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# D E C I S I O N
# of 19 May 2004

**Case Number:** T 0096/01 - 3.4.2

**Application Number:** 93301319.5

**Publication Number:** 0559362

**IPC:** G01N 25/48

**Language of the proceedings:** EN

**Title of invention:**
Method and apparatus for modulated differential analysis

**Patentee:**
TA INSTRUMENTS, INC.

**Opponent:**
Mettler-Toledo GmbH
PerkinElmer LAS, Inc.

**Headword:**
-

**Relevant legal provisions:**
EPC Art. 100(c), 123(2), 112(1)(a)

**Keyword:**
"Opposition grounds - extension of subject-matter (yes, all requests)"
"Referral to the Enlarged Board of Appeal (no) - no bearing on the outcome of the appeal"

**Decisions cited:**
-

**Catchword:**
-

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Beschwerdekammern | Boards of Appeal | Chambres de recours

**Case Number:** T 0096/01 - 3.4.2

# D E C I S I O N
**of the Technical Board of Appeal 3.4.2**
**of 19 May 2004**

| | |
|---|---|
| **Appellant:** (Proprietor of the patent) | TA INSTRUMENTS, INC.<br>109 Lukens Drive<br>New Castle<br>Delaware 19720 (US) |
| **Representative:** | Tönhardt, Marion, Dr.<br>Forrester & Boehmert<br>Pettenkoferstrasse 20-22<br>D-80336 München (DE) |
| **Respondent:** (Opponent) | Mettler-Toledo GmbH<br>Im Langacher<br>CH-8606 Greifensee (CH) |
| **Representative:** | Kraus, Jürgen Helmut, Dipl.-Phys. Dr.<br>Leinweber & Zimmermann<br>Rosental 7<br>D-80331 München (DE) |
| (Opponent) | PerkinElmer LAS, Inc.<br>549 Albany Street<br>Boston MA 02118 (US) |
| **Representative:** | Grünecker, Kinkeldey<br>Stockmair & Schwanhäusser<br>Anwaltssozietät<br>Maximilianstrasse 58<br>D-80538 München (DE) |
| **Decision under appeal:** | **Decision of the Opposition Division of the European Patent Office posted 27 October 2000 revoking European patent No. 0559362 pursuant to Article 102(1) EPC.** |

**Composition of the Board:**

**Chairman:** A. G. Klein
**Members:** F. J. Narganes-Quijano
M. J. Vogel

## Summary of Facts and Submissions

I. The appellant (patent proprietor) lodged an appeal against the decision of the opposition division revoking European patent No. 0559362 based on European patent application No. 93301319.5.

The oppositions filed by respondent I (opponent I) and respondent II (opponent II) against the patent as a whole were based on the ground of inadmissible extension of subject-matter (Article 100(c) EPC) and on the grounds of lack of novelty and lack of inventive step (Article 100(a) EPC). The ground for opposition under Article 100(c) EPC was raised and substantiated in respect of several features of claim 1 as granted, and in particular in respect of the claimed feature relating to the differential signal being processed "to produce at least one derived signal component which is a direct function of the component at the rate of underlying change of the driving variable".

In the decision under appeal the opposition division held that the subject-matter of claim 1 as amended during the first-instance proceedings did not involve an inventive step (Article 56 EPC) with regard to the prior art cited in the decision and concluded that the ground for opposition under Article 100(a) EPC prejudiced the maintenance of the patent as amended (Article 102(1) EPC). As regards the grounds for opposition under Article 100(c) EPC, the opposition division omitted to comment on the objection raised in respect of the above-mentioned feature relating to the derived signal component and held that the remaining

objections would not have prejudiced the maintenance of the patent in amended form.

II. Oral proceedings before the Board were held on 19 May 2004 in the presence of the parties.

The appellant requested that the decision under appeal be set aside and that the patent be maintained in amended form on the basis of the amended set of claims 1 to 20 filed with the statement of grounds of appeal as a main request, or on the basis of one of the amended sets of claims 1 to 20 according to first to third auxiliary requests filed with the letter dated 16 April 2004.

Respondent I and respondent II both requested that the appeal be dismissed. In addition, respondent II maintained on an auxiliary basis the two following requests 2a and 2aa previously formulated in the letter dated 19.04.2004:

request 2a: that "the Board declare that claim 1 [amended according to the appellant's requests] has to fulfil the requirements of Article 84, Article 83, and Article 123(2) EPC, although claim 1 is a combination of claims 1, 2, 3, and 15 as granted", and

request 2aa: should the Board be unable to grant request 2a, the following question be referred to the Enlarged Board of Appeal: "Does a claim which is not a granted independent claim but is a combination of claims of the patent as granted in accordance with cross-references therein, and which has been made to an independent claim during opposition

proceedings, have to fulfil the requirements of Articles 84, 83 and 123(2) EPC ?".

At the end of the oral proceedings the Board gave its decision.

III. Claim 1 according to the main request of the appellant reads as follows:

" A method of analysing a material that undergoes a transition as a function of the temperature, comprising the steps of:

(a) placing a sample of the material in an apparatus for detecting differential changes of the heat flow to and from the sample with respect to a reference as a function of the temperature;

(b) varying the temperature with a modulation function, said modulation function having a pre-selected modulation frequency and modulation amplitude;

(c) determining or monitoring a signal representative of differential changes in the heat flow caused by the variation of the temperature;

(d) processing the differential signal to produce at least one derived signal component which can be utilised or analysed or compared with another signal,

characterised in that

the temperature is varied with a first component at an underlying rate of change modulated by said modulation function as a second component;

the derived signal component is a direct function of the component at the rate of underlying change of the temperature; and

the processing step involves deconvoluting the differential signal to separate the dependence of the heat flow on the temperature into two or more component parts which can be utilised or analysed separately or compared. "

Claim 1 according to each of the first to third auxiliary requests differs from claim 1 of the main request - apart from minor amendments having no bearing on the present decision - in that the second of the characterising clauses of the claim worded "the derived signal component is a direct function of the component at the rate of underlying change of the temperature" has been replaced in the first to third auxiliary requests by the following respective wording:

"the derived signal component is a direct function of the first temperature component, i.e. it is representative of an underlying DC heat flow that is directly dependent on the underlying DC temperature component",

"the derived signal component is a function of the first temperature component such that the derived signal is representative of an underlying DC heat flow that changes measurably when the first underlying DC temperature component changes measurably", and

"the derived signal component is a function of the first DC temperature component such that the derived signal is representative of an underlying DC heat flow that is proprtional to the first DC temperature component in temperature intervals where no transition is occurring".

IV. During the written and the subsequent oral proceedings the parties made detailed submissions concerning the compliance of the appellant's requests with the formal and the substantive requirements of the EPC (Articles 83, 84, 123(2) and 123(3), and Articles 52(1) and 56 EPC). The arguments of the parties in support of their respective requests, as far as they concern issues which are relevant to the present decision, can be summarized as follows:

*Appellant's arguments:*

As disclosed in the equation in column 6 of the patent specification and the corresponding passage of the application as originally filed, the heat flow out of the sample can be expressed as follows:

$$dQ/dt = - dT/dt\ f_r(t,T) + f_n(t,T) \qquad [1]$$

where the two components $dT/dt\ f_r(t,T)$ and $f_n(t,T)$ designate the rapidly and the non-rapidly reversible components, respectively. In addition, according to the invention as defined in the patent and in the original application the temperature T(t) is varied according to a first component $T_u(t) = T_0 + f_u(t)$ at an underlying rate of change and modulated by a second component $T_{mod}(t) = A\ F_{mod}(\omega,t)$, where $T_0$ is a constant, and A and $\omega$ represent the pre-selected modulation amplitude and modulation frequency, respectively, i.e.

$$T(t) = T_u(t) + T_{mod}(t) = T_0 + f_u(t) + A\ F_{mod}(\omega,t). \qquad [2]$$

It follows from the expressions [1] and [2] that

$$dQ/dt = - df_u(t)/dt\ f_r(t,T) + \qquad [3]$$
$$- A\ dF_{mod}(\omega,t)/dt\ f_r(t,T) + f_n(t,T).$$

The differential signal can therefore be resolved in AC and DC components, and the rapidly reversible component is dependent on $df_u(t)/dt$ as specified in claim 1 according to each of the requests. In addition, a signal processed so as to be dependent on the derivative of a function is also dependent on the function itself.

The term "direct function" designates a function of a variable and in the context of claim 1 of the main request the term simply means that an expression may be written that directly expresses the dependence of the derived signal component on the heating rate dT/dt as explicitly shown in equations [1] and [3] above. The ability to explicitly express the dependence of the heat flow signal on the different components of the temperature variation is an important requirement that allows deconvolution of the signal to separate the dependence of the heat flow on the temperature into component parts, i.e. to separate the two fundamentally different contributions to the heat flow, namely the rapidly reversible contribution that derives from the heat capacity and the non-rapidly reversible contribution that derives from kinetic processes.

*Arguments of respondent I:*

The application as originally filed discloses the derivation of signal components that are either a function of the overall temperature T(t) as it is the case with the component $f_n(t,T)$, or a function of the rate of change of the temperature as it is the case with the component dT/dt $f_r(t,T)$. However, whatever the precise meaning of the expression "direct function", there is no basis in the application as originally filed for the feature of claim 1 according to the main request that the derived signal component is "a direct function of the component at the rate of underlying change of the temperature". The same applies to the corresponding feature of claim 1 amended according to each of the first to third auxiliary requests.

*Arguments of respondent II:*

Claim 1 amended according to the main request does not comply in several respects with the requirements or Articles 83, 84 and 123(2) EPC, and in particular in respect of the feature relating to the expression "direct function". In addition, the claim results from amendments to claim 1 as granted and therefore all these objections should be admitted in the proceedings pursuant to Article 102(3) EPC, regardless of whether in substance the claim results from the combination of claims as granted in accordance with cross-references therein. Should the Board consider some of these objections as not admissible, then the fact that different boards have followed different approaches in this respect would justify in the present case the referral of the question to the Enlarged Board of

Appeal pursuant to Article 112(1) (a) EPC. In addition, the amended formulation of the feature relating to the expression "direct function" in claim 1 amended according to each of the first to third auxiliary requests gives rise to additional objections under Articles 84, 123(2) and 123(3) EPC.

## Reasons for the Decision

1. The appeal is admissible.

2. *Appellant's main request - Article 100(c) EPC*

2.1 Claim 1 amended according to the appellant's main request results, in essence, from the combination of claim 1, 2, 3 and 15 as granted and is directed to a method of analysing a material sample. According to the claimed method, a signal representative of the differential changes of the heat flow to and from the material with respect to a reference sample, i.e. dQ/dt in the terminology of the appellant (see point IV above), is detected and monitored as the temperature T(t) is varied according to a first component $T_u(t)$ at an underlying rate of change $dT_u(t)/dt$ modulated by a modulation function $T_{mod}(t)$ as a second component, the signal being then processed by deconvolution to separate the dependence of the heat flow on the temperature into two or more components.

The amended claim also specifies that "the derived signal component is a direct function of the component at the rate of underlying change of the temperature". This feature of claim 1 results from the combination of

the feature of claim 1 as granted according to which the derived signal components is "a direct function of the component at the rate of underlying change of the driving variable" and the feature of dependent claim 2 as granted that "the driving variable is temperature".

In its notice of opposition respondent I objected under Article 100(c) EPC with respect to, *inter alia*, the above-mentioned feature of claim 1 as granted and submitted in support of this objection that there was no basis in the application as originally filed for processing the differential signal so as to obtain a signal that is a direct function of the component at the rate of underlying change of the driving variable, the latter being exemplified in the original application as the variable temperature (column 3, lines 32 to 38 and column 8, lines 21 to 25). Accordingly, the objection initially raised by respondent I in its notice of appeal already addressed the case in which the driving variable is the temperature and the objection also applies to the corresponding amended feature of present claim 1. The Board also notes that this objection, although addressed and discussed during the first-instance proceedings, was not - unlike other objections raised under Article 100(c) EPC - considered in the decision under appeal (see point I above). However, since the aforementioned objection was already raised and substantiated with the notice of appeal and thus constitutes a ground potentially prejudicing the maintenance of the patent (Article 102 EPC) and, in addition, the assessment of the grounds for opposition under Article 100(a) EPC relied upon in the contested decision for the revocation of the patent depends on

the objected feature, the fact that the opposition division failed to address the objection in its decision does not preclude consideration of the objection within the factual and legal framework of the present appeal.

2.2 During both the first-instance and the appeal proceedings the respondents disputed that the expression "direct function" in the feature of claim 1 mentioned above was clear and had a precise meaning. This expression was already present in both the patent and the original application and according to the appellant the corresponding claimed feature should be construed in the sense that an expression may be written that directly expresses the dependence of the derived signal component on the component at the rate of underlying change. Notwithstanding the respondents' objections, it is apparent from the submissions made by the parties during the proceedings in respect of the remaining formal and substantive requirements of the EPC that the parties concurred in construing the expression "direct function" in the context of the claim as at least expressing a functional dependence of the derived signal component on the component at the rate of underlying change of the temperature. Accordingly, the following assessment of whether the grounds for opposition under Article 100(c) EPC prejudices the maintenance of the patent will rely, regardless of the precise meaning of the expression "direct function", on this construction of the claimed feature.

2.3 According to the application as originally filed the signal representative of the differential changes of the heat flow dQ/dt to and from the sample is first determined. There are, however, two different kinds of physical and chemical phenomena occurring in the sample that contribute to the heat flow: on the one hand, rapidly reversible processes, i.e. thermodynamically reversible processes which occur rapidly relative to the rate of change of the temperature (column 3, lines 44 to 56) and, on the other hand, non-rapidly reversible processes such as thermodynamically irreversible processes and thermodynamically reversible processes that reverse very slowly relative to the rate of change of the temperature (column 3, line 57 to column 4, line 13).

The rapidly and the non-rapidly reversible processes occur simultaneously or overlap each other in temperature and time (column 3, lines 8 to 15, and column 6, lines 26 to 43) and, in order to separate the respective contributions of these processes to the differential changes of the heat flow, the application proposes processing the signal representing the differential changes in the heat flow dQ/dt so as to deconvolute and resolve the signal into a rapidly reversible and a non-rapidly reversible signal component (column 4, lines 14 to 22, and column 5, lines 14 to 53 together with column 10, line 15 to column 12, line 4 and example 2), whereby

(a) the rapidly reversible signal component is by definition "a direct function of the rate of change of the driving variable" (column 3, lines 44 to 56) and is identified with the component part of the differential signal "which

is dependent on heating rate" (column 5, equation (1) and lines 42 to 46), i.e. dependent on the rate of change dT(t)/dt of the temperature T(t), and more particularly dependent on the underlying heating rate $dT_u(t)/dt$ in accordance with the deconvolution method exemplified in the application (column 11, lines 53 to 56), and

(b) the non-rapidly reversible signal component is by definition "a direct function of the value of the driving variable" (column 3, line 57 to column 4, line 13) and is identified with the remaining component part of the differential signal, i.e. with that component part which - although being generally dependent on the temperature - "is not dependent on heating rate" dT(t)/dt (column 5, equation (1) and lines 42 to 46).

2.4 The main line of argument of the appellant is that the derived signal component defined in claim 1 is a function of the rate of underlying change of the temperature, i.e. of $dT_u(t)/dt$, and that this signal component corresponds to the rapidly reversible signal component disclosed in the original application. However, the strict, literal meaning of the wording used in the claim as it stands identifies the "component at the rate of underlying change of the temperature" with the first component of the temperature, i.e. with $T_u(t)$, and not with the rate $dT_u(t)/dt$ of underlying change of the temperature. It follows that, contrarily to the appellant's submissions, the derived signal component defined in present claim 1 is - regardless of the precise meaning of the expression "direct function", see point 2.2 above - a signal component functionally dependent on the first

component of the temperature, i.e. on $T_u(t)$. In addition, according to the original application (see paragraph 2.3-a above) the rapidly reversible signal component is the contribution to the differential signal that depends on the rate dT(t)/dt of change of the temperature or, as is corroborated by the mathematical derivation submitted by the appellant (see point IV above), on the rate $dT_u(t)/dt = df_u(t)/dt$ of underlying change of the temperature, and the rapidly reversible signal component can therefore not be identified with the derived signal component defined in claim 1 as being dependent on $T_u(t)$.

The appellant has also submitted that a signal processed so as to be dependent on the derivative of a function is also dependent on the function itself. The Board, however, cannot follow this submission. A signal dependent on the derivative of a function such as $T_u(t)$, i.e. dependent on $dT_u(t)/dt$, cannot be properly considered as being dependent on the function $T_u(t)$ as evidenced by the fact that in the mathematical derivation presented by the appellant (see point IV above) the signal component dependent on $dT_u(t)/dt$ is not dependent on the constant term $T_0$ of the function $T_u(t)$ and therefore is not dependent on the function $T_u(t)$ itself. In addition, the identification of a signal component dependent on the variable temperature (such as the derived signal component defined in claim 1) with a signal component dependent on the rate of variation of the temperature (such as the rapidly reversible signal component defined in the original application) is manifestly at variance with the essential aspect of the invention identified by the appellant (see point IV above) that the contributions

to the differential heat flow signal of the rapidly and the non-rapidly reversible processes occurring in the sample are separated from each other by resolving the differential signal into the corresponding signal components precisely according to their functional dependency on the rate dT(t)/dt of variation of the temperature (see paragraphs 2.3-a and b above).

Therefore, the derived signal component defined in claim 1 and dependent on $T_u(t)$ cannot be identified with the rapidly reversible signal component disclosed in the application as originally filed.

In addition, the derived signal component defined in claim 1 cannot be identified either with the non-rapidly reversible signal component which by definition is dependent on the overall temperature, i.e. on T(t) (see paragraph 2.3-b above). Although the temperature component $T_u(t)$ at the rate of underlying change of temperature is a component of the overall temperature $T(t) = T_u(t) + T_{mod}(t)$, there is no disclosure in the application as originally filed addressing or singling out the dependence of the non-rapidly reversible signal component or of any other processed signal component on the component of the temperature at the rate of underlying change, i.e. on $T_u(t)$.

2.5 Apart from the passages of the application as originally filed referred to in points 2.3 and 2.4 above, the appellant has failed to point to any other passage that would have provided a support for processing the differential signal so as to obtain a signal component dependent on the component at the rate of underlying change of the temperature as claimed.

Accordingly, the feature of claim 1 of the main request relating to a derived signal component being "a direct function of the component at the rate of underlying change of the temperature" extends, regardless of the precise meaning of the expression "direct function" (see point 2.2 above), beyond the content of the application as originally filed. For this reason, the main request cannot be allowed.

3. *Appellant's first to third auxiliary requests - Article 100(c) EPC*

The feature of claim 1 of the main request considered in point 2 above has been amended in claim 1 according to each of the first to third auxiliary requests (see point III above) for the purpose of clarifying in what respect the derived signal component is a "direct function" of the component at the rate of underlying change of the temperature. Nonetheless, the amended feature in each of the versions according to claim 1 of each of the first to third auxiliary requests still expresses - and even emphasizes - the functional dependence of the derived signal component on the "first temperature component" which according to the literal meaning of the wording of the respective claim corresponds to the first component of the temperature at the underlying rate of change, i.e. with $T_u(t)$. As concluded in point 2 above, however, there is no basis in the original disclosure for processing the differential signal so as to obtain a signal component having such characteristics. Consequently, the subject-matter of claim 1 amended according to each of the first to third auxiliary requests extends beyond the

content of the application as originally filed, regardless of whether the additional amendments comply with the requirements of the EPC as disputed by respondent II.

4. Having regard to the above, none of the amendments to claim 1 according to the main and the first to third auxiliary requests overcome the grounds for opposition raised under Article 100(c) EPC with respect to claim 1 as granted. Consequently, the ground for opposition under Article 100(c) EPC initially invoked by respondent I in its notice of appeal prejudices the maintenance of the patent as amended according to the present requests of the appellant (Article 102(1) EPC) and for this reason the appeal cannot be allowed.

As the appeal is not found allowable, there is no need to consider the additional grounds for opposition and the remaining objections relied upon by the respondents in the course of the proceedings.

5. *Auxiliary requests of respondent II*

The requests of respondent II to the effect that the Board issued a "declaration" according to request 2a or that a question be referred to the Enlarged Board of Appeal pursuant to Article 112(1) (a) EPC according to request 2aa were only made on an auxiliary basis in the event that the respondent's main request for dismissal of the appeal were not to be allowed by the Board (see point II above). The main request of respondent II is, however, being allowed by the Board. In addition, the issues addressed by respondent II in auxiliary requests 2a and 2aa are unrelated to those considered in

points 2 to 4 above relating to the ground for opposition under Article 100(c) EPC and therefore have no actual bearing on the outcome of the present appeal. Consequently, there is no need for the Board to consider the auxiliary requests of respondent II.

## Order

## For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

P. Martorana A. G. Klein