BESCHWERDEKAMMERN DES EUROPÄISCHEN PATENTAMTS

BOARDS OF APPEAL OF THE EUROPEAN PATENT OFFICE

CHAMBRES DE RECOURS DE L'OFFICE EUROPEEN DES BREVETS

Internal distribution code:
(A) [ ] Publication in OJ
(B) [ ] To Chairmen and Members
(C) [X] To Chairmen

D E C I S I O N
of 5 September 2000

Case Number: T 1023/96 - 3.3.5

Application Number: 88308210.9

Publication Number: 0306350

IPC: B01D 61/14

Language of the proceedings: EN

Title of invention:
Honeycomb structure for fluid filtration

Patentee:
NGK INSULATORS, LTD.

Opponent:
Cerasiv GmbH Innovatives Keramik-Engineering

Headword:
-

Relevant legal provisions:
EPC Art. 54, 56

Keyword:
"State of the art - conference proceedings"
"Inventive step (no) - aggregation of obvious or arbitrary features without a surprising effect"

Decisions cited:
-

Catchword:
-

Europäisches Patentamt | European Patent Office | Office européen des brevets

Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number: T 1023/96 - 3.3.5

D E C I S I O N
of the Technical Board of Appeal 3.3.5
of 5 September 2000

Appellant: (Proprietor of the patent)
NGK INSULATORS, LTD.
2-56, Suda-cho, Mizuho-ku
Nagoya-shi, Aichi 467 (JP)

Representative:
Paget, Hugh Charles Edward
Mewburn Ellis
York House
23 Kingsway
London WC2B 6HP (GB)

Respondent: (Opponent)
Cerasiv GmbH
Innovatives Keramik-Engineering
Postfach 11 49
D-73201 Plochingen (DE)

Representative:
Grünecker, Kinkeldey,
Stockmair & Schwanhäusser
Anwaltssozietät
Maximilianstrasse 58
D-80538 München (DE)

Decision under appeal: **Decision of the Opposition Division of the European Patent Office posted 12 September 1996 revoking European patent No. 0 306 350 pursuant to Article 102(1) EPC.**

Composition of the Board:

Chairman: R. K. Spangenberg
Members: A.-T. Liu
S. C. Perryman

Summary of Facts and Submissions

I. The appeal is from a decision of the opposition division revoking the patent upon opposition on the grounds of Article 100(a) and (b) EPC.

II. The decision was based on the amended claims which were filed with the letter of 22 February 1994 in the preceding appeal case T 1071/93. This set of claims consisted of independent claim 1, with claims 2 to 8 depending thereon. Claim 1 read as follows:

"A honeycomb structure for fluid filtration comprising a support (11) of porous ceramic material having a multiplicity of axially parallel passageways (12) extending therethrough and uniformly spaced by porous partition walls (11a) which permit flow of fluid under pressure and a porous selective membrane (11b) coated onto the surface of the passageways to separate one or more components from the fluid and permitting flow of filtrate passing therethrough to be carried through the porous partition walls to the exterior surface of the partition walls for collection, the average pore size of the selective membrane (11b) being in the range from 1 to 1000 nm,
characterized in that the porous partition walls (11a) permit the passage of filtrate at a flow rate more than twenty times the flow rate of filtrate through the selective membrane (11b) and partition walls (11a), wherein the partition walls (11a) are formed to have pores of from 0.2 to 5.0 μm in average size and of from 0.1 to 0.25 ml/g in pore volume, and the flow rate of pure water passing through the selective membrane (11b) and partition walls (11a) is less than 1000 l/m^2 h kg/cm^2."

III. The following documents cited by the parties are referred to in the present decision:

D4: US-A-4 069 157

D7: FR-A-2 549 736

D10: Undated article entitled "Nouveaux Médias Filtrants Céramiques pour Microfiltration Tangentielle et Ultra-filtration" by J. Gillot, D. Garcera of Société Ceraver, B.P. 113 - 65001 Tarbes.

D12 Letter addressed to Mr. Olapinski, dated 11 July 1994 and signed by J. Gillot.

IV. The opposition division relied on D12 as evidence that the content of document D10 was available to the public before the priority date of the patent in suit.

During the oral proceedings which were held on 24 July 1996, the opposition division provided calculations converting the pore volume range as stipulated in claim 1 into the more commonly found feature of porosity. The opposition division found that the only essential feature distinguishing the subject-matter of claim 1 from D10 was the average pore size of the support. It went on to conclude that the claimed honeycomb structure was an obvious combination of the teachings according to D10 and D7.

V. In the statement of grounds of appeal, the appellant contested the finding that document D10 formed part of the state of the art for the patent in suit. He also advanced the argument that the assessment of inventive step by the opposition division was based on hindsight.

In particular, it was contended that the opposition division had not demonstrated the actual motivation for the skilled person to combine D7 with D10 so as to obtain the honeycomb structure as stipulated in claim 1.

VI. In reply to the appeal, the respondent essentially reiterated the view of the opposition division concerning the public availability of D10 and the lack of inventive step of the claimed honeycomb structure with regard to D7 and D10.

VII. The Board of its own motion ordered excerpts from the proceedings of the FILTRA 84 conference:

D10a: 6e Congrès et Exposition de la Filtration et des Techniques Séparatives, 2-3-4 Octobre 1984.

In the communication 26 June 2000, the Board drew the parties' attention to the relevant pages of the proceedings and expressed its preliminary opinion that, in view of D10a, D10 would appear to form part of the state of the art.

VIII. The appellant requests that the decision under appeal be set aside and the patent be maintained with the claims which formed the subject of the impugned decision.

The respondent requests that the appeal be dismissed.

Reasons for the Decision

1. *Amendments*

It is undisputed that the combination of features of claim 1 is not expressis verbis disclosed in the application as originally filed but based in part on particular examples. The Board has strong reservations as to the allowability of taking data obtained under specific conditions and combining them with other structural requirements of a support in the more general context of claim 1. However, the Board does not deem it necessary to discuss this point further since the appeal must fail for other reasons (see below). For the purpose of the present decision, the Board thus accepts in the appellant's favour that the amendments are allowable.

2. *State of the art*

2.1 In D12, Mr. Gillot states that document D10 is an article made available to the public at the FILTRA 84 conference in Paris, 2 to 4 October 1984. In order to verify this piece of information, the Board has ordered excerpts from the conference proceedings (D10a).

The copy of D10a obtained from the University of Hannover bears a stamp dated 8 January 1986 at page 5. In the introductory address at page 1, the president of SFF, the company in charge of organising the conference, points out that the proceedings contain all the lectures given at the FILTRA 84 conference (see page 1, paragraphs 1 and 3). The programme indicates at page 8 that the presentation by J. Gillot and D.

Garcera of Ceraver - Tarbes was scheduled for Wednesday, 3 October 1984 at 11 h 45. The related article starting from page 161 of the conference proceedings corresponds exactly to document D10.

In the Board's view, this new piece of evidence D10a is entirely in agreement with the declaration by Mr. Gillot in D12 (see also point VII). The appellant has not commented on this document. The Board finds that D10a is conclusive evidence that D10 was available to the public on 8 January 1986 at the latest, thus before the priority date of 4 September 1987 of the patent in suit.

2.2 The Board considers that D10, which discloses all the technical features recited in the preamble of claim 1, represents the closest prior art.

D10 relates to filters comprising ceramic supports which can be either tubes or monoliths with a multiplicity of parallel passageways. The supports are macroporous, with a pore diameter of approximately 15 μm. The interior surface of the passageways are coated with a ceramic membrane. For use in filtration, a tube or monolith may be used as support for a separate filtration element or several of these elements are assembled in parallel into modules (see D10, point 2, paragraph 2 and penultimate paragraph, Tab. 1; point 3, paragraph 1; point 4, paragraph 2, Tab. 4; Figures 2 and 4).

For use in microfiltration, the interior of the supports are coated with a membrane with an average pore diameter in the range of from 0.2 to 5 μm. Ultrafiltration devices are available with a membrane having an average pore diameter ranging from 40 Å to 1000 Å (see D10, Summary, points 3.1 - 3.2 and Tabs. 2 and 3).

2.3 D7 also relates to ceramic filtration devices comprising a support in form of a tube, the interior of which is coated with a ceramic membrane. In examples 1 and 2, the support tubes have a pore diameter of 5 μm, a porosity of 35 vol% and the membrane has an average pore diameter of 0.12 μm or 1.2 μm respectively. In example 3, the tube has a pore diameter of 15 μm, a porosity of 35 vol% and the membrane has an average pore diameter of 0.8 μm.

3. *Inventive step*

3.1 The appellant has contended that the aim of the invention is to provide honeycomb filters which are simple and easy to manufacture, and which have unexpectedly high fluid permeation rates.

3.1.1 As to simplicity and ease of manufacture, the appellant has advanced the argument that the claimed filters do not require an intermediate layer between the support and the membrane (Grounds of appeal, point 4). However, not only does D10 also disclose filtration devices without an intermediate layer, but the invention according to the patent in suit itself does not exclude the presence of such an intermediate layer. Thus, the presence of such a layer is said to be desirable, which is seen in the patent in suit at page 3, last line to page 4, line 7.

3.1.2 The appellant has not submitted, let alone proved, that the claimed honeycomb structure has a higher fluid permeation rate than the filtration devices of D10.

The appellant has contended that the permeability of a support cannot be calculated merely in the knowledge of the pore size. He has, however, not refuted the opponent's argument that the permeation rate of a support is proportional to the pore size of the

partition walls (see Grounds for opposition dated 5 May 1992, page 5, paragraph 1 and appellant's letter dated 23 December 1992, page 2, paragraphs 1 and 2). The Board further notes that the average pore size of the partition walls are much smaller in the claimed honeycomb structures than in the closest prior art (0.2 to 5 μm as compared to 15 μm). It would therefore be unfounded speculation on the part of the Board to presume that the permeation rate of the claimed structure is higher than that of the filter devices according to D10.

3.1.3 The appellant has contended that the examples of the patent in suit demonstrate that the combination of the features of claim 1 leads to unexpectedly high fluid permeation rates (Grounds for appeal, paragraph 4). The Board, however, notes that the examples of the patent in suit do not show any effect beyond the fact that the permeability rates of the partition walls and the membrane are proportional to the pore size of the material involved (see Tables 1 and 3). There is thus no evidence on file lending any support to the appellant's contention that the combination of the features as claimed results in a surprising effect.

3.1.4 As corollary of the above, the Board cannot accept that the technical problem stated by the appellant has been solved by the claimed honeycomb structures. The problem to be solved with respect to D10 can, however, be seen in the provision of another honeycomb structure suitable for fluid filtration (see also patent in suit, page 2, lines 3 to 6).

3.2 The invention proposes in claim 1 a honeycomb structure device for filtration characterised by the following features:

(i) the partition walls (11a) of the support are formed to have pores of from 0.2 to 5.0 μm in average size,

(ii) the partition walls (11a) of the support are formed to have pores of from 0.1 to 0.25 ml/g in pore volume,

(iii) the flow rate of pure water passing through the selective membrane (11b) and partition walls (11a) is less than 1000 $l/m^2 \cdot h \cdot kg/cm^2$, and

(iv) the porous partition walls (11a) permit the passage of filtrate at a flow rate more than twenty times the flow rate of filtrate through the selective membrane (11b) and the partition walls (11a).

3.3 It is not disputed that the claimed honeycomb structure is suitable for fluid filtration.

3.4 The only question is therefore whether the proposed solution to the technical problem as stated in point 3.1.4 derives from the state of the art in an obvious way.

3.4.1 Re: feature (i)
Honeycomb support with a pore size of 5.0 μm

As is indicated above, D10 discloses beside honeycombs also tubes as supports for filtration devices, both with a pore diameter of 15 μm (see point 3.2). It is also irrefutable that this pore specification is met by the tubes in example 3 of D7. The latter prior art document, on the other hand, does not only disclose filtration tubes with an average pore size of 15 μm but also similar tubes with an average pore size of 5.0 μm (examples 1 and 2). Thus, the modification of a support

having an average pore size of 15 μm as in D10 to a support having an average pore size of 5.0 μm is already exemplified in D7 in respect of the tubes. With the provision of honeycomb structures as support for filtration devices displaying an average pore size of 5.0 μm instead of 15 μm, the skilled person would merely close the gap left by the combination of D7 with D10.

The Board does not concur with the appellant that the above combination of the teachings according to D10 and D7 is based on hindsight (see Grounds of appeal, points 8 to 10). The Board notes that both of these documents relate to the same technical field as that of the patent in suit. Furthermore, D7, published on 1 February 1985, has become available to the public only a few months after the date of the FILTRA 84 conference, the occasion on which the content of D10 was made public (see above, point 2.1). In the Board's judgement, it is a routine task of a person skilled in the art to monitor the development in the art concerned. Thus, when faced with the problem of providing another filtration device of the kind known from D10, it is obvious that the skilled person would consider the more recent teaching according to D7. Moreover, the disclosure of D7 is not restricted to the specific supports with definite pore sizes. Rather, its general teaching is to match the pore size of the support to the pore size of the membrane in a particular manner (see D7, claim 1). Thus, it provides the skilled person with an express suggestion to vary the pore size of the support, the explicit alternatives being one with an average size of 15 μm and one with an average size of 5 μm. As a consequence, the modification of the filtration device according to D10 consisting in replacing the honeycomb support having an

average pore size of 15 μm with a honeycomb support having an average pore size of 5.0 μm with the view of providing a further device of the same kind is straightforward and obvious in the light of the closely related prior art teachings according to D10 and D7.

3.4.2 Re: feature (ii)

Pore volume of the partition walls of the support.

The Board concedes that neither D10 nor D7 indicates the pore volume of the support but only its porosity. The appellant however, has not disputed the opposition division's finding that a comparison can be made by directly converting the pore volume range as stipulated in claim 1 into corresponding porosity values. Neither has he submitted that the calculations provided by the opposition division are wrong. These calculations show that the pore volume range of from 0.1 to 0.25 ml/g encompasses a porosity of 35% (see point IV above and point 9 of the minutes of the oral proceedings of 24 July 1996, dispatched with the decision on 12 September 1996 and "Porosity calculation" annexed thereto). Under these circumstances, the Board is satisfied that feature (ii) is implicitly disclosed in D7 (see point 2.3). This feature therefore cannot contribute to the solution of the problem as stated in point 3.1.4.

3.4.3 Re: feature (iii)

Permeability of the filtration membrane.

D10 discloses a selection of membranes, for example for use in ultrafiltration. These are available with an average pore size varying from 40 to 1000 Å. As an orientation, it is further indicated in D10 that the flow rate of pure water passing through a membrane with an average pore diameter of 40 Å is approximately 8 l/m^2 . h . bar.

The claimed devices are particularly intended for the same uses as in D10, including ultrafiltration (see patent in suit, page 2, line 3 to 4). As is already explained in D10, the choice of the membrane should be governed by the intended use (see D10, point 3 including points 3.1 and 3.2; Tables 2 and 3). The Board therefore cannot see that any inventive contribution can be attributed to the requirement that the membrane for ultrafiltration have a flow rate value for pure water of less than 1000 l/m^2 . h . bar.

3.4.4 Re: feature (iv)

Permeability ratio between support and membrane

The appellant has submitted that the opposition division's view concerning the prior art disclosure of the permeability ratio is not objectively substantiated (see Grounds of appeal, page 2, point 1). The Board concedes that neither D10 nor D7 mentions the permeability of the support or the permeability ratio between the support and the membrane. However, for a membrane with a given pore size, the stipulation as in claim 1 of a lower limit for the ratio between the flow rate of filtrate through the partition walls and the flow rate of filtrate through the membrane is nothing else than the stipulation of a lower limit of permeability through the partition walls.

On the other hand, it is well known in the art that the resistance of the passageway walls to filtration flow limits the device capacity (see for example D4, column 2, lines 10 to 17). In other words, it is well established that the permeability through the partition walls of the support should be as high as possible. The appellant has not argued, let alone proved, that the permeability ratio stipulated in claim 1, and thus indirectly the permeability through the partition walls of the support of the claimed structure, is outside the limits which a skilled person would consider reasonable for devices of the kind described in D7 and D10. The Board therefore holds that the stipulated permeability ratio is one which the skilled person would have chosen for a modified device of the known kind.

3.4.5 It follows from the preceding considerations that the combination of features as claimed results from a selection within the technical framework provided by D7 and D10. As is already established above, the appellant has not made it plausible, much less shown, that the characterising features interact with each other or with the remaining technical features stipulated in claim 1 in a particular way (see also point 3.1.3 above). In the absence of any particular circumstances, such a selection with the only aim of providing a further embodiment within an existing framework does not necessitate inventive skill.

4. *Conclusion*

The subject-matter of claim 1 thus lacks an inventive step. As a consequence, the appellant's only request is not allowable.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

S. Hue R. Spangenberg