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**D E C I S I O N**  
**of 13 March 2000**

**Case Number:** T 0058/97 - 3.2.3

**Application Number:** 91918219.6

**Publication Number:** 0555257

**IPC:** F26B 3/347, C04B 41/00, E04B 1/70

**Language of the proceedings:** EN

**Title of invention:**  
Drying procedure

**Patentee:**  
ELMATEC OY

**Opponent:**  
Munters Oy

**Headword:**  
-

**Relevant legal provisions:**  
EPC Art. 56

**Keyword:**  
"Inventive step - yes (after amendment)"

**Decisions cited:**  
-

**Catchword:**  
-



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Boards of Appeal

Chambres de recours

Case Number: T 0058/97 - 3.2.3

**D E C I S I O N**  
**of the Technical Board of Appeal 3.2.3**  
**of 13 March 2000**

**Appellant:** ELMATEC OY  
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**Respondent:** Munters Oy  
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**Representative:** Niemi, Hakan Henrik  
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**Decision under appeal:** Decision of the Opposition Division of the  
European Patent Office posted 13 November 1996  
revoking European patent No. 0 555 257 pursuant  
to Article 102(1) EPC.

**Composition of the Board:**

**Chairman:** F. Brösamle  
**Members:** H. Andrä  
J. P. B. Seitz

## Summary of Facts and Submissions

- I. European patent No. 0 555 257 was granted on 28 June 1995 on the basis of European patent application No. 91 918 219.6.
- II. The patent was opposed by the respondent Munters Oy on the ground that claim 1 does not define inventive subject-matter having regard to the state of the art. In support of his arguments, the respondent referred *inter alia* to the following documents:
- (D1) DE-A-2 854 263
- (D3) Research reports IVO-A-04/86, H. Siimes, V. Tarvainen, M. Paräniitty, "Suurtaajuuskuivauksen käyttömahdollisuudet mekaanisessa metsäteollisuudessa", Imatran Voima Oy, Helsinki lokakuu, 1986.
- III. The patent was revoked by decision of the Opposition Division dated 13 November 1996 on the ground that the subject-matter of claims 1 to 3 does not meet the requirements of Article 56 in conjunction with Article 52(1) EPC.
- IV. The appellant (patentee) filed an appeal against this decision on 13 January 1997 paying the appeal fee on the same day.

The statement of grounds of appeal was received on 18 March 1997.

- V. In communications dated 2 October 1998 and 10 June

1999, the latter in preparation of oral proceedings, the Board set out its provisional opinion with regard to the question of inventive step.

VI. With letter dated 21 June 1999 the respondent communicated to the Board that he will not participate in the oral proceedings scheduled.

VII. With Telefax of 17 February 2000 the appellant filed new claims 1 to 3 and an adapted version of the description. He requested that the decision under appeal be set aside and that the patent be maintained on the basis of these documents.

Independent claim 1 thereof reads as follows:

"1. A process for the non-destructive drying out of water damaged building structures (1) made of concrete, stone or brick material, wherein on the water damaged building structure (1) is directed microwave radiation dewatering the building structure by heating, characterized in that the heating is carried out by directing into the water damaged building structure (1) as the only heating source microwave radiation in the form of a plurality of consecutive similar drying periods and non-heating pauses thereinbetween, keeping the temperature of the water damaged building structure (1) substantially on a given level throughout the drying process."

VIII. The appellant's arguments can be summarised as follows:

The process according to (D1) preferably uses as heating source a combination of microwave radiation and

hot gas treatment as shown in Figures 2, 5, 7 and 8.

Even when using sequential series of microwave heatings, (D1) does not interrupt the drying, but continues it in the form of hot gas treatment. It suggests heating by alternating microwave radiation and hot gas convection periods which heating does not dry building structures in a non-destructive way.

(D3) concerns the drying of wood whereas the invention dries water damaged building structures. The starting moisture of wood varies from over 150% to 30% based on the dry weight of the wood whereas the starting amount of free water in cement concrete is below 5% by weight. The person skilled in the art knowing that analogy with respect to non-destructive drying does not even exist between different concrete material grades would not rely on the teachings provided by (D3).

Furthermore, according to the invention the drying periods are interrupted by non-heating periods whereas according to (D3) hot air heating is always present.

Neither of (D1) and (D3) disclose the use of microwave radiation as the only heating source. (D1) alternates microwave radiation and hot gas treatment, and (D3) either does the same or combines both drying operations simultaneously. Either alone or in combination, (D1) and (D3) do not lead to the claimed process.

IX. The respondent requested that the appeal be dismissed.

No observations have been filed, however, by the respondent with regard to the claims submitted by the

appellant both with Telefax of 11 February 1999 and with Telefax of 17 February 2000.

### **Reasons for the Decision**

1. The appeal is admissible.
2. *Article 123(2) and (3) EPC*
  - 2.1 In claim 1 the wording "...drying out of wet building structures on concrete, stone brick and/or block base..." has been replaced by the wording "...drying out of water damaged building structures made of concrete, stone or brick material..." as compared with granted claim 1. This amendment, apart from a purely linguistic variant and the deletion of the term "block base", derives from page 1, paragraphs 2 and 3 and page 3, paragraph 2, of the published application.

The feature added to claim 1 as granted that dewatering of the object to be dried is effected by heating derives from page 2, paragraphs 2 and 3 of the published application (see in particular "...the radiation mainly boils the water out from the structures...").

Having regard to the feature added to claim 1 as granted that the only heating source is microwave radiation, the appellant refers to the figure and its description at column 3, line 47 to column 4, line 48 of the patent in suit which passage corresponds to page 5, line 13 to page 6, line 34 of the published application. Whilst this passage of the original

documents does not indicate *expressis verbis* that microwave radiation is the only heating source, the whole application discloses no heating source other than microwave radiation. In particular, the ventilation means (5) which blows air into the radiation chamber to cool the magnetrons (4) and removes from the radiation chamber moisture that has evaporated from the surface (2) being treated, cannot be regarded as a heating source. The feature relating to microwave radiation being the only heating source directed into the water damaged building structure is therefore considered to be originally disclosed.

Claim 1 differs from the version as granted further in that the wording "...similar drying periods and pauses thereinbetween..." has been replaced by the wording "...similar drying periods and non-heating uses thereinbetween...". It derives from claim 6 and from the sentence bridging pages 2 and 3 (see in the latter passage "...the radiation is directed on the object to be dried in the form of periodic radiation or with varying or constant time intervals") of the published application that in the pauses between periods of radiation no heating is effected.

In claims 2 and 3 "water damaged built structure" has been substituted for "object to be dried" by analogy with claim 1 (see observations above). Furthermore, in claim 3 the second of the two options "...moved over the surface periodically or at a substantially uniform rate" has been deleted, the other features being maintained.

Claims 1 to 3 comply therefore with Article 123(2) EPC.

2.2 The amendments made to claims 1 to 3, respectively, as far as they are not of an exclusively linguistic character limit the protection of the corresponding claims as granted so that claims 1 to 13 satisfy also Article 123(3) EPC.

3. *Problem and solution*

It has not been in dispute between the parties to the proceedings that the nearest prior art is disclosed by (D1).

This citation describes a process for the non-destructive drying of water damaged structures made of concrete such as bridge decks, but also roadway pavements or aircraft runways, wherein on the concrete structure is directed microwave radiation dewatering the structure by heating.

The technical problem to be solved in view of the disclosure of (D1) is to provide a drying process which enables water damaged building structures to be dried with less energy consumption than in the prior art whereby cracking of the object to be dried is to be avoided.

By the features of claim 1 a slow uniform warming-up of the structure to be dried is achieved whereby due to the non-heating pauses between consecutive drying periods high local temperature peaks in the structure to be dried leading possibly to cracking are reduced. Since microwave radiation is directed into the water damaged building structure as the only heating source, energy consumption which would be required by



additional heating sources can be saved. Thus, claim 1 provides a complete solution to the underlying technical problem.

4. *Inventive step*

4.1 In the process of the relevant prior art disclosed in (D1) two different methods of drying are proposed. According to the first method heating by microwaves and hot gas occurs in a single process step as outlined on page 18, paragraph 2 of (D1)(in quoting (D1) the typed numbering of the pages is referred to):

"Referring to Figure 2, the step of heating and drying the concrete base layer with microwave energy may be greatly facilitated by also applying a flow of hot gas to the surface of the base layer. The application of hot gas may in part precede the microwave heating or may be commenced at an intermediate time during microwave heating or thereafter."

According to a second method described in (D1) the single heating stage and drying step of Figure 2 may be replaced with a staged or sequential series of microwave heatings and hot gas treatments as depicted in Figure 5 (see the sentence bridging pages 19 and 20).

In the process shown in Figures 7 and 8, respectively, of (D1), also a combined application of microwave radiation and hot gas treatment is recommended (see page 31, paragraph 2, sentence 1 and 2, and page 33, paragraph 2).

Thus, (D1) gives the clear information that it is advantageous to use as heating source a combination of microwave radiation and hot gas treatment, be it simultaneously or in an alternating mode. This citation, taken *per se*, cannot therefore suggest the teaching of claim 1 of the patent in suit.

4.2 (D3) which had been filed in a non-official language was submitted by the respondent with his letter dated 16 November 1998, received on 18 November 1998, as an English translation which in the following references is cited.

(D3) is headed "The use of high-frequency drying in mechanical wood processing industry" and deals with both radio frequency drying as well as microwave drying of wood. The question in dispute between the parties was whether the technical fields of drying building structures on concrete, stone or brick basis and of drying wood are so closely related that the person skilled in the art would take into account developments in these neighbouring fields.

The person skilled in the art of drying water damaged building structures by radiation is an expert in the field of drying, in particular by means of microwave of high frequency radiation. The problem of achieving uniform, non-destructive, low energy-requiring drying arises both in drying building structures and in drying wood. In the judgement of the Board, the person tackling the cited problem in the field of drying building structures will therefore basically look for solutions in the field of drying wood by microwave radiation taking, however, into account the different

conditions in these two fields as regards for instance the material properties and the initial and final moisture contents.

- 4.3 On page 74 (125) and on page 81 (125) of (D3) the following information is given:

"Combinatory solutions involving microwaves and conventional drying are economic in drying applications, as they are at radio frequencies".

"Microwaves are used as a supplementary or the main source of energy in chamber and tunnel kiln drying, vacuum drying and hot air drying" (see 6.1 General).

"McAllister and Resch (1971) studied the drying of 25 mm thick ponderosa pine board with microwave (915 MHz) and hot air. The lumber was heated with microwave doses of 4.6 to 15 KWh/m<sup>3</sup> at intervals of 0.75 to 10 minutes..... The board was conveyed through openings at the side of a meander type of waveguide so many times that the desired lumber humidity was achieved. The waveguide comprised one curve, and consequently passed twice through the drying tunnel into which heated air was blown from above" (see 6.2.1).

"According to Managing Director Lööf, the interior temperature of the wood can be measured with an optic fibre as the sensor. Microwave effect is switched on when the temperature is below the lower limit for the wood species, and the power is switched off when the upper temperature control limit has been reached" (see page 81 (125)).

It follows from the above passages that according to (D3) microwave radiation is used in combination with hot air drying. Also in the case of microwave radiation at intervals heated air was blown into the treatment area without any operation in intervals thereof being indicated.

These circumstances apply also to the disclosure in section 5.2.2 on page 60 (125) of (D3) with the heading "Combined RF and hot air drying".

In the last paragraph of page 60 (125) the following is set out:

"Dean (1970) combined RF and hot air drying in a process patented by Electronic Kilns Ltd. High frequency energy is directed to the drier intermittently at suitable intensities, lengths of periods and intervals between periods. The tight metal drier chamber is heated with steam pipes, lowering the drying costs owing to inexpensive steam energy...".

It derives clearly from this passage that although periodical RF treatment is applied, the drying with steam is continuous by means of the steam-heated drying chamber. Apart from the fact that "microwave radiation" is not synonymous with "RF-radiation" the above-cited passage on page 60 (125) of (D3) teaches analogous to the information given on pages 74 (125) and 81 (125) of (D3) to make use of microwave radiation and RF-radiation, respectively, in combination with hot gas drying.

4.4 Summarising, both citations (D1) and (D3) recommend to

use a combination of microwave radiation and hot gas drying in the process for the non-destructive drying out of the objects to be dried. In contrast, claim 1 of the patent in suit teaches to use microwave radiation as the only heating source in the form of a plurality of consecutive similar drying periods and non-heating pauses thereinbetween.

It follows from the above consideration that both citations (D1) and (D3) direct away from the subject-matter of claim 1. They cannot, therefore, taken individually or in combination, lead in an obvious manner to claim 1.

The Board considers that an inventive step has to be acknowledged already in the teaching of claim 1 that periodic, interrupted drying of water damaged building structures by microwave radiation as the only heating source is required in order to preserve concrete building structures undamaged and to achieve at the same time a drying process having a low energy consumption.

In this situation, it can be left undecided whether or to what extent the remaining features of claim 1 contribute to the presence of an inventive step.

4.5 For the reasons given above the subject-matter of claim 1 involves an inventive step (Article 56 EPC) and is patentable under Article 52(1) EPC.

5. Claims 2 and 3 are dependent upon claim 1 and relate to preferred embodiments thereof. They are therefore also patentable.

6. The amendments to the description relate to the adaptation thereof to the independent claim and to the indication of the relevant prior art in accordance with Rule 27(1) EPC. The description is therefore also appropriate for maintaining the patent in an amended version.

## **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 maintain the patent in amended form on the basis of the following documents:
  - set of claims 1 to 3 and description both filed on 17 February 2000
  - drawing (single sheet) as granted.

The Registrar:

The Chairman:

N. Maslin

F. Brösamle