (see e.g. page 3, lines 17 to 21) expressly addresses the issue of preventing the formation of build-up on the fibres to thereby maintain a high flux over a long period.

Closest prior art

22. Considering that the invention as defined in the claims at issue relates to the use of specific microfiltration apparatuses, features relating to the particular way in which said apparatuses are put into use have more weight in determining the closest prior art than in the case of Claim 1 of the main request, which is of the apparatus category and only comprises indications concerning intended uses. In particular, the mandatory presence, according to the claims at issue, of "*gas-distribution means*" and the use thereof to generate bubbles contacting the fibres "*while filtering the substrate to withdraw permeate*" are decisive for determining the closest prior art for the assessment of inventive step according to the problem-solution approach.

22.1 Whereas D2 discloses that the gas-distribution means described therein are operated (page 3, first full paragraph) only during the intermittent backwash operations, i.e. not while filtering, D3 discloses the operation of its gas-distribution system while filtering, to prevent build-dup on the fibres, i.e. in a similar manner and for a similar purpose as according to the invention as defined in claims 1, 2 and 3 at issue.

22.2 The board thus accepts that regarding the subject-matter of the claims according to present subsidiary request 6, D3 and not D2 is to be considered as the closest prior art for assessing inventive step.

Technical problem

23. Starting from the disclosure of document D3, which is extensively acknowledged in the patent in suit (see [0001] to [0003]) as the closest prior art, the technical problem can be seen in providing a microfiltration method with improved filtering efficiency in terms of the maintenance of a high flux over a long period, while reducing the risk of fibre entanglement, abrasion between the fibres and excessive shear forces on the fibres near the upper header (see e.g. page 2, lines 21 and 25, and page 3, lines 20 to 21.)

Solution

24. As solutions to this technical problem, the patent in suit proposes the uses and the process according to Claims 1, 2 and 3 at issue, which are in particular characterised in that:
- "the headers are vertically spaced apart", i.e. vertically oriented);*
- "the fibres are swayable in the substrate" to be filtered, because their are*
- "having substantially the same length between the opposed faces of the headers, said length being from at least 0.1% to less than 5% greater than said fixed distance", thereby permitting restricted displacement of an intermediate portion of each fibres,*
- independently from the movement of the other fibres,*
- and,*
- that the outer surface of the swayable fibres is scrubbed with rising gas bubbles "while filtering the substrate to withdraw permeate" (Claims 1 and 2), i.e. "while increasing the concentration of said particulate material in said substrate" (Claim 3).*

Success of the solution

25. For the following reasons, the board is satisfied that the stated technical problem is indeed effectively solved over the full breadth of claims 1, 2 and 3:

25.1.1 The patent in suit contains an experimental comparison of the performance of a method as described in the closest prior art D3 with a method in line with claims 1 to 3 at issue. The results of said examples (page 4, lines 12 to 18; paragraphs [0040] to [0042]) are shown in Figure 1. It is apparent therefrom that in contrast to the results achieved by the method described in D3 (Figure 1, curve 1), and by a method according to D13 (curve 2), the claimed uses and process involving the specific microfiltration apparatus referred to in the claims at issue are characterised by a long (up to at least 250 hours of operation) maintenance of the initial flux. The comparative methods show a very pronounced and irreversible drop of the flux in the first few hours of operation.

25.1.2 Moreover, the results shown in Figures 18 (comparison between vertical and horizontal fibre configuration) and Figure 20 (comparison between swayable and taut vertical fibre configurations) demonstrate the positive impact of these features on the achievable flux.

25.1.3 For the board, these results make it credible that the use of a vertical arrangement of restrictedly swayable fibres with a gas-distribution system as defined in the claims at issue effectively improves the overall filtration efficiency of the microfiltration process, compared to the results achieved when using the

apparatus and method according to D3. The results make it plausible, that a high initial flux can be maintained for a long period whilst by virtue of the spaced-apart arrangement of the fibres and their controlled swayability there is a low risk of fibres abrasion and entanglement.

Non-obviousness of the solution

26. It remains to be decided whether the skilled person starting from the apparatus and method of using it described in D3 and facing the stated technical problem was induced by the prior art relied upon by the respondent to modify the teaching of D3 such as to arrive at a use or process falling within the terms of one of Claims 1, 2 or 3 at issue.

26.1 Document D3 taken alone

26.1.1 In the apparatus of D3 (see figures 3 to 11), the fibres are used in arcuated, i.e. non-vertical, configuration. The fibres are buoyantly suspended within the substrate (the permeate has a lower density than the substrate), and they are scrubbed by the rising gas bubbles. D3 does not hint at using a vertical configuration of hollow fibre membranes.

26.1.2 In this respect, the Board notes that D3 (column 8, line 3, to column 10, line 12) acknowledges the teachings of D13 and D14 and highlights their poor performance which is attributed to specific configurations of the fibre bundle and their positioning relative to the gas distribution means, the latter being provided only at the outside the skein. Hence, D3 actually discourages the skilled person from using a vertical configuration of hollow fibre

membranes as illustrated and described in these to references (e.g. Figures 1 and 2 of D13; Figure 1 of D14).

26.1.3 Moreover, even assuming for the sake of argument that the skilled person would consider using a vertical configuration, D3 does not contain any hint at the restricted swayability of the fibres as defined in Claim 1.

26.1.4 Hence, D3 alone does not lead to the claimed subject-matter in an obvious manner.

26.2 Combination of D3 with D2

26.2.1 Document D2 (*supra*) discloses a filtering apparatus with vertically oriented hollow fibres also comprising a gas-distribution system, in which the slight "excess length" of the fibres results in restricted swayability without risk of entanglement. However, both gas-distribution system and the optimised, slight excess length and swayability of the fibres only play a role during the intermittent back-washing, in order to prevent a drop of the backwashing effect (see D2, page 5, paragraph "Action").

26.2.2 Thus, D3 and D2 contain teachings which are incompatible under two aspects, i.e. namely non-intermittent versus intermittent operation of the gas distribution means, and arcuate versus vertical fibre configuration. It is thus questionable whether the skilled person, unaware of the present invention and faced with the stated technical problem, would actually consider combining D3 and D2.

26.2.3 Even assuming for the sake of argument that the skilled person would envisage such a combination, he would not be induced to retain, in particular, the continuous operation of the gas distribution means of D3 whilst adopting the vertical fibre arrangement and restricted fibre swayability described in D2, since he would have no reason to expect, as a result, an improved filtration performance in terms of conservation of the initial flux over a longer period than according to D3.

26.2.4 Even considering, purely for the sake of argument, that D2 were taken as the closest prior art, similar conclusions would have to be drawn regarding its combination with D3.

Thus, even if the combination of D3 and D2 were nevertheless considered, despite their incompatible teachings, the skilled person unaware of the present invention was not induced to, thus would not provide a process with all the features of one of claim 1 to 3 at issue.

26.3 Document D8 was also mentioned initially in a writ of the respondent, in combination with D2 (not with D3), but was no longer relied upon thereafter. The closest embodiment of D8 invoked by the respondent is shown in Figure 13, described on page 26 thereof. However, D8 neither discloses vertically oriented fibres (see Figure 13) having a restrictedly swayability as claimed, nor does it mention bringing the fibres into contact with gas bubbles whilst filtering. Hence, D8 provides no pointer towards the claimed invention either.

26.4 In the board's judgement, the subject-matter of claims 1 to 3 thus involves an inventive step (Articles 52(1) and 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 on the basis of the claims according to subsidiary request 6 submitted with the letter dated 30 March 2011 and a description to be adapted thereto where necessary.

The Registrar:

The Chairman:



D. Magliano

B. Czech

Decision electronically authenticated