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**Datasheet for the decision
of 25 March 2014**

Case Number: T 1119/10 - 3.4.02

Application Number: 99951485.4

Publication Number: 1114308

IPC: G01N5/04, G01N22/04

Language of the proceedings: EN

Title of invention:

METHOD AND APPARATUS FOR MEASURING VOLATILE CONTENT

Applicant:

CEM Corporation

Headword:

Relevant legal provisions:

EPC Art. 56

Keyword:

Inventive step - (yes)

Decisions cited:

Catchword:



**Beschwerdekammern
Boards of Appeal
Chambres de recours**

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Case Number: T 1119/10 - 3.4.02

D E C I S I O N
of Technical Board of Appeal 3.4.02
of 25 March 2014

Appellant:
(Applicant)

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Decision under appeal:

**Decision of the Examining Division of the
European Patent Office posted on 8 December 2009
refusing European patent application No.
99951485.4 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chairman: A. Klein
Members: F. Maaswinkel
D. Rogers

Summary of Facts and Submissions

- I. The appellant lodged an appeal against the decision of the examining division, refusing the European patent application 99951485.4. This patent application relates to an apparatus for measuring the moisture or volatile content of a sample in analytical laboratories.

According to the decision, the subject-matter of method claim 1 did not involve an inventive step within the meaning of Article 56 EPC having regard to a combination of the disclosures in documents D4 and D5:

D4: GB-A-2 202 054

D5: WO97/13137.

In addition objections under Article 84 and 123(2) EPC were raised against independent method claim 10.

- II. With the notice of appeal the applicant requested that the appealed decision be set aside. With the subsequent letter containing the grounds of appeal the appellant filed two sets of amended claims according to a main and auxiliary request. The main request includes the following documents:

Claims: 1 to 23 of the main request filed with the
Grounds of Appeal of 15 April 2010;

Description: pages 1, 3, 4, 6 to 10 as published;
pages 2, 2.1 and 5 as annexed to the
International Preliminary Examination
Report;

Drawings: sheets 1/2 to 2/2, as published.

- III. The wording of independent claim 1 reads as follows:

" An apparatus for determining the volatile content of samples that tend to burn when heated while monitoring or controlling the sample temperature, the apparatus comprising:

 a cavity (11) in which a sample (12) for which the volatile content is to be determined can be placed;

 an infrared temperature sensor (13) capable of measuring and positioned to measure the temperature of the sample placed within said cavity without contacting the sample, from infrared radiation emitted by the sample;

 an analytical balance (14) for measuring the weight of the sample while the sample is in said cavity;

 a power source (21) for introducing microwaves into said cavity to heat the sample; and

 a processing unit (23) in communication with said temperature sensor, said balance, and said power source for controlling the introduction of microwave energy into said cavity in response to the temperatures measured by said temperature sensor and for determining the volatile content of the sample based on the weight change of the sample on said balance".

The wording of independent claim 10 reads as follows:

"A method for determining volatile content of samples that tend to burn when heated, the method comprising:

 measuring the infrared radiation emitted by a sample using an infrared photosensor during the application of microwaves to determine the temperature of the sample without contacting the sample or anything in contact with the sample;

 measuring the weight of the sample using an analytical balance;

applying microwave energy to the sample at a predetermined power level that heats the sample without burning the sample; and

moderating the microwave energy applied to the sample in response to the temperature determined by the infrared photosensor in a manner that maintains the temperature of the sample at or below a set point, or within a set range, below the temperature at which the sample would burn;

monitoring the weight of the sample with the analytical balance as the microwave energy dries the sample; and

ending the application of microwave power to the sample when sufficient volatiles have been driven from the sample to calculate the volatile content of the sample".

Claims 2 to 9 and claims 11 to 23 are dependent claims.

IV. The appellant's arguments may be summarised as follows:

The claims of the main request differ from the claims considered in the decision by amendments in claim 10 which should overcome the objections under Art. 84 and 123(2) EPC raised in the decision under appeal.

In the decision document D4 was considered to be the closest prior art to the subject-matter of claims 1 and 10. However, this document is not within the same technical field as the claimed invention since in D4 the measuring of "the moisture content of coal and other organic products which decompose and evolve gas when heated" is addressed and the coal samples analysed in D4 are significantly larger than the samples measured by the apparatus and method of the present

invention. In contrast, the claimed invention is directed to accurately and precisely measuring the volatile content of small samples that tend to burn when heated. According to D4 (see page 2, 1st para) "drying to a constant weight is not possible either with a rapid drying process with temperature control or at a constant temperature", therefore D4 explicitly states that the present invention is not possible.

According to the decision, the subject-matter of the independent claims differs from the prior art in that an infrared temperature sensor is used to measure the temperature of the sample without contacting the sample, whereas the temperature sensor in D4 is a contact thermometer placed within the sample. The technical problem addressed by this difference was seen in "providing a more suitable temperature sensor for the purpose of D4". It is submitted that a skilled person would not consider any alternative temperature sensor to be more suitable for the apparatus of D4 since that document explicitly teaches that contact sensors yield a technical benefit (page 4, last two lines and page 5, lines 1 - 2). Furthermore, D4 discloses that a plurality of such contact-based temperature sensors may be necessary to enable the detection of local superheating and subsequent prevention of overheating (page 8, first para). Clearly, in order to reliably detect a local effect a contact sensor should be employed and the skilled person would not have any reason to use a remotely located optical pyrometer as disclosed in document D5. Furthermore, the heating of large samples which is the subject of D4 requires to measure the temperature by a sensor inserted in the sample: a surface temperature measurement (e.g. by infrared radiation measurement) would not be adequate for large, bulky samples,

therefore the skilled person would not consider to use such a measurement in D4. It is noted that in the apparatus disclosed in document D4 ventilation of the measuring chamber is effected continuously with a blower (*page 9, 3d para*), which again illustrates that in D4 large samples are measured, because in case of small samples, measured with an analytical scale (*as in the device and method of the independent claims*) such a blower would affect the precision of the measurement. Finally, D4 relies on the use of gas concentration indicators in combination with the *contact* temperature sensors for regulating the oven heating temperature which again shows that it relates to a different problem. Therefore the claimed subject-matter is novel and involves an inventive step.

Reasons for the Decision

1. The appeal is admissible.
2. Amendments

The board is satisfied that the present application documents comply with the formal provisions of the EPC. In particular the objections against former claim 10 in the decision have been overcome by amending this claim.

3. Patentability

- 3.1 Novelty

- 3.1.1 In the decision under appeal no objections pertaining to lack of novelty have been raised. The examining division based its analysis of patentability on the disclosure in document D4.

3.1.2 Referring to Figure 3 and the description on page 7 of document D4, the examining division identified the following features of claim 1 in document D4:

An apparatus for determining the volatile content of samples that tend to burn when heated while monitoring or controlling the sample temperature (*Abstract of D4*), comprising :

a cavity (*the inside of microwave oven 1, Fig. 3*) in which a sample for which the volatile content is to be determined can be placed (*on sample holder 3*);

a temperature sensor (8, 8A) capable of measuring and positioned to measure the temperature of the sample placed within the cavity;

an analytical balance (4) for measuring the weight of the sample while the sample is in the cavity;

a power source (*generator GM*) for introducing microwaves into the cavity to heat the sample; and

a processing unit (5) in communication with the temperature sensor, the balance, and the power source (see Fig. 3) for controlling the introduction of microwave energy into the cavity in response to the temperatures measured by the temperature sensor (*page 7, last para*) and for determining the volatile content of the sample based on the weight change of the sample on the balance (*page 6, third para, continued on page 7; and page 7, second para, lines 9-13*).

3.1.3 According to the decision, claim 1 differed from the closest prior art document D4 in that it specifies an infrared temperature sensor to measure the temperature of the sample "without contacting the sample, from infrared radiation emitted by the sample", the processing unit then suitable for controlling the introduction of microwave energy "in response to the temperatures measured by said temperature sensor". In

contrast thereto, the temperature sensor in D4 is a contact thermometer placed within the sample.

3.1.4 Therefore the subject-matter of claim 1 is novel over the disclosure in document D4. This similarly applies to the method defined in claim 10. The further documents cited in the International Search Report or during the examination proceedings disclose remote subject-matter.

3.2 Inventive step

3.2.1 In its decision the examining division considered that, starting from the disclosure in document D4, the subject-matter of claim 1 did not involve an inventive step. In particular the technical problem to be addressed would be "providing an alternative, more suitable temperature sensor for the purposes of D4". In the opinion of the examining division, the solution to this problem was obvious from document D5 which disclosed an infrared pyrometer with the advantages of non-invasiveness and a fast response time.

3.2.2 According to the appellant, document D4 does not represent a proper starting point for the discussion of inventive step. Moreover, even in the hypothetical assumption that the discussion of inventive step was to be started from this document as the closest prior art, the skilled person would not consider replacing the contact temperature sensor in the apparatus of D4 by an infrared pyrometer such as disclosed in document D5 since for the purpose of document D4 (*heating and measuring of large samples*) to employ a (*plurality of*) contact temperature sensors was an advantageous choice.

3.2.3 The board concurs with the appellant that document D4 discloses that the use of (a plurality of) contact temperature sensors inserted into the measurement product is an advantageous improvement (D4, paragraph bridging pages 4 and 5) because with such local sensors overheating of the (*large*) measurement product may be detected. Therefore the skilled person would not consider that the device of D4 could be improved by using a pyrometer as in D5 (*as argued in the decision*).

3.2.4 Furthermore, apart from the type of temperature sensors, the board observes that there is a further difference between the subject-matter of claim 1 (*and similarly claim 10*) and the disclosure in document D4 in that the independent claims define the presence of an analytical balance. According to the decision, the corresponding measurement device in the apparatus of D4 was the one labelled as (4) in Figure 3. However, the description of D4 discloses that this device is a "scales" device (*page 7, 2nd para, lines 8 and 11; and claim 1 of D4*) including a sample carrier (3). See also the introductory paragraph at page 1 of document D4 that the weighing device essentially consists of "scales with a scale pan". This supports the appellant's argument that the scales system of D4 is conceived for measuring large (heavy) samples. Also, as schematically indicated in Figure 3, one or more temperature indicators (8,8A) are inserted into the measurement product located in the scale pan, which necessarily influences the reading of the scales (4). In contrast an analytical balance is typically a measurement device for precise measurement of small masses. This is supported by the reference at page 5, lines 12 - 22 of the published patent application to prior art devices disclosing such analytical balance systems, e.g. US-4,457,632, which document discloses in

col. 7, lines 6 - 25 that an "electrobalance" is able to measure a 100mg weight loss and that the preferred sample weight would be in a range between about 1 to 40 grams.

3.2.5 The skilled person would not have an incentive to exchange the scale for the device of document D4 with an analytical balance, since such a balance would also preclude the use of temperature sensors inserted in the sample; also the air flow of the blower in the apparatus of D4 would equally affect the results. The other prior art documents on file do not come closer to the claimed invention.

3.2.6 Therefore the board finds that the subject-matter of independent claim 1 is novel and involves an inventive step. The same conclusion applies to the subject-matter of claim 10 which recites substantially the same limitations in terms of a method.

4. Claims 2 to 9 and claims 11 to 23 are dependent claims and are equally allowable.

5. For the above reasons, the board finds that the appellant's request meets the requirements of the EPC and that a patent can be granted on the basis thereof.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the first instance with the order to grant a patent based on the following documents:

Claims: 1 to 23 of the main request filed with the Grounds of Appeal of 15 April 2010

Description: pages 1, 3, 4, 6 to 10 as published; pages 2, 2.1 and 5 as annexed to the International Preliminary Examination Report;

Drawings: sheets 1/2 to 2/2, as published.

The Registrar:

The Chairman:



M. Kiehl

A. G. Klein

Decision electronically authenticated