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D E C I S I O N
of 13 December 1995

Case Number: T 0489/94 - 3.4.2

Application Number: 85304056.6

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Language of the proceedings: EN

Title of invention:
Fluid treatment process

Patentee:
ECO-TEC LIMITED

Opponent:
Scanacon Environmental System AB

Headword:
-

Relevant legal provisions:
EPC Art. 56

Keyword:
"Inventive step - main request and auxiliary requests 1, 2 and 3 - no"
"Auxiliary request 4 - yes"

Decisions cited:
-

Catchword:
-



Case Number: T 0489/94 - 3.4.2

D E C I S I O N
of the Technical Board of Appeal 3.4.2
of 13 December 1995

Appellant:
(Proprietor of the patent) ECO-TEC LIMITED
925 Brook Road South
Pickering
Ontario L1W 2X9 (CA)

Representative:
Chettle, Adrian John
Withers & Rogers
4, Dyer's Buildings
Holborn
London EC1N 2JT (GB)

Opponent:
Scanacon Environmental System AB
Box 1036
S-172 21 Sundbyberg (SE)

Representative:
Heunemann, Dieter, Dr.
Vossius & Partner
Postfach 86 07 67
D-81634 München (DE)

Decision under appeal: Decision of the Opposition Division of the
European Patent Office posted 29 April 1994
revoking European patent No. 0 201 640 pursuant to
Article 102(1) EPC.

Composition of the Board:

Chairman: E. Turrini
Members: C. Black
L. C. Mancini

Summary of Facts and Submissions

I. European patent No. 0 201 640 (application No. 85 304 056.6) was granted on the basis of a set of claims 1 to 7 of which claim 1 reads as follows:

"1. A process for treating a fluid to remove a component therefrom, in which the fluid is passed through a bed of a particulate material in the form of an ion exchange resin that is capable of both taking up the component from the fluid and of being regenerated in place and the volume of which would change appreciably in use if unconfined, wherein

(a) the bed comprises particles of substantially uniform size and

(b) finer than 0.42 mm (35 Tyler sieve size)

(c) maintained in an overpacked condition between first and second end faces of the bed,

(d) the bed defining a substantially constant depth between said faces of less than about 76 cm (30 inches) and

(e) a cross-sectional area which is constant or increases uniformly from one face to the other, and

(f) wherein the fluid is passed through the bed by distributing the fluid substantially uniformly across one of said end faces, permitting the fluid to flow through the bed and collecting the fluid substantially uniformly across the other said end face,

(g) the size of particles in the bed and the degree of overpacking being selected to provide for substantially even distribution of fluid across the cross-sectional area of the bed in flowing between said bed end faces, and

(h) the process being operated at a capacity of less than about 35% of the maximum capacity of the process."

The sub division into features (a) to (h) has been made by the Board; it corresponds closely, though not exactly, to that used in the appealed decision.

II. The patent was opposed by Kerachemie GmbH (01) and Scanacon Environmental System AB (02) on the grounds specified in Article 100(a) EPC. Opponent 01 subsequently withdrew the opposition. Opponent 02 argued that the claimed subject-matter was not novel having regard to an alleged prior use, or did not involve an inventive step.

III. The Opposition Division found that the prior use had not been established but revoked the patent on the grounds of lack of inventive step. In Annex I/II to its decision, the division listed documents D1 to D21 which had been cited during the opposition proceedings. Of these, the documents referred to directly or indirectly in the discussion of inventive step are as follows:

D9: New Short Bed for ion Exchange Technology... (Brown)
D10: US-A-4 366 060
D17: Affidavit of Brian Boulton
D19: Declaration in lieu of an oath of J. L. Davis
D20: Letter of J. L. Davis dated 28 February 1989
D21: Declaration of J. L. Davies dated 21 May 1992.

The Opposition Division argued in effect that features (a), (b), (d), (e) and (f) plus the introductory part of claim 1 were known from the Eco-Tec unit sold and operated by Umbraco Steel Co. as evidenced by D17, D19, D20 and D21, that feature (c) was known from D10 for the solution of substantially the same problem as in the patent in suit, that feature (g) was a desideratum which was fulfilled as long as features (b) and (c) were present, and that feature (h) was a necessary consequence of feature (c).

IV. The present appeal lies against this decision. At oral proceedings the appellant (patent proprietor) requested that the decision under appeal be set aside and a patent granted on the basis of claim 1 as granted (main request), or claim 1 according to auxiliary requests 1, 2 or 3 filed on 15 November 1995 and labelled Appendix I, II, and III respectively, or claim 1 according to auxiliary request 4 submitted at the oral proceedings.

The respondent (opponent 02) requested that the appeal be dismissed.

V. Claim 1 according to auxiliary request 1 differs from that according to the main request (see paragraph I above) in that the wording "that is capable of both taking up the component from the fluids can of being regenerated in place" is replaced by "that is use takes up the component from the fluid and is regenerated in place".

Claim 1 according to auxiliary request 2 differs from that according to the main request in that the words "in operational use" are inserted between "maintained" and "in an overpacked condition".

Claim 1 according to auxiliary request 3 incorporates the amendments effected in both auxiliary requests 1 and 2.

Claim 1 according to auxiliary request 4 differs from that according to auxiliary request 3 in that it commences with the words "An ion exchange process..." instead of "A process...".

VI. Other documents which are referred to in this decision are the following:

D2: Ionenaustauscher (Dafner) de Gruyter & Co.
Berlin 1964

D8: Acid Purification Unit (Eco-Tec Manual M116);
1 October 1977

VII. The argumentation of the appellant may be summarised as follows:

As regards the alleged public prior use the Opposition Division was correct in finding that this had not been established.

The subject-matter of claim 1 (main request) is novel over D10, because the process disclosed in this document, although using an ion exchange resin, operates by chromatography without exchange of ions. Further D10 does not disclose overpacking as defined in the attached patent, the pressure range of 3 to 17 psig mentioned in column 5, lines 61 to 66 being inconsistent with the required degree of overpacking.

The present invention seeks in particular to solve the problems of flow maldistribution occurring in prior art ion exchange systems. The skilled person would not look to D10 for a solution to the problem because it does not relate to ion exchange systems and in any case does not disclose overpacking.

The claims according to the auxiliary requests 1 to 4 are even further distinguished from the prior art.

The gist of the respondent's argumentation is as follows:

The objection that the claimed subject-matter is not novel in view of a public prior use is maintained, particularly having regard to the Davis declaration (D19) in conjunction with the Boulton Affidavit (D17).

The subject-matter of claim 1 is also not new having regard to D10 because the claimed process is not limited to one operating by ion-exchange and any distinction based on this is not valid. The various functional features of claim 1 do not serve to distinguish its subject-matter from the prior art and the remaining features are to be found in D10.

But even if the claimed subject-matter could be considered to be novel it would not involve an inventive step having regard *inter alia* to a combination of D9 or the public prior use with the teaching of D10 which seeks to solve the same problem as does the patent in suit.

Reasons for the Decision

1. The appeal is admissible.
2. The question of conformity with Article 123(2) and (3) EPC is not at issue in the present appeal and the Board is satisfied that no objection arises in this respect as regards any of the appellant's requests.

3. *Main request - novelty and inventive step*

3.1 A few words are first of all required on the construction of claim 1. The claim is formulated in the one-part form and as set out in paragraph I above it consists of a preamble and a sequence of features (a) to (h).

The preamble indicates that the claimed process is a conventional separation process utilising an ion exchange resin which is capable of being regenerated in place and the volume of which would change appreciably in use if unconfined. Regenerated is interpreted as meaning that the resin is restored to its original condition so that it may be used for further separation but since this feature has a role to play in distinguishing the process from the prior art it will require closer scrutiny later. The volume of ion exchange resins is known to vary according to the composition of the fluid with which they are in contact and particularly according to whether they are in the acid, base or neutral form. In this respect the word appreciably is a relative term but not objectionable for this reason alone. However in the present case the word also seeks to contribute to distinguishing the claimed process from the prior art and again this will require closer scrutiny.

Feature (a) requires that the particles should be of substantially uniform size. The Board sees no difficulty in interpretation here. Ideally the particles should be completely uniform, but a reasonable assumption is that any non-uniformity should not be such that a plurality of relatively small particles can fit into the spaces between relatively large particles.

Features (b), (d), (e), (f) and (h) present no problems in interpretation.

Overpacking, as required by feature (c), is defined in column 4, lines 40 to 46 of the description. The particles are to be confined within the bed so that they are under compression at all times. The significance is that this applies no matter to what extent the particles shrink in use.

Feature (g) has been objected to by the respondent and the Opposition Division as being a desideratum and also resulting automatically if features (b) and (c) are present. In the Board's view, feature (g) does contribute to the definition of the claimed process. If a process otherwise meeting the requirements of claim 1 does not provide substantially even distribution of liquid across the cross-sectional area of the bed then the size of the particles and/or the degree of overpacking have to be adjusted, respectively downwardly (this follows from column 9, lines 9 to 37) and upwardly.

3.2 In the opposition proceedings, one of the grounds of opposition was lack of novelty of the subject-matter of claim 1 on the basis of an alleged public prior use. It was argued by the opponent 02 that ion exchange columns marketed by the patent proprietor operated in just the same way as those of the patent in suit. The Opposition Division, in part 2 of the Reasons for the Decision, found that operation of the said prior Eco-Tec columns corresponded to many of the features of claim 1 but that it had not been established that these columns operated in the overpacked condition as required by feature (c). The Board agrees with this finding. Moreover in the appeal proceedings, the respondent requested that Mr J. L. Davies and Mr B. Boulton be heard as witnesses

in the oral proceedings. The Board took the view that this was neither appropriate nor necessary. In the case of Mr Davis, the request was made with a view to his explaining why he considered the expression "overpacked condition" unclear (page 7 of response). Mr Davis would therefore be giving an opinion rather than testifying as a witness, and this could be done in writing, or orally at the proceedings.

As regards Mr Boulton, it seemed that the respondent was requesting that he be given the opportunity to amplify what was said in his Affidavit (D17). In this respect the Board can agree with the Opposition Division (point 4 of the minutes of oral proceedings and page 7 of the decision) that the opponent had sufficient time to provide evidence of prior use and that prior use had not been established. Only documentary corroboration (such as an instruction manual) that the prior Eco-Tec columns operated in an overpacked condition in the sense of the patent in suit would appear to be useful to demonstrate the public prior use of columns operating in the overpacked condition and this has not been forthcoming. In this respect therefore the subject-matter of claim 1 is novel.

3.3 D10 discloses a process for treating a fluid to remove a component therefrom, in that the said process removes at least part of the dextrose from a mixture thereof with fructose (see summary of the invention in columns 4 and 5). The fluid is passed through a bed of particulate material in the form of an ion exchange resin (e.g. column 4, lines 30 to 35) that is capable of taking up the component from the fluid - fructose has a greater affinity for the resin than dextrose and is therefore

held back (column 1, lines 37 to 41). The resin can be restored to its original condition by backwashing (column 6, lines 59 to 61) and therefore is capable of being regenerated in place.

At this point it is convenient to consider that aspect of the appellant's argumentation which seeks to distinguish the subject-matter of claim 1 from the disclosure in D10 in that the process according to D10, although using an ion exchange resin column, does not operate by ion exchange as does that of the patent in suit, but merely by chromatography of the non-ionic sugars. The appellant argues therefore that in the patent in suit, the ion exchange resin, having taken up ions from the fluid being treated, subsequently has to be restored to its original ionic form and this is what is meant by regeneration. In D10, there is no change in ionic form, so that the ion exchange resin does not have to undergo regeneration as understood in the patent in suit.

In the Board's opinion however, the wording of claim 1 is not restricted to a process operating by ion exchange, so that the word regeneration cannot be given the narrow interpretation ascribed to it by the appellant and therefore does not serve to distinguish the claimed process from that disclosed in D10.

In any case "capable...of being regenerated" is a definition of the ion exchange resin rather than a feature of the process and applies to a greater or lesser extent to all ion exchange resins.

The appellant again invokes the argument that D10 does not disclose an ion exchange process in respect of the feature "the volume of which would change appreciably in use if unconfirmed", asserting that in the process disclosed in D10 the volume of the ion exchange resins would not change appreciably in use if unconfined. In the Board's opinion the ion exchange resin employed in D10 will be exposed in the course of the process to solutions of different compositions, that is, the solution of dextrose and fructose, the at least partially separated mixture of these and the eluting water. A small change in volume in use is therefore to be expected. It is true that this change will be much less than would occur in the course of an ion exchange process. However as has already been emphasised, the wording of claim 1 is not restricted to an ion exchange process, so that the relative term "appreciably" cannot be given the narrower and somewhat more precise meaning it would have in that case, and again does not serve to distinguish the claimed process from that disclosed in D10.

The features of claim 1 labelled (a) to (h) will now be considered.

Feature (a) requires that the particles are of substantially uniform size. This is not disclosed in D10, although column 4, lines 61, 62 refers to the uniformly packed particulate absorbent and this would appear to necessitate some uniformity of particle size. In any case the skilled person in this field will usually seek to have some degree of uniformity of particle size and this is evidenced by D2, reflecting common general knowledge, which states on page 53 that particle size and the uniformity thereof are the most important prerequisites for achieving a sharp separation.

Feature (b) is anticipated by the size range of 200 to 500 microns disclosed in D10.

As regards feature (c), in D10 the column is first packed with resin in a shrunken state, the column is sealed and deionised water passed through, causing the resin to swell (column 5, lines 48 to 57). The resin expands, packing the resin particles densely together and causing a positive pressure against the separation column in the range of 3 to 17 psig. In the Board's view at least at the upper end of this pressure range the bed will be overpacked and remain so when any small volume changes as mentioned above occur.

The appellant, with a communication dated 15 November 1995, submitted the results of an experiment which sought to demonstrate that overpacking as required by the patent in suit was not achieved in D10. In the Board's view the result of one experiment cannot be seen as conclusive in the present case so that the question of whether this evidence, submitted less than one month before the date set for oral proceedings, should be admitted need not be gone into.

It is noted also that the packing process disclosed in D10 is very similar to that of the patent in suit when method 1 is modified according to method 3 (columns 10 to 12).

The bed depth of 76 cm required by feature (d) cannot be said to be anticipated by the disclosure in D10 of beds up to seven feet in height (column 4, lines 53, 54). Nevertheless the skilled person carrying out the teaching of D10 on a laboratory or pilot plant scale would use much smaller and shorter columns.

Feature (e), to the extent that it requires a constant cross-sectional area, is normal in ion exchange resin columns.

Feature (f) can be seen as a desideratum and is in any case in substance disclosed in D10, column 6, lines 15 to 23 and 43 to 61. D10 does not disclose that the size of the particles is selected to provide for substantially even distribution of the liquid as required by feature (g). However as pointed out above it is common general knowledge that particle size has a role to play in achieving a sharp separation and the latter cannot occur without even fluid distribution.

A further aspect of feature (g) is that the degree of overpacking is selected for the same purpose. According to D10, lines 49 to 58, the disclosed packing method obviates the need for internal baffling or flow distribution structures and in column 10, lines 39 to 45 it is stated that the tightly packed bed is not subject to channelling, front running or other irregularities in liquid flow through the successive columns. That is D10 is also seeking to achieve even distribution of fluid. Since it is the overpacking of the column which brings this about, the column must clearly be sufficiently overpacked for this purpose and therefore the degree of overpacking has to be selected.

Finally feature (h) requires that the process be operated at less than 35% of the maximum capacity. The appellant has argued that this feature makes it clear that the claimed process is an ion exchange process, because capacity is meaningless in a chromatographic process. This argument might be valid for a chromatographic process wherein a thin layer of a mixture to be separated is applied to the top of a column and is separated by introducing a liquid which

does not contain the constituents of the mixture. D10 however is disclosing a process wherein the fluid to be treated is supplied continuously to the column just as in ion exchange separation and indeed in column 5, lines 4, 5 it is stated the volume of the input feed stream may vary from 0.3 to 1.0 of the bed volume per cycle of feed stream, that is, operating at much less than maximum capacity is contemplated. It is true that "less than 35%" cannot be derived from D10, but the lower end of the above quoted range must be fairly close to, possibly less than 35% capacity.

It follows from the foregoing that there are some differences between the disclosure in D10 and the subject-matter of claim 1 so that the latter can be considered to be novel. However these differences are not such as would impart inventivity to the subject-matter of claim 1 but rather fall within the competence of the skilled person repeating the teaching of D10. The appellant's main request cannot be allowed.

4. *Auxiliary requests 1, 2 and 3*

The main request fell because claim 1 could not be interpreted as being restricted to an ion exchange process. Claim 1 according to auxiliary requests 1, 2 and 3 differs from that according to the main request as is set out in paragraph V above. In the Board's opinion the amendments introduced are not sufficient to make it clear beyond doubt that the claimed process is an ion exchange process. The claim according to these requests therefore must fall for substantially the same reasons as does claim 1 according to the main request.

5. *Auxiliary request 4*

5.1 Claim 1 according to this request is clearly restricted to an ion exchange process and its subject-matter is therefore novel over disclosure in D10. As regards the alleged prior use the same considerations apply as set out in paragraph 3.2 above.

5.2 For the evaluation of inventive step it is appropriate to start from D9 because this also discloses an ion exchange process. D9 is the text of a paper presented by the inventor of the patent in suit and describes an ion exchange process known as Recoflo[®] and equipment therefor marketed by the present appellant. In the Board's view moreover the disclosure in D9 is consistent with that of D17, D19, D20 and D21 which sought to establish the alleged prior use in respect of equipment sold to Unbrako Steel by the appellant.

The Board can largely follow the argumentation of the Opposition Division and the respondent as to the extent to which D9 (or D17 to 21) discloses the features of claim 1. Any minor reservations on the Board's part need not be gone into here, because most importantly the Board finds that the question of a distinction based on features (c) and (g) can be resolved in the appellant's favour.

In this respect D9 discloses that the Recoflo[®] ion exchange columns are designed so that there is no freeboard above the resin bed. As to how this is achieved, recourse is necessary to other documents. D8, page 10, an Eco-Tec manual clearly describing Recoflo[®] equipment, discloses mounding the resin above the top of the bed and compressing it by assembling end-plates. D17, an Affidavit from a customer of Eco-Tec, confirms

this and also indicates that the resin could be scooped into the column and patted down, or introduced in pre-shrunk form and then expanded in the column. This is in fact not in dispute between the parties.

The Board however is not convinced that such methods of packing a column will result in a condition which can be described as overpacked as required by the patent in suit, wherein the degree of overpacking is such that this condition is maintained no matter to what extent the resin particles contract during operation. Nor would a combination of D9, or any document describing the Recoflo® process, with D10 lead to the subject-matter of claim 1. As noted above D10, column 4, lines 19 to 27 and 40 to 49, also column 5, lines 45 to column 6, line 3, discloses a means of filling a column which seeks to avoid channelling effects and turbulence, a problem also in substance addressed in the patent in suit - cf. column 2, lines 29 to 38 in conjunction with column 3, lines 29 to 31. Moreover the method of packing the column disclosed in D10 is similar to that employed in the patent in suit - see column 11 under method 3. It is true, as stated above, that D10 does not operate by ion exchange so that the associated volume changes in use will be much smaller, but for the average skilled person it arguably contains a teaching of general applicability which provides a useful method of filling a column which avoids the above mentioned defects. Nevertheless the Board can agree with the appellant that the positive pressure range of 3 to 17 psig against the column quoted in column 5, lines 61 to 66 would be insufficient to achieve overpacking in the sense of the patent in suit which refers to pressures greater than 100 psi (column 11, line 25) and there is no hint in D10 to overpack to such an extent.

The file of the present appeal case contains numerous Affidavits or the like seeking to support the argumentation of the parties. Apart from the disputed question of overpacking these contain nothing of substance which is inconsistent with the Board's finding and need not be considered further. Other cited documents come no nearer to the claimed subject-matter than those already referred to. For the foregoing reasons the subject-matter of claim 1 according to auxiliary request 4 is seen as involving an inventive step.

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 in amended form on the basis of claim 1 according to auxiliary request 4 filed at the oral proceedings, claims 2 to 7 as granted, with claim 6 corrected in accordance with Annex 3 (see minor amendment) accompanying appellant's grounds of appeal dated 5 September 1994, and drawings and description to be adapted where necessary.

The Registrar:

The Chairman:

P. Martorana

E. Turrini