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# Datasheet for the decision of 25 April 2013

**Case Number:** T 0957/09 - 3.3.05

**Application Number:** 02742482.9

**Publication Number:** 1368276

**IPC:** C02F 1/461, C02F 1/467, C25B 1/26

**Language of the proceedings:** EN

**Title of invention:**
High efficiency electrolysis cell for generating oxidants in solutions

**Applicant:**
Helen of Troy Limited

**Headword:**
Electrolysis cell/HELEN OF TROY LTD

**Relevant legal provisions:**
EPC Art. 54, 56

**Keyword:**
"Inventive step - main request (no) - auxiliary request (yes)"

**Decisions cited:**
-

**Catchword:**
-

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**Case Number:** T 0957/09 - 3.3.05

# D E C I S I O N
**of the Technical Board of Appeal 3.3.05**
**of 25 April 2013**

**Appellant:** (Applicant)
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**Decision under appeal:**
**Decision of the Examining Division of the European Patent Office posted 13 January 2009 refusing European patent application No. 02742482.9 pursuant to Article 97(2) EPC.**

**Composition of the Board:**

**Chairman:** G. Raths
**Members:** H. Engl
P. Guntz

## Summary of Facts and Submissions

I. European patent application EP 02742482.9, published as WO-A-02/066 382, is concerned with a high efficiency electrolysis cell for generating oxidants in solution.

II. The following documents were *inter alia* cited in the international search report:

D1: US-A-5 954 939
D2: DE-A-33 41 797
D5: DE-A-31 21 337
D6: US-A-4 917 782
D7: US-A-3 701 728.

III. The European patent application was refused by a decision of the examining division posted with letter dated 13 January 2009, on grounds of lack of inventive step having regard to document D1 (main request) and to D1 in combination with documents D5, D6 or D7 (auxiliary request).

IV. The appellant's notice of appeal was received by letter dated 12 March 2009. The statement of grounds of appeal, dated 23 April 2009, was accompanied by new sets of claims constituting a main and an auxiliary request.

V. The independent claims are worded as follows:

*Main request:*

"1. An apparatus for electrolyzing an electrolytic solution, said apparatus comprising:
(a) a non-membrane electrolytic cell (10) comprising:

(i) an planar anode (21) wherein a surface area of said anode is less than 30 $cm^2$;
(ii) a planar cathode (22), said anode and said cathode defining a passage (24) formed there-between, said passage having a distance between said anode and said cathode of less than 0.5 mm;
(iii) a cell inlet port (25) communicating with said passage (24), said inlet port used to receive a flow of electrolytic solution; and
(iv) a cell outlet (26) opposed to said cell inlet port and communicating with said passage, said outlet port providing an exit for the flow of electrolytic solution having been electrolyzed, wherein the planar electrodes have a length along the flow path of the solution and a width oriented transverse to the flow path and wherein said electrodes have an aspect ration [sic] defined by the ratio of length to width between 2 and 4; and
(b) an electrical current supply for providing an electrical current from said anode to said cathode, wherein said current supply delivers less than 5 watts of power, wherein the electrical current electrolyzes the flow of electrolytic solution."

Independent claim 24 is directed to the use of the apparatus of claim 1, for electrolyzing an electrolytic solution.

*First auxiliary request:*

Apparatus claim 1 differs from claim 1 of the main request in that the following passages (c) and (d) are added at the end of the claim:

"(c) a filter (300) positioned after said electrolytic cell which is adapted to remove 99.95% of particulates having a size of 3 microns or greater from the electrolytic solution, wherein said filter also removes inorganic species present in said electrolytic solution; and
(d) an ion exchange resin (500) as a pre-treatment to the electrolytic solution prior to electrolysis, said ion exchange resin being adapted to increase the halogen-containing ion concentration of the electrolytic solution."

Independent claim 15 defines the use of the apparatus of claim 1 for electrolysing an electrolytic solution. Dependent claims 2 to 14 and 16 and 17 represent particular embodiments of the subject-matter of the respective claims on which they depend.

VI. As per the assignment deed of 11 July 2012, the new applicant and appellant is "Helen of Troy Ltd.".

VII. The board issued a communication dated 21 December 2012 in which it discussed the relevant prior art of documents D1, considered to be the closest prior art, and D7. The board provisionally gave a negative opinion on the allowability of the main request, which was considered to lack inventive step over D1. However, it indicated that the claims in accordance with the first auxiliary request could be considered to involve an inventive step having regard to D1 and D7.

VIII. Oral proceedings took place on 25 April 2013. The appellant, although duly summoned, did not attend.

IX. The appellant argued in writing essentially as follows:

- The electrode gap of less than 0.5 mm defined a first point of novelty of the claimed apparatus over D1;

- The claimed aspect ratio of 2 to 4 of the electrodes provided a second point of novelty;

- As the prior art of D1 appeared to require the disclosed position and disclosed sizing of the inlet and outlet ports, the skilled reader would not be motivated to change this configuration;

- The claimed cell configuration provided the unexpected advantage of an improved efficiency (productivity) of the cell, as documented in the examples, compared with productivity indices of less than 100 achieved by the cells of D1;

- The subject-matter of claim 1 of the auxiliary request included as a further distinction a filter positioned after the electrolytic cell adapted to remove 99.95% of particulates having a size of 3 µm or greater; furthermore, the apparatus comprised an ion-exchange resin as a pre-treatment to the electrolytic solution;

- Document D7 contained only a very general teaching of an ion-exchange resin which could not suggest the claimed apparatus.

X. Requests

The appellant requested in writing that the decision under appeal be set aside and that a patent be granted on the basis of the claims of the main request or alternatively, of the first auxiliary request, both filed on 23 April 2009.

## Reasons for the Decision

1. Amendments (first auxiliary request)

The claim features of claim 1 of the first auxiliary request are sufficiently based on the disclosure of the originally filed application documents, published as WO-A-02/066 382.

- Claim feature (i) is based on the description, page 10, line 18;
- Claim feature (ii) is based on the description, page 8, lines 5 to 7;
- Claim feature (iv) is based in part on original claim 1 and in part on the description, page 10, lines 18 to 21;
- Claim features (a)(iii) and (b) are based on original claim 1;
- Claim feature (c) is based on original claims 5, 7, 8 and 11;
- Claim feature (d) is based on original claims 18 and 19.

Use claim 15 is based on originally filed claim 24 with the additional claim features being originally disclosed as indicated above.

Dependent claims 2 to 14 and 16, 17 find a basis in original claims 2 to 4, 10 to 13, 18 to 23, 25 and 28, respectively.

The claims of the first auxiliary request thus meet the requirements of Article 123(2) EPC.

2. Novelty and inventive step

*Main Request*

2.1 Novelty

2.1.1 Document D1 discloses a non-membrane electrolyzing apparatus for electrolyzing flowing water containing chlorine ions. The apparatus comprises stacked plate-shaped electrodes arranged at a distance of from > 0.2 to less than 0.5 mm (see claim 1) and having a size of 70 x 50 mm (Tests 1, 2) or 40 x 40 mm (Test 8); cell outlet and opposed cell inlet (see for instance Figure 9); and an electric current supply.

The electrode surface in the examples is 30 or 60 $cm^2$. Electrode spacing is 0.19, 0.43 and 0.86 mm (see Table 1). The apparatus is capable of producing chlorine with an efficiency of up to 2.4%, as calculated by formula I (see Table 1; column 15, line 31).

D1 does not directly and unambiguously disclose a cell having an electrode distance of less than 0.5 mm and an anode surface of less than 30 $cm^2$. Furthermore, the aspect ratio of the electrodes in D1 appears to be lower than 2.

The subject-matter of present claim 1 is therefore novel over D1.

2.1.2 D1 furthermore does not disclose the amount of power supplied by the power supply. It is, however, questionable whether this feature characterises the apparatus itself, rather than its mode of operation.

As to the further distinguishing features, the board disagrees with the appellant's view that the claimed electrode gap constitutes a novel feature having regard to D1. In fact, D1 discloses electrode gaps well below 0.5 mm (see Table 1 and Test 1: column 14, lines 61 to 63; and claim 1).

The board also shares the opinion of the examining division that D1 discloses opposing cell inlets and outlets (see points 2.1 and 2.2 of the contested decision).

2.1.3 The board is also satisfied that the claimed subject-matter is novel having regard to the remaining prior art documents.

2.2 *Inventive Step*

2.2.1 The invention concerns an electrolyzing apparatus for generating oxidants, such as hypochlorite or chlorine,

from aqueous solutions containing salts. The apparatus consists of a non-membrane electrolytic cell with planar cathodes and anodes of specified size and shape, cell inlet and outlet ports and a current supply. The apparatus and the cell are designed to efficiently oxidize halide ions in the flowing electrolyte feed, so as to produce an effective anti-microbial mixed oxidant (see page 2, line 20, to page 3, line 8).

2.2.2 The board considers that document D1 represents the closest prior art, because it also deals with the sterilisation of water by electrolysing flowing water containing small amounts of chloride ions.

2.2.3 According to the appellant and the application under appeal (see description, page 2, lines 15 to 18), the problem consisted in improving the efficiency of the cell.

2.2.4 As a solution to the said problem, the application under appeal proposes an apparatus according to claim 1, characterised by an anode surface of less than 30 $cm^2$ and an aspect ratio of the electrodes of between 2 and 4.

2.2.5 As regards the success of the solution, no direct comparison with D1 is available, taking into account that the efficiency values reported in D1 (Table 1) are based on a different evaluation equation than the ones given in the instant application. In the opinion of the board, the efficiency of oxidant (chlorine) generation depends not only on cell geometry, but also on the anode structure and material, important features which are not defined in the claim. The board cannot accept

the presence of an improvement over the closest prior art, as the electrolysis apparatus disclosed in D1 offers essentially the same advantages in terms of efficiency of electrolysis and of maintaining a stable operation.

2.2.6 The technical problem underlying the application under appeal must therefore be reformulated. It can be defined as the provision of an inexpensive, simple and effective electrolytic apparatus for producing antimicrobial oxidants, i.e. an alternative apparatus to the one of D1.

The board is satisfied that this problem has been plausibly solved.

2.2.7 As to the question of obviousness, the claimed apparatus is in the board's judgment not the result of inventive activity in view of D1. The minor modifications to the apparatus known from D1 are within the skills of a person familiar with this kind of electrolysis apparatus. It is evident that a fully functional electrolytic cell can be designed having the claimed characteristics (electrode surface, electrode gap, aspect ratio, power supply) which do not in any event deviate much from what is disclosed in D1. Such an apparatus would be expected to exhibit an essentially similar efficiency of oxidant (chlorine) generation.

The technical significance of the claimed aspect ratio is not fully understood from the application itself (see for instance page 10, lines 18 to 21). It is, however, evident to those of skill in the art that

extreme aspect ratios (very elongate electrodes) would tend to impede the even distribution of the electrolyte flow across the electrode's surfaces and make efficient removal of gas bubbles difficult. Also, issues of current distribution may arise. The skilled person is familiar with these problems and would take them into account for the design of an electrolysis cell. A moderate aspect ratio of the electrodes of between 2 and 4, however, would be considered appropriate under most circumstances, by those of skill in the art.

Concerning the feature relating to the amount of power supplied by the electric power supply, the claimed upper limit of 5 W is of limited technical significance for the efficiency of the apparatus, in view of the fact that the electrode size, the current density and the cell voltage are not defined.

The problem of providing an alternative apparatus with comparable efficiency would thus be solved in an obvious manner.

2.2.8 Therefore, the subject-matter of claim 1 does not involve an inventive step (Article 56 EPC). Essentially the same analysis and conclusion applies to use claim 24.

The appellant's main request is therefore not allowable.

*First Auxiliary Request*

2.3 Novelty

Compared with claim 1 of the main request, the apparatus claimed in claim 1 of the first auxiliary request comprises as additional features a filter (300) and an ion exchange resin (500) (see claim items (c) and (d)). Similar differences exist with respect to use claim 15.

The claimed subject-matter is therefore novel at least for the reasons given under point 2.1.

2.4 *Inventive Step*

2.4.1 The reasoning is the same as outlined under points 2.2.1, 2.2.2 and 2.2.3 above, but the solution is of course different from the one of the main request.

2.4.2 As a solution to the problem defined under point 2.2.3, the application under appeal proposes an apparatus in accordance with claim 1, characterised *inter alia* by a filter positioned after the electrolytic cell and by an ion-exchange resin as a pre-treatment unit, adapted to increase the halogen-containing ion concentration of the electrolytic solution.

The application also proposes the use of the said apparatus, in accordance with claim 15, for electrolysing an electrolytic solution, the apparatus features being the same as in claim 1.

2.4.3 As to the success of the solution, the board finds it plausible that the ion-exchange resin, positioned as a pre-treatment unit and adapted to increase the halogen-containing ion concentration of the electrolytic solution, tends to improve the cell's efficiency, by

increasing the halogen-ion concentration in the electrolytic solution. Therefore, the problem as defined under point 2.2.3 has been successfully solved.

2.4.4 It remains to be decided whether the proposed solution is obvious having regard to the prior art.

The board regards the provision of a filter in an apparatus which is intended to deliver sterilized water as a matter of routine design (see for instance D5, Figure 1). This would also apply to the kind of filter defined in claim 1, because sub-micron filters are well known in the art.

As regards the ion-exchange resin unit, positioned upstream as a pre-treatment unit and adapted to increase the halogen-containing ion concentration of the electrolytic solution, a combination of an ion-exchanger bed and an electrolysis cell is shown in document D7 (see Figure 1; column 4, lines 13 to 45). However, in accordance with D7, the purpose of the electrolytic cell(s) is to periodically produce chlorine *in situ* and to discharge it into the ion-exchange bed so as to prevent fouling of the resin and to provide a general antimicrobial treatment (see column 3, line 50, to column 4, line 4). Thus, the electrolytic treatment is carried out essentially simultaneously with the ion-exchange treatment (see D7, claim 1). The purpose of the electrolysis units in D7 is to generate chlorine for sterilising the resin bed, not for purifying the effluent water.

Therefore, document D7 does not disclose or suggest a position of the ion-exchanger upstream of the

electrolysis cell, as a pre-treatment and to increase the chlorine concentration for subsequent electrolysis, as in the instant application. In view of the above-explained differences in function of the electrolytic cell and ion-exchange resin, the board is also not convinced that the skilled person would have taken D7 into account at all, as it neither explicitly teaches how to improve the efficiency of an electrolytic apparatus, such as the one disclosed in D1, nor even refers to the problem of efficiency of such an apparatus.

2.4.5 None of the other prior art documents on file suggest an ion-exchange resin unit, positioned upstream as a pre-treatment unit to an electrolytic cell having the characteristics of the instant invention, said ion exchange unit being adapted to increase the halogen-containing ion concentration of the electrolytic solution.

2.4.6 Claim 1 of the first auxiliary request thus meets the inventive step requirement of Article 56 EPC.

2.4.7 Use claim 15 and the other claims in accordance with the first auxiliary request derive the presence of an inventive step from claim 1 and are therefore also considered to meet the requirement of Article 56 EPC.

2.4.8 The board has noted minor clerical errors in claims 1 and 15 ("ration" instead of "ratio"). A correction would be required before grant of a patent.

**Order**

**For these reasons it is decided that:**

1. The decision under appeal is set aside.

2. The case is remitted to the department of first instance with the order to grant a patent on the basis of the claims of the first auxiliary request, filed with letter dated 23 April 2009, and a description and drawings to be adapted.

The Registrar The Chairman

C. Vodz G. Raths