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Datasheet for the decision of 22 April 2008

Case Number: T 1201/03 - 3.3.05

Application Number: 96937531.0

Publication Number: 0802164

IPC: C02F 1/467

Language of the proceedings: EN

Title of invention:
Process for producing bactericide, apparatus therefor, and bactericide

Patentee:
Morinaga Engineering Co., Ltd., et al

Opponent:
-

Headword:
Method for manufacturing bactericide

Relevant legal provisions:
EPC Art. 54(1)(2); 56; 123(2)

Relevant legal provisions (EPC 1973):
-

Keyword:
"Novelty (yes)"
"Inventive step (yes) - non obvious alternative"

Decisions cited:
T 0077/87

Catchword:
-

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Case Number: T 1201/03 - 3.3.05

D E C I S I O N
of the Technical Board of Appeal 3.3.05
of 22 April 2008

Appellant: (Applicant)
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Decision under appeal:
Decision of the Examining Division of the European Patent Office posted 11 July 2003 refusing European application No. 96937531.0 pursuant to Article 97(1) EPC.

Composition of the Board:

Chairman: G. Raths
Members: E. Waeckerlin
C. Vallet

Summary of Facts and Submissions

I. The appeal is from the decision of the examining division to refuse European patent application No. 96 937 531.0. The decision was based on amended claims 1 to 8 as submitted during the oral proceedings held on 24.06.2003.

II. In the decision the following documents are referred to:

D1 : US 3 458 414 A

D2 : JP 06-206074 A; the abstract thereof, i.e. Derwent Abstract AN 94-275635 (hereinafter D2A); and a machine translation of D2 into English (hereinafter D2E)

D3 : JP 4-094785 A; and its family member EP 0 470 841 A (hereinafter D3E)

[D4]: Patent Abstracts of Japan, abstract of JP 63-016093 A)

The examining division stated that the claimed method was novel having regard to the prior art. It lacked an inventive step over D2, however. There were two features which distinguished the method of claim 1 over the disclosure of D2, namely:
- the use of an electric current in the form of an alternating current with a frequency of more than 0 Hz to no more than 5 Hz; and
- the application of an electrical quantity rate of 0.4 to 6 Coulombs per milliliter water.

As far as the first distinguishing feature was concerned, the examining division held that it was a normal practice in similar electrolytic processes to use alternate current having a frequency within the specified range. The second distinguishing feature related to a relatively broad range. It was very likely that the skilled person, when trying to carry out the method of D2, would have employed an electrical quantity rate falling within said range. It was generally known that a minimum rate of electrical quantity is necessary to obtain an electrolytic effect, and it was also known that by increasing the electrical current a greater amount of gases is produced. The skilled person would have optimized the electrical quantity rate in the method of D2, thus arriving at the value specified in claim 1 without exercising an inventive step. For these reasons the application was refused.

III. With the grounds of appeal, the appellant submitted an amended set of claims 1 to 7. Claim 1 as amended incorporated the feature of the former claim 3.

IV. The appellant (applicant) submitted *in essence* that the abstract D2A did not correctly convey the disclosure of the original Japanese application D2 and the English translation thereof, D2E. Therefore D2A did not provide a valid description of the original disclosure in D2. The various methods described in D2 and D2E, respectively, did not unequivocally exclude the presence of NaCl in the raw water solution which undergoes electrolysis. Accordingly, D2 and D2E did not unambiguously disclose the electrolysis of hydrochloric

acid-containing raw water which has a pH of between 0.5 and 3.0 and which does not contain sodium chloride.

Having regard to inventive step, the appellant submitted that the combination of novel features in the claimed method permitted the attainment of a bactericide having acceptable bactericidal effects in a manner which is both simpler and more efficient than the methods of the prior art. The application disclosed the conditions under which exceptional bactericidal effects may be achieved without requiring the inclusion of NaCl in the raw water which undergoes electrolysis in a non-diaphragm cell. Nothing in the prior art led the skilled artisan to the claimed method.

V. Claim 1 as submitted with the reasons of appeal reads as follows:

" 1. A method for manufacturing a bactericide consisting of an electrolytically treated liquid having high bactericidal action, said method consisting of introducing raw water containing hydrochloric acid into an electrolytic cell having no diaphragm between the cathode and anode, wherein said raw water containing hydrochloric acid is prepared by diluting hydrochloric acid of a hydrochloric acid molar concentration of between 0.001 mol/L and 6.4 mol/L, has a pH of between 0.5 and 3.0 and does not contain sodium chloride, applying electric current between the cathode and anode immersed in said raw water containing hydrochloric acid to electrolyze said raw water containing hydrochloric acid, the conditions of electrolysis being such that chlorine ions on the surface of the anode are converted to hypochlorous acid, wherein electric current is

applied in the form of alternating current with a frequency of more than 0 Hz and no more than 5 Hz and at an electrical quantity rate of between 0.4 and 6.0 Coulombs per milliliter raw water containing hydrochloric acid,
optionally diluting the thus electrolytically treated liquid with water,
and then recovering the liquid thus electrolytically treated and having a high bactericidal action due to the hypochlorous acid. "

Claim 6 reads as follows:

" 6. A method for sterilizing raw water, said method comprising the steps of preparing raw water containing hydrochloric acid by adding hydrochloric acid to raw water and then recovering an electrolytically treated liquid by implementing the method as defined in anyone of Claims 1 through 5, the electrolytically treated liquid thus recovered being in the form of sterilized raw water. "

Dependent claims 2 to 5 relate to particular embodiments of claim 1; the same holds for claim 7 depending on claim 6 and, thus, indirectly on claim 1.

VI. The appellant requested that the decision under appeal be set aside and that a patent be granted on the basis of the revised set of 7 claims enclosed with the grounds of appeal.

Reasons for the Decision

1. *Allowability of the amended claims under Article 123(2) EPC*

1.1 Claim 1 as amended has the following basis in the application as originally filed:
Claims 1, 3, 4, 6, 7 and 8; page 11, line 3 to page 12, line 5; page 48, lines 6 to 12; page 16, lines 17 to 21; page 17, lines 17 to 19; page 17, lines 17 to 20.

1.2 Claim 6 as amended is based on Claim 10 and page 12, lines 9 to 24 of the application as originally filed.

1.3 The amended dependent claims 2 to 5 and 7, respectively, have the following basis in the application as originally filed:
Claim 2 as amended: Claim 2.
Claim 3 as amended: page 19, line 25 to page 20, line 1.
Claim 4 as amended: Claim 5.
Claim 5 as amended: page 15, lines 25 to 26.
Claim 7 as amended: Claim 11.
The subject-matter of claims 1 to 7 fulfils the requirements of Article 123(2) EPC.

2. *Novelty*

2.1 Novelty was not contested in the decision under appeal.
Claim 1 as amended is further specified by including the additional feature according to which the *"raw water containing hydrochloric acid is prepared by diluting hydrochloric acid of a hydrochloric acid molar concentration of between 0.001 mol/L and 6.4 mol/L"*.

2.2 None of the documents D1 to D4 discloses the feature of preparing the raw water by diluting hydrochloric acid having a molar concentration in the range between 0.001 mol/L and 6.4 mol/L. Nor does any of these documents disclose the feature of applying an electrical quantity rate between 0.4 and 6.0 Coulombs per milliliter raw water containing hydrochloric acid.

2.3 The board is satisfied that the method of claim 1 is novel over the documents D1 to D4 representing the prior art. The subject-matter of claims 2 to 7 is also novel, since all these claims refer directly or indirectly to claim 1.

3. *Inventive step*

3.1 *Closest prior art*

3.1.1 The method set out in claim 1 relates to the manufacture of a bactericide prepared by the electrolysis of raw water containing hydrochloric acid. In the decision under appeal document D2 has been selected as representing the closest prior art. The board can accept this choice, because D2 relates to the same technical field as the application, and because the methods disclosed in D2 have a high number of technical features in common with claim 1.

3.1.2 D2 discloses *inter alia* a method for sterilising water by electrolytic treatment, consisting of:
- introducing raw water containing hydrochloric acid into an electrolytic cell having no diaphragm between the cathode and anode;

- applying an electric current between the cathode and anode, thus electrolysing said raw water;
- and subsequently recovering the treated liquid

(see D2A, section AB in combination with drawing 1 of D2; D2E, claims 1, 2 and section [0027] together with drawing 1).

3.1.3 In the method of D2, the pH of the raw water is adjusted to a value between 2 and 6.5 (see D2E, sections [0016], [0031]) by means of ion exchange (see, for example, D2, drawing 1, reference sign 12 *"ion-exchange machine"*) and, as far as required, by adding hydrochloric acid (see, for example, D2E, section [0005] in combination with section [0027], reference sign 4; [0041]).

Between the cathode and anode immersed in the raw water, an electric current in the form of direct current (DC) is applied (see D2E, section [0028]).

3.2 *Technical problem*

3.2.1 Starting from the closest prior art D2, the technical problem to be solved can be seen in providing an alternative method for manufacturing a bactericide, which lies in simplifying the known method, while achieving a good balance between the bactericidal activity of the treated raw water and the consumption of electric energy, and while preventing (i) scaling of the cathode of the electrolytic cell, (ii) salt precipitations during the use of the treated raw water, and (iii) undesirable production of gases such as hydrogen chloride, chlorine gas, hydrogen gas and oxygen gas (see, in this respect, the following passages of the application: page 1, lines 5 to 10;

page 8, line 17 to page 9, line 6; page 10, lines 10, 14 to 17; page 14, line 17 to page 15, line 6; page 19, lines 1 to 6; page 20, lines 5 to 11; page 20, line 17 to page 21, line 2; page 22, lines 3 to 17; page 23, lines 2 to 8; page 24, lines 7 to 11; page 48, lines 12 to 16).

3.3 *Solution of the technical problem*

3.3.1 The solution proposed according to claim 1 involves in particular the following features of the method:
- the exclusion of sodium chloride from the raw water containing hydrochloric acid;
- the preparation of said raw water by diluting hydrochloric acid of a hydrochloric acid molar concentration of between 0.001 mol/L and 6.4 mol/L;
- the use of an alternating current with a frequency of more than 0 Hz and no more than 5 Hz; and
- the application of an electrical quantity rate of between 0.4 and 6.0 Coulombs per milliliter raw water containing hydrochloric acid.

3.3.2 In view of the experimental data contained in the description of the application, it is credible that the technical problem has been effectively solved. As far as the simplification of the method is concerned, the claimed method does not require the use of ion exchange step for adjusting the pH value of the raw water, and for this reason it can be performed in an apparatus having a simple structure such as the one represented in drawing 1 of the application. This has to be compared with the more complicated structure of the apparatus according to D2, which requires an ion

exchange unit (see D2, drawings 1 to 3, reference sign 12).

3.3.3 Furthermore, the claimed method leads to a high bactericidal action of the treated liquid, while the electrical quantity rates are low (see page 53 of the application, table 1: bactericidal effect, for example, > 7.04 (at frequencies from 0.5 to 2 Hz); page 56, table 2: bactericidal effect, for example, > 6.90 (at a current rate of 0.80 and 1.30 c/ml, respectively); page 61, line 1 to page 62, line 20, example 2).

3.3.4 In the absence of any evidence to the contrary, it is also credible that scaling of the electrolytic cell, salt precipitation and undesirable production of gases are minimised under the operating conditions, as contended by the applicant.

3.4 *Obviousness*

3.4.1 It remains to be decided whether the proposed solution according to claim 1 involves an inventive step, or not.

3.4.2 D2 does not specify that the raw water containing hydrochloric acid is prepared by diluting hydrochloric acid having a molar concentration of between 0.001 mol/L and 6.4 mol/L. Neither does it disclose the use of alternating current (AC) having a frequency of more than 0 Hz and no more than 5 Hz. Moreover it is silent on the electrical quantity rate of between 0.4 and 6.0 Coulombs per milliliter raw water used in the electrolytic treatment.

3.4.3 As far as the further conditions of electrolysis are concerned, there is no explicit statement in D2 that chlorine ions on the surface of the anode are converted to hypochlorous acid. This feature forms part of the implicit disclosure, however, since it is inherent in the electrolysis of chloride that nascent chlorine and hydrogen are produced. The nascent chlorine combines immediately with water to produce hypochlorite ions as the primary sterilizing agent (see, for example, D1, col. 5, lines 32 to 37; D3E, page 3, lines 31 to 39).

3.4.4 According to claim 1 of the application in suit the raw water containing hydrochloric acid does not contain sodium chloride. Thus, the presence of sodium chloride is expressly excluded from the scope of claim 1. In the examining division's view this feature was comprised in the state of the art as represented by D2. In support of this, the examining division referred to the abstract D2A, wherein it is stated that an aqueous solution of HCl **or** NaCl stored in a reagent tank (4) is pumped to the raw water in a water feed pipe connected to the electrolytic cell (see D2A, section AB, lines 14 to 17). From that the examining division concluded that *"D2 foresees two alternatives: (1) the use of a solution of a HCl solution or (2) the use of a NaCl solution. In the alternative (1) only HCl is added to the water to be treated"*. In other words *"only HCl but no NaCl is mixed with the water fed to the electrolytic cell"* in alternative (1) (see decision under appeal, numbered paragraph 2).

3.4.5 In the abstract D2A it is, indeed, recited that the method makes use of a reagent tank (4), *"in which aq. soln. of HCl [hydrochloric acid]* ***or*** *NaCl [sodium*

chloride] is stored" (emphasis added). This statement is not consistent with the content of the original Japanese document D2, however. Referring to the drawings, D2 states that reference sign (4) relates to an *"NaCl tank"* (see D2, page 485, line 21; page 487, right column, line 6). The identical meaning is given to reference sign (4) in the English translation of D2 (see D2E, page *"Description of Drawings"*, line 12), whereas in the specification of D2E the *"fluid tank (4)"* is described as containing *"chloride solution, such as hydrochloric acid* ***and*** *a sodium chloride"* (emphasis added) (see D2E, section [0027]). Therefore, having regard to the solution stored in reagent tank (4), it would appear that the abstract D2A does not provide a correct description of the original disclosure contained in D2.

3.4.6 Under these circumstances the board concludes that, *prima facie,* the statement in D2A, according to which either an aqueous solution of hydrochloric acid or an aqueous solution of sodium chloride are used, cannot be regarded as part of the state of the art (see, in this context, decision T 77/87, headnote 2 and paragraphs 4.1.4 and 4.1.6 of the reasons; OJ EPO 1990, 280).

3.4.7 Document D2E discloses in general various methods of producing sterilised water by electrolytic treatment of raw water containing chloride. As far as the machine translation can be understood, chloride is introduced into the system in the form of sodium chloride, optionally in combination with other chloride salts and/or hydrochloric acid (see D2E, section [0017]). Since electrolysis of the raw water leads to the formation of OH^- ions, the method described in D2E

foresees the adjustment of the pH value of the raw water to a level within the range of 2 to 6.5 by means of an ion exchange treatment, whereby sodium ions (called *"+ ions"* in D2E) are replaced by hydrogen ions (see D2E, sections [0016], [0017], [0018], [0022], [0023]; [0029] together with drawing 1, reference sign 12 *"ion-exchange machine"*; [0032]; [0033] together with drawing 2, reference sign 12; [0034] together with drawing 3, reference sign 12). If required, hydrochloric acid may be added to the raw water for further adjusting the pH value (see D2E, sections [0005], [0022], [0041], [0042]).

3.4.8 Having regard to the foregoing, the board considers that it would be inappropriate to interpret the wording of D2E as embracing the possibility of excluding the presence of sodium chloride as a component of the raw water solution which undergoes electrolysis. Therefore, in the absence of any proof to the contrary, the board concludes that the feature contained in claim 1, according to which the raw water does not contain sodium chloride, forms also part of the distinguishing features of the method of claim 1 over the disclosure of D2 as represented by D2E.

3.4.9 The board notes that neither D2 nor the other documents representing the prior art suggest the combination of operating conditions recited in claim 1, with an aim to achieving a good balance between the bactericidal activity of the treated liquid and the other properties of the method as explained above, and thus solving the technical problem posed.

3.4.10 In the decision under appeal, the objection of lack of inventive step against claim 1 is based on the arguments that it was *"a normal practice in similar electrolytic processes to alternate the current with a frequency in the range specified"* in this context the examining division referred to D4; furthermore, in the examining division's view it was *"very likely that the skilled person trying to carry out the method of D2 would employ an electrical quantity rate falling within the range of present claim 1"* (see decision, numbered paragraph 4).

3.4.11 The board agrees that D4 discloses, in fact, an electrolytical method for the treatment of water, wherein the polarities of the electrodes are alternated within a time interval in the range of 2 s to 4 minutes. This mode of operation can be equated with the application of an alternating current having a frequency of 0.004 to 5 Hz. But D4 is completely silent on the technical effect achieved by using alternating current. Documents D1 and D3, respectively, foresee on their part the use of direct current (see D1, col. 6, lines 58 to 60 together with drawing 9, in particular reference signs 60, 76, 176, 178; D3, page 3, line 31; page 4, line 31 to 32). Therefore, the prior art offered two possibilities, namely to use either alternating current or direct current. In the board's view the teaching of D4 did not prompt the skilled person, when faced with the technical problem underlying the present application, to use an alternating current with a frequency of more than 0 Hz and no more than 5 Hz, let alone to combine this feature with the other features recited in claim 1.

3.4.12 None of the documents D1, D2, D3 and D4 representing the state of the art contains any information about the suitable range of the electrical quantity rate. According to the decision under appeal the skilled person would have arrived at the range specified in claim 1 by means of trial and error in an effort to optimise the process (see decision, numbered paragraph 4). The board notes that this statement has not been substantiated by any facts or evidence. Therefore it has to be regarded merely as an allegation.

3.4.13 Under these circumstances the board considers that the objection of lack of inventive step contained in the decision under appeal is based on hindsight.

3.4.14 Accordingly, for the reasons indicated above and in the absence of evidence to the contrary, the method of claim 1 cannot be considered as being obvious to a person skilled in the art in view of the cited documents.

3.5 Claim 6 relating to a method for sterilizing raw water contains a reference to claim 1 and, by this, includes all the features of claim 1.

3.6 The same applies to the dependent claims 2 to 5 and 7, respectively, since all these claims refer also back to claim 1 or claim 6.

3.7 Therefore all the claims involve an inventive step as required by Articles 52(1) and 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 following basis:

   – Claims 1 to 7 according to the main request as filed with the grounds of appeal dated 18.11.2003;

   – a description to be adapted to these claims; and

   – drawings 1 to 7 as originally filed.

The Registrar: The Chairman;

S. Sánchez Chiquero G. Raths