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**Datasheet for the decision
of 26 February 2016**

Case Number: T 1219/13 - 3.3.05

Application Number: 04716199.7

Publication Number: 1704907

IPC: B01D11/02

Language of the proceedings: EN

Title of invention:

AN EXTRACTION METHOD AND THE APPARATUS THEREOF

Applicant:

Cao, Peisheng

Headword:

Extraction/CAO PEISHENG

Relevant legal provisions:

EPC Art. 83, 84, 56

Keyword:

Sufficiency of disclosure - (yes)
Claims - clarity after amendment (yes)
Inventive step - non-obvious alternative

Decisions cited:

Catchword:



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Case Number: T 1219/13 - 3.3.05

D E C I S I O N
of Technical Board of Appeal 3.3.05
of 26 February 2016

Appellant: Cao, Peisheng
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Shanghai, 200070 (CN)

Representative: Plougmann Vingtoft a/s
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Decision under appeal: **Decision of the Examining Division of the
European Patent Office posted on 13 December
2012 refusing European patent application
No. 04716199.7 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chairman A. Haderlein
Members: J.-M. Schwaller
P. Guntz

Summary of Facts and Submissions

- I. This appeal lies from the decision of the examining division to refuse European patent application No. 04 716 199.7.

The two independent claims filed with letter dated 29 December 2011 and underlying the impugned decision read as follows:

"1. An extraction method, wherein it comprises the flowing steps: crushing and soaking the raw material, and then extracting, wherein the extracting step is carried out under a 18-33 kHz nonlinear vibration, using water as a solvent, under a pressure of 25-35 MPa and at the temperature of 0-50°C, thus obtaining a extract which contains the active components of the raw material, wherein the nonlinear vibration makes water generate the waves with different frequency and different amplitude so as to bring the water into a critical structural condition."

"8. An extraction apparatus for carrying out the extraction method according to claim 1 comprising: an extracting can comprising a can body and a top lid, a sealing structure to seal the can body and the top lid, and a pipeline connection to input the water into the can body and output the extraction liquid; wherein said apparatus further comprises a high pressure pump, which is linked to the extracting can and maintain the high pressure in the extracting can under a pressure of 25-35 MPa; wherein a raw material can and a nonlinear vibration apparatus emitting nonlinear vibration with the frequency in the range of 18-33 kHz are set in the inner of extracting can, the nonlinear vibration apparatus makes water generate the waves with different

frequency and different amplitude, said nonlinear vibration apparatus is a string of nonlinear vibration apparatus consisting of many vibration apparatuses emitting nonlinear vibration, with the axes of the adjacent nonlinear vibration apparatus perpendicular in different surfaces with each other, wherein said nonlinear vibration apparatus has two proximate ends with outputting curve surface and a vibrating slice set between the two proximate end, and a insulation layer is set outside of the vibrating slice, and a conducting line connects the vibrating slice with the external electrical resource of the extracting can; wherein said top lid is equipped with a conducting line-connecting hole and a vent hole connected with a seal valve to connect said nonlinear vibration apparatus with the external electrical source; wherein a water-supplying system is connected with said water-inputting pipe connection to input the water to said extracting can; wherein a material pump and a material liquid is connected to the extracting can through the extraction liquid-outputting pipe connection."

II. The following documents are of relevance for the present decision:

D1: DATABASE WPI, Week 20, January 1973,
AN 2001-626708 & CN 1 172 669 A

D3: US 6 656 436 B1

D4: Romdhane, M. et al., "Investigation in
Solid-Liquid Extraction: Influence of Ultrasound",
Chem. Eng. J., 87 (2002), pages 11 to 19

D5: Abramov, O., High-Intensity Ultrasonics, chapter 2, Overseas Publishers Association, pages 16, 17, 66 to 69 (1998).

III. The contested decision was taken, at the applicant's request, according to the state of the file (see letter of 20 November 2012), with the examining division referring to its communication dated 20 July 2012, in which it had raised objections under Articles 83, 84 and 56 EPC.

Under Article 83 EPC, the examining division argued in particular that it was unclear which were the structural features providing the stability of the "nonlinear vibration" defined in the claims.

Furthermore, the meaning of the expression "critical structural condition" was unclear (Article 84 EPC).

The examining division further argued that the claimed subject-matter lacked inventive step in view of either document D1 or D3 taken alone.

IV. With its statement of grounds of appeal dated 23 April 2013, the appellant filed two sets of amended claims as main and first auxiliary requests, with independent claims 1 and 8 of the main request reading as follows (amendments with respect to the claims underlying the decision highlighted by the board):

"1. An extraction method, wherein it comprises the following steps: crushing and soaking the raw material, and then extracting, wherein the extracting step is carried out under a 18-33 kHz nonlinear vibration, using water as a solvent, under a pressure of 25-35 MPa and at the temperature of 0-50°C, thus obtaining a extract

which contains the active components of the raw material, ~~wherein the nonlinear vibration makes water generate the waves with different frequency and different amplitude so as to bring the water into a critical structural condition.~~"

"8. An extraction apparatus for carrying out the extraction method according to claim 1 comprising: an extracting can (5) comprising a can body (9) and a top lid (10), a sealing structure to seal the can body and the top lid, and a pipeline connection (N4, N5, N6, N7) to input the water into the can body and output the extraction liquid; wherein said apparatus further comprises a high pressure pump (6), which is linked to the extracting can (5) and maintain the high pressure in the extracting can under a pressure of 25-35 MPa; wherein a raw material can (8) and a nonlinear vibration apparatus (24) emitting nonlinear vibration with the frequency in the range of 18-33 kHz are set in the inner of extracting can (5), ~~the nonlinear vibration apparatus makes water generate the waves with different frequency and different amplitude,~~ said nonlinear vibration apparatus (24) is a string of nonlinear vibration apparatus consisting of many vibration apparatuses (28) emitting nonlinear vibration, with the axes of the adjacent nonlinear vibration apparatus perpendicular in different surfaces with each other, wherein said nonlinear vibration apparatus has two proximate ends (29) with outputting curve surface and a vibrating slice (31) set between the two proximate end, and a insulation layer (37) is set outside of the vibrating slice, and a conducting line connects the vibrating slice (37) with the external electrical resource of the extracting can (5); wherein said top lid is equipped with a conducting line-connecting hole (N2) and a vent hole (N1) connected with a seal valve (18) to connect said nonlinear

vibration apparatus with the external electrical source; wherein a water-supplying system is connected with said water-inputting pipe connection (N7) to input the water to said extracting can (5); wherein a material pump (7) and a material liquid is connected to the extracting can (5) through the extraction liquid-outputting pipe connection (N6)."

- V. The appellant requested that the decision under appeal be set aside and that a patent be granted on the basis of one of the sets of claims filed with the statement of grounds of appeal.

Reasons for the Decision

1. Main request - Amendments

The amended claims according to this request have a basis as follows in the application as filed:

- claims 1 to 7 correspond to claims 1 to 7 as filed;
- claim 8 corresponds to the combination of claims 8 and 9 as filed. The pressure range of from 25 to 35 MPa has a basis in claim 1 as filed and also on page 13, last paragraph;
- claims 9 to 18 have a basis in claims 10 to 19 as filed, respectively.

The subject-matter of the claims of this request thus does not extend beyond the application as filed, and so these claims meet the requirements of Article 123(2) EPC.

2. Sufficiency of disclosure

With its grounds of appeal, the appellant stated that the feature "nonlinear vibration" as defined in the present invention was common general knowledge. The board furthermore notes that the details of an apparatus specifically designed for carrying out the claimed process, and the operating conditions for carrying out the claimed process, are disclosed at pages 13 to 19 and in the figures of the application in suit. Moreover, the objections raised by the examining division in the impugned decision in this respect relate to effects, i.e. stability of nonlinear vibration under high pressure, which are not called for in the claims at issue. The absence of a non-claimed effect is however not an obstacle to the requirement of sufficiency of disclosure. There is thus no basis for concluding that the requirements of Article 83 EPC are not met.

3. Clarity

3.1 The expression "critical structural condition" that the examining division held to be unclear no longer appears in the claims. The examining division's objection is thus overcome.

3.2 The examining division also objected to the expression "nonlinear vibration" as unclear in view of the submissions made by the appellant. The board notes that these submissions have now been withdrawn. As this objection was raised only in view of the submissions made by the appellant, the board is satisfied that this expression is sufficiently clear.

4. Novelty

No novelty objection was raised by the examining division. The board is also satisfied that the claims of this request meet the requirements of Article 54 EPC, as none of the documents in the proceedings discloses an extraction method carried out simultaneously under an 18 to 33 kHz nonlinear vibration and a pressure of 25 to 35 MPa in the presence of water as the solvent.

5. Inventive step

For the board, the claimed invention involves an inventive step for the following reasons:

- 5.1 The invention relates to a method and an apparatus for extracting active components from a raw material using water as the solvent.
- 5.2 For the board, the closest prior art seems to be document D1, which discloses the extraction of flavone and terpene lactone from ginkgo leaves by means of supercritical carbon dioxide as the solvent in the presence of a mixture of ethanol (3 to 7%) and water (93 to 97%) as polar modifier at a temperature of from 50 to 60°C and a pressure of from 25 to 35 MPa.

Contrary to the view taken by the examining division, D3 cannot represent the best starting point for assessing the inventive step of the claimed subject-matter, since this document **does not disclose an extraction process** but rather the conversion by means of ultrasound of a chemical structure in e.g. water (see in this respect D3, claims 1 and 8). In the passage bridging columns 9 and 10, D3 explains that the chemical structure is to be degraded with a view to its destruction or its

conversion into products able to be used in industry. This is not the purpose of an extraction process, which in general aims at keeping the structure of the extracted substance intact.

- 5.3 The problem underlying the invention is described on page 4 of the application in suit as consisting in the provision of an extraction process and apparatus which enable a substantial full-components extraction without substantial loss and destruction.
- 5.4 As a solution to this problem, the application proposes the process according to claim 1 at issue, which is in particular characterised in that *the extracting step is carried out under an 18 to 33 kHz nonlinear vibration*.
- 5.5 For the board, the problem underlying the invention is effectively solved. The examples show that the extraction of e.g. angelica was successful, with the extracted liquid being light orange, having no bitterness and having the original light aroma of angelica.
- 5.6 Since, however, the process according to document D1 solves the same problem, the problem is to be reformulated as an alternative process and alternative apparatus for extracting components from a material without substantial loss and destruction.
- 5.7 As to the question whether the proposed solution was obvious from the prior art, in particular document D1 and/or D3, the board concludes that it was not, since:
- D1 does not disclose or teach the use of a nonlinear vibration in the frequency range of 18 to 33 kHz.

- D3 does not disclose the extraction but rather the conversion of chemical substances in the sense of degradation or destruction. Furthermore, D3 (claim 1) requires the presence of a salt. For these reasons, the skilled person would not consider D3 when looking for an alternative extraction method without substantial loss and destruction of the material to be extracted.

So the skilled person faced with the problem set out in point 5.6 above would not find in either of these documents the solution proposed in claim 1.

In the board's judgement, the remaining documents cited during the examination proceedings likewise do not point towards the claimed solution of the problem stated above. In particular, while it may be argued that it was known in the prior art to use ultrasound in extraction processes (cf. D4, abstract and page 18, left-hand column, third paragraph or D3, column 7, lines 49 to 53), including irradiation leading to nonlinear effects such as cavitation (cf. D5, page 67, second paragraph), there is no evidence on file that would teach the skilled person to induce such nonlinear effects not only in ambient systems such as the one of D4 but also in supercritical systems such as the one of D1 representing the closest prior art.

It follows that the subject-matter of claim 1, and by the same token that of dependent claims 2 to 7, which include all the features of claim 1, is not obvious to the person skilled in the art.

The apparatus defined in claims 8 to 18, which is specifically designed for carrying out the extraction method of claim 1, derives its patentability from

claim 1 on which it depends, in particular because of the specific nonlinear vibration apparatus (24) emitting nonlinear vibrations within the frequency range of from 18 to 33 kHz, which permits the simultaneous extraction of a multiplicity of substances.

It follows from the above considerations that, having regard to the state of the art, the subject-matter of claims 1 to 18 is not obvious to a person skilled in the art, and so said claims involve an inventive step within the meaning of Article 56 EPC.

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 on the basis of claims 1 to 18 of the main request dated 23 April 2013, and a description and figures to be adapted as necessary.

The Registrar:

The Chairman:



C. Vodz

A. Haderlein

Decision electronically authenticated