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) [ ] To Chairmen
(D) [X] No distribution

Datasheet for the decision of 28 May 2008

Case Number: T 1650/06 - 3.3.06

Application Number: 01960577.3

Publication Number: 1305110

IPC: B01J 19/00

Language of the proceedings: EN

Title of invention:
Arrangement for the parallel testing of materials

Applicant:
HTE Aktiengesellschaft The High Throughput Experimentation Company

Opponent:
-

Headword:
Testing arrangement/HTE

Relevant legal provisions:
-

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

Keyword:
"Inventive step - yes"

Decisions cited:
-

Catchword:
-

Europäisches Patentamt | European Patent Office | Office européen des brevets

Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number: T 1650/06 - 3.3.06

D E C I S I O N
of the Technical Board of Appeal 3.3.06
of 28 May 2008

Appellant: HTE Aktiengesellschaft The High Throughput Experimentation Company
Kurpfalzring 104
D-69123 Heidelberg (DE)

Representative: Ricker, Mathias
Wallinger Ricker Schlotter Foerstl
Patent- und Rechtsanwälte
Zweibrückenstrasse 5-7
D-80331 München (DE)

Decision under appeal: **Decision of the Examining Division of the European Patent Office posted 27 April 2006 refusing European application No. 01960577.3 pursuant to Article 97(1) EPC.**

Composition of the Board:

Chairman: L. Li Voti
Members: P. Ammendola
U. Tronser

Summary of Facts and Submissions

I. This appeal lies from the decision of the Examining Division to refuse the European patent application No. 01 960 577.3, internationally published as WO 02/09867, relating to an arrangement for the parallel testing of materials.

II. The decision of the Examining division was based on the set of amended claims according to the Applicant's sole final request filed under cover of a letter dated 22 March 2006.

Claim 1 of such request read:

"*1. Arrangement for the parallel testing of a plurality of building blocks of a material library for performance characteristics, the arrangement having a block containing at least two heating/cooling modules (200) and at least one reaction module (100) comprising reaction channels (110), wherein each reaction module (100) being laterally bordered by at least two heating/cooling modules (200), wherein the heating/cooling modules each have a plurality of heating elements and/or cooling elements (220,230,240,250) which in each case are controllable independently of one another, wherein internal tubes (120) are inserted into said reaction channels (110), wherein the reaction channels (110) and the internal tubes (120) are open on both ends.*".

III. The Examining division found that the feature of such claim 1 that "*the internal tubes (120) are open on both ends*" had no basis in the application as originally filed and, thus, that this claim did not comply with the requirement of Article 123(2) EPC 1973. Moreover, the Examining division considered the claimed subject-matter lacking an inventive step because the feature establishing the novelty of the claimed arrangement over the closest prior art disclosed by

document (3) = EP-A-0 963 791

would not contribute to solve the technical problem underlying the invention of imposing a temperature profile along the reaction path.

IV. The Applicant (hereinafter "Appellant") lodged an appeal against this decision filing, *inter alia*,

document (6) = EP-A-0 971 225

as well as new sets of amended claims and a statement by a technical expert Armin Brenner, one of the inventors of the refused application, as to the temperature constraints associated to the use of Peltier elements for heating/cooling and to their unsuitability for use in apparatuses for testing catalysts.

During the oral proceedings held before the Board on 28 May 2008 the Appellant replaced all previously filed requests by five sets of amended claims respectively labelled as main request and auxiliary requests 1 to 4. It also expressly agreed to take into consideration

document (7) = WO 99/19724,

i.e. a prior art document concerning ceramic modules acknowledged in the application (see page 2, lines 8 to 13 of the application as originally filed and internationally published).

V. Claim 1 of the main request reads as follows:

"*1. Arrangement for the parallel testing of a plurality of building blocks of a library of heterogeneous or heterogenized catalysts for performance characteristics, the arrangement having a block containing:*
(i) at least one reaction module (100) and
(ii) at least two heating/cooling modules (200), wherein each reaction module has two or more reaction channels (110), and
wherein the reaction and the heating modules are not permanently connected to one another, and
wherein at least one reaction module (100) and/or the heating/cooling modules (200) have at least one temperature sensor,
and wherein each heating/cooling module (200) has a plurality of heating elements and/or cooling elements, each of which can be controlled independently of one another."

The remaining claims 2 to 10 of the main request describe preferred embodiments of the arrangement of claim 1.

VI. The Appellant argued in respect of the patentability of the main request by presenting the following arguments.

The wording of claim 1 would be based on original claims 1, 3, 7, 8 and 12 as well as on the original description at page 3, lines 32 and 33, page 4, lines 16 to 19, page 8, lines 29 to 30, and page 11, lines 23 to 25. Claim 9 would be supported by the original claim 12 and the remaining claims 2 to 8 and 10 of the main request would respectively be identical to the original claims 2, 4 to 6, 9 to 11 and 13 renumbered.

In respect of the novelty of the claimed subject-matter the Appellant considered that document (3) would not disclose any multi-channel reaction module not permanently connected to the heating/cooling modules.

The claimed arrangement would also differ from those of document (7), wherein the heating elements were integrated in the same module(s) containing the reaction channels. Similarly, document (6) only disclosed monolithic apparatuses containing a plurality of reaction and heating channels integrated in the same block.

The sole prior art relevant for the inventive step assessment would be one relating to the parallel testing of heterogeneous catalysts. Hence, the skilled person would have started from the prior art acknowledged in the application and/or disclosed in documents (6) or (7). To the contrary, he would not have considered the reactors heated/cooled with Peltier elements, such as those disclosed in document (3)

because, as indicated in the statement by the technical expert and inventor Armin Brenner, the Peltier elements would at most allow to reach temperatures of about 150°C and, thus, would be unsuitable for testing heterogeneous catalysts which normally require reaction temperatures from 200°C to 1000°C.

The Appellant considered document (6) as the most reasonable starting point for the assessment of inventive step. However, the Appellant admitted at the hearing that the claimed subject-matter was intended to encompass whatever arrangement allowed the imposition of some kind of temperature profile and, thus, possibly also arrangements suitable for imposing, for instance, an individual temperature control in each of the reaction channels, as e.g. in the multi-channel arrangements for catalyst testing of figures 23 to 25 of document (7).

Nevertheless, the testing arrangements according to the present invention provided over the testing apparatuses of documents (6) and (7) the non-obvious solution to the problem of rendering easier any work on the heating elements that could become necessary, e.g., for their maintenance.

Since the prior art did not contain any suggestion to modify the apparatuses of this prior art as requested by the claims, the claimed subject-matter involved an inventive step.

VII. The Appellant requested that the decision under appeal be set aside and a European patent be granted on the basis of the main request or alternatively according to

any of the auxiliary requests 1 to 4, all requests submitted during oral proceedings.

Reasons for the Decision

Main request

1. Admissibility of the main request in view of Articles 84 EPC 1973 and 123(2) EPC.

The Board is satisfied that the wording of the claims of the main request is clear and supported by the portions of the original application identified by the Appellant (see above sections V and VI of the Facts and Submissions). No further details need to be given in these respects since the claims of the present main request no longer contain the wording that had been found to violate Article 123(2) EPC 1973 by the Examining division (see sections II and III of the Facts and Submissions).

2. *Novelty*

2.1 The arrangement defined in claim 1 of the main request (see above section V of the Facts and Submissions) is a modular apparatus suitable for the parallel testing of heterogeneous catalysts characterized by the mandatory presence of a block containing

a) at least one reaction module containing a plurality of reaction cavities (channels) in which the catalysed reactions may take place,

b) a plurality of heating/cooling modules that, beside comprising each a plurality of independently controllable heating/cooling elements, are also not permanently connected to the reaction module(s)

and

c) at least one temperature sensor within any of a) or b).

2.2 The Board notes that each modular block assembly disclosed in document (3) contains only one reaction vessel associated with its own heating elements (see document (3) e.g. portion 21 of figure 3 and the section with three reaction containers 93 depicted in figure 4). Hence, the Board concurs with the Appellant that these apparatuses of the prior art contain no *reaction module* in the sense of claim 1 of the application comprising a plurality of reaction cavities distinct from the heating/cooling modules.

2.3 Moreover, neither the monolithic arrangement of document (6) (wherein the heating/cooling elements and the reaction channels are integrated, see document (6) paragraph 47 and figure 1), nor the modular multi-channel catalyst testing apparatus disclosed in document (7) (that, as evident from the combination of page 31, lines 12 to 16, with figures 23 to 25 of this document, is provided with temperature sensors and heating elements integrated in each reaction channel for an independent temperature control) contains a plurality of heating/cooling modules each comprising a plurality of heating/cooling elements and not

permanently connected to the modules in which the catalysed reaction may occur.

2.4 Also the remaining prior art documents considered during the substantive examination lack one or more of the features of the claimed arrangement identified above at point 2.1.

2.5 The Board concludes, therefore, that the arrangement defined in claim 1 according to the Appellant's main request is novel over the cited prior art. The same applies to the preferred embodiments thereof defined in the remaining claims of the main request.

3. *Inventive step*

3.1 According to the established jurisprudence of the Boards of appeal of the EPO, the appropriate starting point for the inventive step assessment is to be identified within the same technical field of the claimed subject-matter by taking into account the specific technical problem mentioned in the application.

3.2 The subject-matter of claim 1 is limited to arrangements suitable for the **parallel testing of heterogeneous catalysts**. Accordingly, the description of the application as originally published, after having indicated at page 1, lines 13 to 16, that:

"*For arrangements such as industrial reactors, for example, the optimum temperature profiling, in many applications, for example heterogeneously catalysed reactions, is of great importance for conversion rate, selectivity and space-time yield of a defined reaction*"

states at page 2, lines 33 to page 3, line 2, that

"*None of the reactor variants described in the prior art solves the problem of imposing a defined temperature profile. The object therefore underlying the present invention is to provide an improved arrangement which is suitable, inter alia, for carrying out the testing of building blocks of a material library with imposition of any predetermined, preferably precisely defined, temperature profile and maintaining the temperature profile during the testing*".

Hence, according to the application, a main advantage of the claimed arrangement consists in allowing the imposition of whatever needed temperature profile in the reaction module(s).

In this respect, it is important to stress that neither the wording of the claims nor the description of the application justify a restrictive interpretation of the claimed subject-matter, as if it would only encompass arrangements suitable for producing the kind of temperature profile disclosed in figure 3 of the application.

This is evident already from the fact that the above-cited expression "*any predetermined, preferably precisely defined, temperature profile*" implies the recognition that a multiplicity of temperature profiles is possible.

Moreover, the whole application defines exclusively as "*preferable*" any further features of the claimed

arrangement not already present in claim 1, such as the tubular, continuous and/or open structure of the reaction channels or the orientation of the heating/cooling element perpendicularly to the reaction streams features (see e.g. page 6, lines 16 to 19, page 8, lines 33 to 35, and page 9, lines 5 to 8).

Hence, the disclosure of the application as a whole is neither explicitly nor implicitly limited to the arrangements suitable for imposing the (preferred) temperature profile along the open tubular reaction channels during the passage of reacting streams as depicted in particular in figure 3 (such temperature profiles are indicated hereinafter as "vertical temperature profiles").

Moreover, in the opinion of the Board, the very fact that the open tube form for the reaction channels and heating/cooling elements as well as their relative perpendicular orientation are described as "*preferable*" in the application, would inevitably prompt the skilled reader thereof to pose himself the question as to the possible nature of the other possible construction alternatives. An almost self-evident answer to this question appears to be that of rotating of 90° the disk-like heating/modules of e.g. figures 1 or 2, so as to render their heating/cooling elements parallel to the channels of the reaction modules. Even though such an evident alternative arrangement cannot be used to impose vertical temperature profiles, it apparently still allows for other sorts of temperature profiles in the testing apparatus (i.e. with temperatures differing from one reactor to the other, or changing with time in each reactor; such temperature profiles are indicated

hereinafter as "horizontal temperature profiles"). Thus, nothing in the application would render illogical or technically unrealistic for the skilled reader to assume that the claimed subject-matter also encompasses, for instance, such alternative arrangements as well.

Hence, the Board concludes that the application identifies one of the major advantage of the apparatuses of the invention in the possibility of imposing thereto whatever needed temperature profile (and not exclusively the vertical ones).

3.2.1 The Board also notes that the original application extensively refers to other advantages of the modular structure of the claimed arrangement. In particular the description of the application states at page 11, lines 1 and 2, that:

"*Owing to the modular construction, good accessibility of all parts is ensured*"

and further specifies at lines 13 to 28 on the same page that:

"A further great advantage is the use of the modular heating elements. … The modular structure ensures a great ease of maintenance, … Further work which is also necessary on the modular heating elements is also made considerably easier".

3.2.2 In view of the above considerations, the Board concludes that the technical problem underlying the invention is twofold: on the one side, that of imposing temperature profiles (whatever needed) during the

parallel testing of heterogeneous catalysts and, on the other side, that of ensuring easier maintenance and use of the testing apparatus.

3.3 It is acknowledged in the first two pages of the application as filed that arrangements expressly qualified as suitable for parallel testing heterogeneous catalyst were already known in the prior art (see page 1, line 34 to page 2, line 28).

In particular, the application refers to two sorts of such apparatuses: the monolithic constructions, such as that disclosed in document (6), and the modular constructions, such as those disclosed in document (7).

Furthermore, the application recognises at page 2, lines 8 to 13, the advantages in terms of easy of access to the reaction channels (and thus implicitly also in terms of their maintenance) of the apparatuses of document (7). These advantages are particularly apparent in the modular multi-channel constructions depicted in figures 23 to 25 of document (7).

The monolithic apparatus of document (6) would be instead much less easy to use and maintain.

Moreover, while both documents (6) and (7) disclose the possibility of imposing a single homogeneous temperature over the whole construction, only document (7) discloses the possibility of having a different temperature in each reaction channel, i.e. the possibility of imposing a (horizontal) temperature profile (see document (7) the disclosure at page 31, lines 12 to 16, being manifestly applicable to the

modular multi-channel embodiments of e.g. the previously described figures 23 to 25).

Hence, the Board finds that the most reasonable starting point for the inventive step assessment is represented by the modular multi-channel arrangements provided with independently controllable heating elements and temperature sensors at each reaction channel disclosed in document (7), because these apparatuses address substantially the same technical problems mentioned in the patent in suit.

3.3.1 The Board considers instead the arrangements for simultaneously carrying out a plurality of reactions disclosed in document (3), all based on the use of thermoelectric heaters and coolers (see document (3) paragraph 20) that are also known as Peltier elements, as not being a relevant prior art for the present case. As a matter of fact such document, beside being silent as to a possible use of such arrangements for carrying out reactions promoted by heterogeneous catalysts, indicates explicitly at column 4, lines 52 to 57, that the temperature in the used reaction vessels may range from -20°C to 140°C. This disclosure thus is consistent with the technical expert statement filed with the grounds of appeal that Peltier elements are known to reach a maximum temperature of 150°C, (see the statement by Armin Brenner page 2, second paragraph). Moreover, there is no reason for disputing the further statement of the technical expert that many heterogeneous catalytic reactions would often require temperatures between 200°C and 1000°C. Hence, in the absence of any evidence to the contrary, the Board finds credible that the apparatuses disclosed in

document (3) would not be considered by the skilled person looking for ways to improve arrangements suitable for testing any heterogeneous catalyst.

3.4 The Board notes that the sole feature distinguishing the claimed subject-matter from the apparatuses of document (7) is that identified already above at point 2.3: i.e. the presence of a plurality of heating/cooling elements not permanently connected to the reaction modules and each containing a plurality of heating/cooling elements.

Even though, as discussed above (see point 3.3), the arrangements of this prior art allow the imposition of a (horizontal) temperature profile and an easy maintenance of the reaction channels, it is evident that the presence of disconnectable separate heating/cooling modules in the claimed invention renders more easy, for instance, the separate maintenance and/or replacement of the heating/cooling elements in comparison with the arrangements of document (7) wherein each module contains integrated both the reaction channels and the heating elements.

Hence, in view of this difference, it is apparent that the claimed subject-matter credibly solves the technical problem underlying the invention of **ensuring easier maintenance and use of the heating/cooling elements** of the apparatuses suitable for parallel testing of heterogeneous catalysts.

3.5 Therefore, the inventive step issue boils down to the question as to whether or not the person skilled in the art would have displaced the independently controllable

heating elements that were integrated at each reaction channel in the multi-channel modules of document (7) into distinct modules not permanently connected to the module containing the reaction channels, in the reasonable expectation of improving the use and maintenance of the heating elements while retaining their ability of imposing a temperature profile.

3.6 The Board notes that document (3) is the sole available document disclosing the use of separate heating/cooling modules. However, as indicated already above (see point 3.3.1), this document is not a document that the skilled person would have taken into consideration in the present case.

3.7 Moreover, none of the available documents belonging to the relevant technical field of testing heterogeneous catalysts discloses a construction in which independently controllable heating/cooling elements are allocated into distinct modules not containing any reaction channel. Therefore, the skilled person would not have found any suggestion in the prior art about how to modify the arrangements of document (7) in order to solve the underlying technical problem and would at most have turned to other arrangements known in the art, which are different from that as defined in claim 1 of the Appellant's main request.

3.8 Hence, the Board concludes that the subject-matter of the claims of the Appellant's main request is based on an inventive step and, thus, this request complies also with the requirements of Article 56 EPC 1973.

Order

For these reasons it is decided that:

The decision under appeal is set aside.

The case is remitted to the department of first instance with the order to grant a patent on the basis of claims 1 to 10 according to the main request filed at the oral proceedings, a description to be adapted thereto and figures 1 to 4 as originally filed.

The Registrar: The Chairman:

G. Rauh L. Li Voti