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D E C I S I O N
of 24 September 2001

Case Number: T 0389/98 - 3.3.5

Application Number: 93902102.8

Publication Number: 0644859

IPC: C02F 3/30

Language of the proceedings: EN

Title of invention:
Process and plant for the purification of polluted water

Patentee:
I. KRÜGER SYSTEMS A/S

Opponent:
DEGREMONT

Headword:
Water purification/KRÜGER

Relevant legal provisions:
EPC Art. 56

Keyword:
"Inventive step - yes, non-obvious alternative"

Decisions cited:
-

Catchword:
-

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Case Number: T 0389/98 - 3.3.5

D E C I S I O N
of the Technical Board of Appeal 3.3.5
of 24 September 2001

Appellant: (Opponent)
DEGREMONT
183, avenue du 18 juin 1940
F-92508 Rueil Malmaison (FR)

Representative:
Armengaud Ainé, Alain
Cabinet Armengaud Ainé
3 Avenue Bugeaud
F-75116 Paris (FR)

Respondent: (Proprietor of the patent)
I. KRÜGER SYSTEMS A/S
363, Gladsaxevej
DK-2860 Soborg (DK)

Representative:
Kyed, Iver
Hofman-Bamg Zacco A/S
Hans Bekkevolds Allé 7
DK-2900 Hellerup (DK)

Decision under appeal: **Interlocutory decision of the Opposition Division of the European Patent Office posted 17 March 1998 concerning maintenance of European patent No. 0 644 859 in amended form.**

Composition of the Board:

Chairman: R. K. Spangenberg
Members: G. J. Wassenaar
M. B. Günzel

Summary of Facts and Submissions

I. The appeal is from the decision of the Opposition Division to maintain European patent No. 0 644 859 in amended form with claims 1 to 13 filed during oral proceedings on 5 March 1998.

II. In the statement of the grounds of appeal, the appellant (opponent) attacked the claims as maintained by the Opposition Division on the grounds of lack of novelty (Article 54(1) EPC) and lack of inventive step (Article 56 EPC). Three new documents numbered D8 to D10 were submitted. With respect to the subject matter covered by independent claim 5 reference was made to the following documents:

D1: "New process design for nutrient removal", J. Wanner et al.; Proc. 6th IAWPRC Conf., August 26-30, 1991,

D2: DE-A-3 833 185,

D3: Mémento technique de l'eau, Edition du Cinquantenaire, 1989, 9th ed., Vol. 2, pages 1271-1276,

D5: "Performances obtenues en élimination des pollutions carbonées et azotées", B. Jimenez et al., 37th Int. Conf. CEBEDEAU-LIEGE, May 1984,

D6: "Nitrification-Dénitrification par bactéries fixées", P. Gilles and Y. Bourdon; L'eau, l'industrie, les nuisances, 93, June-July 1985,

D9: Wat. Sci. Tech. Vol. 22, No. 1/2, 1990, pages 475-

482,

D10: EP-A-0 302 545.

D9 was used for the novelty attack and as starting point for rejecting inventive step.

III. With the letter dated 29 January 1999 the respondent filed new claims 1 and 2, which read as follows:

Claim 1:
"A process for the biological purification of polluted water, such as waste water wherein the polluted water is successively subjected to an anaerobic, an anoxic and an aerobic treatment in the presence of micro-organisms in order to reduce the nitrogen and phosphorus contents of the water, **characterized** in using three immobilised micro-organism cultures, in keeping the two first micro-organism cultures in alternating anaerobic and anoxic conditions and in conducting polluted water alternatingly to the first and second of the two first micro-organism cultures, the polluted water, however, being always conducted to the micro-organism culture which is kept in anaerobic conditions, whereas the water discharged from the immobilised micro-organism culture which is kept in anaerobic condition is conducted to the second of the two first immobilised micro-organism cultures together with nitrate-containing water recycled from the micro-organism culture which is kept in aerobic conditions and periodically removing excess of micro-organism-containing material from the immobilised cultures."

Claim 2:
"A plant for carrying out the process according to

claim 1, **characterized** in that it comprises three filters comprising immobilised micro-organism cultures and means for alternatingly passing polluted water to the first and second filter, means for recycling nitrate-containing water from the third filter to the first or second filter and means for periodically removing excess micro-organism containing material from said filters."

It was argued that D9 disclosed the most relevant technique and that the process according to the new claim 1 differed from the treatment line D) on page 477 of D9 in that the anaerobic and anoxic treatments were performed by immobilised micro-organism cultures and in that the polluted water was alternatingly supplied to the first and the second immobilised micro-organism cultures. The problem to be solved was to remove phosphorus to a higher degree. The invention was based on the discovery that the same micro-organism culture should be subjected to both anaerobic and anoxic conditions in order to obtain an increased phosphorus removal in a process comprising the use of three immobilized micro-organism cultures. None of the cited references taught the claimed solution and the effects obtained.

IV. With letter dated 29 April 1999 the appellant indicated that the said respondent's letter would not be replied to.

V. The appellant (opponent) requested that the decision under appeal be set aside and that the European patent No. 0 644 859 be revoked.

The respondent (patentee) requested that the decision

under appeal be set aside and the patent be maintained with claims 1 and 2 filed with the letter dated 29 January 1999.

Reasons for the Decision

1. The subject-matter of claims 1 and 2 corresponds essentially to the subject-matter of claims 6 and 13 respectively, as maintained by the Opposition Division.

Apart from the feature "periodically removing excess of micro-organism-containing material from the immobilised cultures" all the features of present claim 1 are disclosed in the same context in claims 1, 6 and 7 as originally filed. The said remaining feature follows from the original description on page 8, lines 16 to 19, according to which the plant may comprise means for periodically providing an increased hydraulic load on the filters to achieve increased removal of micro-organisms from the filters at desired points in time, and on page 11, lines 33 to 35, according to which excess biomass from the filters may be removed by backwashing of the filters with water.

The features of claim 2 are all disclosed in the same context in claims 9 and 15 as originally filed. Present claim 2 does not contain the explicit feature of original claim 15 that the three biological filters are **connected in series**. This feature follows, however, from its reference to the process according to claim 1, requiring the **successive** treatment of the polluted water by three immobilised micro-organism cultures.

The present claims do not extend the protection conferred. The amended claims, therefore, fulfill the requirements of Article 123(2) and (3) EPC.

2. The Board can accept the parties' common opinion that D9 represents the closest prior art. D9 discloses a process for the biological purification of polluted water, whereby after the removal of solids the polluted water is first directed to an upflow anaerobic sludge blanket (UASB) bioreactor, whereby biogas is recovered. The effluent from the UASB reactor is subjected to a denitrification treatment in an anoxic fluidized bed reactor and the effluent of the fluidized bed reactor is subjected to a nitrification treatment in an aerated aerobic fixed bed reactor, whereby a part of the effluent from the fixed bed reactor is recycled to the fluidized bed reactor (page 477, Figure 1, flow diagram D). According to D9 only one immobilised micro-organism culture is used. Thus the subject-matter of present claims 1 and 2 is already new because of the requirement that the plant for carrying out the process comprises three filters comprising immobilised micro-organism cultures. The feature of using three filters with immobilised micro-organism cultures under anaerobic, anoxic and aerobic conditions respectively is not disclosed in any of the cited documents. The subject-matter of claims 1 and 2 is thus novel.

3. According to the respondent, starting from the process according to D9, the objective problem of the process according to claim 1 is to remove phosphorus to a higher degree. The Board does not exclude that with the process according to claim 1 the phosphorus removal is more efficient, but there is no evidence to support the effect. Neither D9 nor the patent in suit contain any

figures about the removal of phosphorus. Under these circumstances the Board can consider as the problem underlying the invention the provision of a further process for the biological purification of polluted water. According to the patent in suit it is proposed to solve this problem with a process according to claim 1 and a plant according to claim 2. It is evident that by the process steps according to claim 1 polluted water is purified, so that the Board is satisfied that the process according to claim 1 solves the above-mentioned problem.

4. D9 does not contain any suggestion to replace the UASB reactor and the fluidized bed reactor with fixed bed reactors. The Board cannot accept the appellant's position that in a fluidized bed the micro-organisms are immobilized. But even if the Board were to follow that position there was still no suggestion for an anaerobic fixed bed reactor. If replacing the UASB and the fluidized reactors in D9 by fixed bed reactors were to be considered obvious for a person skilled in the art there would remain the other essential feature of the claims that the polluted water was conducted alternatingly to the first and second micro-organism cultures. The Board cannot accept the appellant's allegation that this feature follows from D1 or D2 in combination with D5 or D6 (page 7 of the grounds of the appeal). D1 and D2 propose a water treatment with four consecutive reactors, an anaerobic reactor, a biofilm nitrification reactor (aerobic), a denitrification reactor (anoxic) and an aeration reactor. The polluted water is, as usual, first conducted into the anaerobic reactor. From the disclosure in D1 and D2 that the micro-organism cultures in the anaerobic reactor and the anoxic reactor can be the same it does not follow

that the polluted water can also be directly conducted to the anoxic reactor, let alone to conduct the polluted water alternately to the first and second of the two first micro-organism cultures. D5 and D6 propose a water treatment with two filters, an anaerobic one for denitrification followed by an aerobic one for nitrification, with means for backwashing the filters to remove micro-organism containing material from the immobilised cultures on the filters. Here too the polluted water is only conducted to the anaerobic filter. Thus, in view of D5 and D6, it might have been obvious to replace the UASB reactor of D9 with an anaerobic filter, but there is no incentive for conducting the polluted water alternatingly to the first and second of the first two micro-organism cultures. Since the latter feature is also not disclosed or suggested in any of the other citations, the subject-matter of claims 1 and 2 does not follow in an obvious way from the available prior art and thus involves an inventive step within the meaning of Article 56 EPC.

5. The description is not yet adapted to the new claims. The Board exercises its power under Article 111(1) EPC to remit the case to the Opposition Division for further prosecution.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the Opposition Division with the order to maintain the patent with claims 1 and 2 filed with the letter dated 29 January 1999 and a description to be adapted.

The Registrar: The Chairman:

D. Spigarelli R. Spangenberg