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D E C I S I O N
of 22 March 2002

Case Number: T 0344/99 - 3.3.5

Application Number: 91919985.1

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Title of invention:
Mineral fibre composition

Patentee:
Paroc Group Oy Ab

Opponent:
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(02) THE MORGAN CRUCIBLE COMPANY PLC
(03) RADEX-HERAKLITH Industriebeteiligungs aG
(04) Grünzweig + Hartmann AG

Headword:
Fibres/PAROC

Relevant legal provisions:
EPC Art. 123(2), 54(2), 54(3), 56

Keyword:
"Amendments not allowable (main request)"
"Novelty and inventive step (yes, 1st auxiliary request)"

Decisions cited:
G 0010/91, T 0198/94, T 0279/89, T 0002/81, T 0925/98

Catchword:

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Case Number: T 0344/99 - 3.3.5

D E C I S I O N
of the Technical Board of Appeal 3.3.5
of 22 March 2002

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Decision under appeal: Interlocutory decision of the Opposition Division
of the European Patent Office posted
5 February 1999 concerning maintenance of
European patent No. 0 558 548 in amended form.

Composition of the Board:

Chairman: R. K. Spangenberg
Members: M. Eberhard
J. Van Moer

Summary of Facts and Submissions

I. European patent No. 558 448 based on application No. 91 919 985.1 was granted on the basis of seven claims. Four opponents filed notices of opposition requesting revocation of the patent on the grounds of lack of novelty and inventive step and insufficiency of disclosure. Opponent 04 withdrew its opposition on 19 June 1998. The opponents relied inter alia on the following documents:

D1: EP-A-459 897

D3: WO 89/12032

D7: Mira and al., Indian Ceramics, vol. 13, n° 4, 1968, pages 97-102

D8: Mat. Rec. Soc. Symp. Proc., Vol. 26, 1984, Scientific Basis for Nuclear Waste Management VII, pages 755-761.

II. By an interlocutory decision the opposition division decided that the subject-matter of the claims according to the main request filed on 26 June 1998 met the requirements of the EPC. It took the view that the claimed subject-matter was novel with respect to D1 since the latter neither suggested to take into consideration a ratio P_2O_5 to Al_2O_3 + iron oxide (hereinafter ratio R) nor gave any hint to an effect resulting from this parameter. D3 was the closest prior art. The respondent had made plausible by comparative examples that the claimed fibre composition exhibited an improved solubility in biological fluids and that this improvement was attributable in particular to the

ratio R. None of the cited documents contained sufficiently clear information allowing a reliable prediction of the effect of adjusting the ratio R.

III. The appellant (opponent 02) lodged an appeal against this decision. In reply to a communication from the board, the respondent filed four sets of amended claims on 20 February 2002 as a main request and three auxiliary requests respectively. Oral proceedings were held on 22 March 2002.

Claims 1 and 4 of the main request read as follows:

"1. A mineral fibre composition which is soluble in biological fluids, characterized in that it contains substantially

SiO ₂	45-65 % by weight
Al ₂ O ₃	0.5-7 % by weight
Fe ₂ O ₃	0-5 % by weight
CaO	15-40 % by weight
MgO	0-20 % by weight
Na ₂ O + K ₂ O	0-6 % by weight
P ₂ O ₅	0.5-10 % by weight

the total amount of Al₂O₃ and iron oxide being 0.5 to 7 % by weight, the weight ratio of P₂O₅ to the sum of Al₂O₃ and iron oxide being 0.5 to 6."

"4. Method of increasing the solubility in a biological fluid of a mineral fibre material, characterized in that to a fiberizable mineral fibre composition containing substantially;

SiO ₂	45-65 % by weight
Al ₂ O ₃	0.5-7 % by weight
Fe ₂ O ₃	0-5 % by weight
CaO	15-40 % by weight

MgO 0-20 % by weight

Na₂O + K₂O 0-6 % by weight

and having a total amount of Al₂O₃ and iron oxide of 0.5 to 7 % by weight, phosphorus oxide is added in such an amount that the weight ratio of P₂O₅ to the sum of Al₂O₃ and iron oxide is 0.5 to 6, optimally 0.5 to 2 the amount of P₂O₅ being up to 10% by weight."

Claims 1 to 3 of the first auxiliary request are identical to claims 1 to 3 of the main request, the sole difference between these two requests being the deletion of claim 4.

IV. The appellant's arguments can be summarised as follows:

Claims 1 and 4 of the main request contained added subject-matter. By moving the lower limit of the ratio R from 0.4 in the application as filed to 0.5 in the claims a new selection had been made since this ratio was said to be critical. The original application did not disclose the range 0.5-7 wt% for the sum of Al₂O₃ and iron oxide in combination with the ranges indicated in claim 1 for the individual components. Furthermore, the said sum was disclosed to be "circa" 0.5-7% in the original application whereas the present claims gave an absolute value of 0.5 wt%. "Circa 0.5 wt%" did not clearly disclose the precise value but a range somewhere around the value. The same objection applied to the upper limit of 10 wt% P₂O₅ in claim 4, since "circa 10%" was indicated on page 3 of the original application. The specific ranges stated in claim 4 for SiO₂, Al₂O₃, Fe₂O₃, CaO, MgO and Na₂O + K₂O were disclosed on page 4 of the original application but in combination with an amount of 0.5-10 wt% P₂O₅ in the composition, which was not the case in claim 4. The

amount of circa 0.5 wt% for the sum of Al_2O_3 and iron oxide was combined on page 2 of the original application with a ratio R of circa 0.4, not with 0.5 as in claim 4.

There was no priority basis in the priority document (hereinafter P1) for the range $R = 0.5$ to 6 specified in present claim 1. P1 defined two ranges, ie circa 0.4 to 6 and circa 0.5 to 2, and gave an example with $R = 0.357$. Furthermore P1 did not disclose the current combination of $R = 0.5$ to 6 with the range 0.5 to 7% for the total amount of Al_2O_3 and iron oxide. According to P1 both Al_2O_3 and iron oxide had to be present in the composition whereas the composition of present claim 1 could be iron-free. As claim 1 was not entitled to the priority date, D1 was available as prior art for novelty. The claimed subject-matter was not novel over the disclosure of D1 or D3. D3 disclosed very broad ranges encompassing the claimed composition and gave an example (fibre 172) of a material containing P_2O_5 . The ratio R was not mentioned in D3; however, neither the patent in suit nor the data presented in the respondent's letter dated 26 May 1998 demonstrated any technical significance or any criticability of the specified range for R. This was confirmed by the appellant's tests submitted on 19 February 2002. The results in the patent in suit and the appellant's graphs filed with the grounds of appeal clearly supported that the amount of Al_2O_3 was the determining factor in solubility and that phosphate had no special effect. The respondent had merely repackaged a known property of the fibres of this class in the guise of a ratio which had no technical significance of itself. Decisions T 198/84 and T 279/89 defined three criteria for a selection invention to be novel. The claimed

invention failed to meet each of these criteria with respect to D1 and D3. The claimed ranges overlapped with those of D1 and the ratio $R = 0.45$ in example 5 of D1 lay just outside the claimed range. The ranges specified in the priority document of D1 (hereinafter P2) fell completely within the ranges of D1 and the claim to priority of D1 was valid to the extent that there was an overlap. The examples of D1 were also entitled to the priority date as the total amount of impurities was the same in D1 and P2, TiO_2 being considered as an impurity in D1. The examples in D1 and D3 were close to the claimed ranges and there was no purposive selection.

The claimed subject-matter lacked an inventive step over the teaching of D3 combined with the teaching of D7 and D8. The patent failed to demonstrate that phosphate had an effect other than that expected from the prior art. The skilled person whose aim was to produce soluble fibres would have looked in all the prior art concerning the solubility of glass. D7 disclosed that the durability of glass decreased when adding small amounts of P_2O_5 . It could also be inferred from D8 that P_2O_5 was a useful constituent for decreasing the durability of a glass. It would have been obvious in view of the teaching of D7 and D8 to use P_2O_5 in the fibre compositions of D3 in order to improve their solubility in physiological fluids. As the solubility of fibre 172 of D3 was higher than that of most of the other fibres, the skilled person would have considered this fibre as an appropriate fibre to start with. There was no inventive step in partially substituting phosphate for silica in glasses for increasing their solubility when the effect of this substitution was already known.

V. The respondent presented inter alia the following arguments:

The objection raised under Article 100(c) was a "fresh ground for opposition" as defined in G 10/91 and should not be reviewed by the board. The late filed experimental report submitted on 19 February 2002 should be disregarded. Claim 4 met the requirements of Article 123(2). The term "circa 10%" stated in the application as filed disclosed both the concept of the point value and something around that value. The combination of features in claim 4 was directly and unambiguously derivable from the preferred combination of ingredients given on page 4 of the application as filed and the ratio indicated on page 2. The priority claim was valid since the priority document P1 disclosed both the end points of the claimed range for the ratio R. It also made explicit that iron oxide need not be present provided the total amount of Al₂O₃ and iron oxide was different from zero. The reference to both alumina and iron oxide in P1 always occurred in the context of a sum. The term "circa 0.5" for the ratio R in P1 also unambiguously disclosed the value 0.5, ie the central point thereof. The combination of 0.5-7 wt% Al₂O₃ + iron oxide and 0.5 to 6 for R was disclosed in claims 1 to 3 of P1. D1, on the contrary, was not entitled to the priority date. The specific composition ranges stated in P2 did not appear in D1 and vice versa. In P2 and D1 the invention was further defined by additional requirements which were different from each other. The examples of D1 did not have the priority as they included TiO₂ which was a critical feature in P2 but not in D1. Therefore D1 was not citable against the present patent. Even if D1 were available as prior art, it would not destroy novelty

since the ratio R fell outside the claimed range. Neither D1 nor D3 discussed the ratio R nor recognised the importance thereof. D3 did not mention P_2O_5 in the summary of the invention. The skilled person would not have seriously contemplated using fibre 172 as it failed the fire test and P_2O_5 was added as a nucleating agent. The three criteria for a selection invention were also met. The ratio R had a technical significance as demonstrated by the respondent's comparative examples submitted on 29 May 1998 and explained on page 4 of the patent in suit. The invention was also remote from D3 in particular by the control of the relative amounts of P, Al and Fe combined with specific ranges of the constituents. The appellant's graphs submitted with the grounds of appeal were misleading as they were based on data which had been extracted from a Table relating to compositions which were not directly comparable. Starting from D3, the technical problem was to provide fibres having an improved solubility for a certain alumina content and which could be produced from more readily available raw materials. The improvement in solubility was shown in the examples of the patent in suit and in the additional comparative examples. There was no suggestion in D3 of the ratio R defined in claim 1 nor of its technical significance. D3 did not recognise the necessity of including phosphorus, and if phosphorus was present, it was included for fire resistance purposes and not for solubility purposes. It was not correct to start from fibre 172. D3 disclosed over 200 examples and the only example with P_2O_5 , ie example 172, failed the fire test. Furthermore a large number of other fibres exhibited a better solubility. D7 concerned sodium silicate glasses having a structure different from the glasses of the patent in suit. These glasses were difficult to

fiberize. D8 was far remote from the patent as it concerned the stability of radioactive waste glasses. It contained nothing which taught the claimed relationship between P_2O_5 , Al_2O_3 and iron oxide.

- VI. The appellant requested that the decision appealed be set aside and that the patent be revoked. The respondent requested that the decision under appeal be set aside and that the patent be maintained with the claims of the main request filed on 20 February 2002 or, in the alternative, with the claims of one of the auxiliary requests 1 to 3 filed at the same date. The other party, ie opponent 01, requested the revocation of the patent in suit. Opponent 03 withdrew his opposition against the patent by a letter dated 15 May 2000.

Reasons for the Decision

1. The appeal is admissible.
2. In the grounds of appeal and at the oral proceedings, the appellant raised an objection of added subject-matter in connection with the lower limit of the range 0.5 to 6 for the ratio R, which is stated in claim 1 of both the main request and the first auxiliary request. The appellant argued that shifting the lower limit of the ratio R from 0.4 in the application as filed to 0.5 in claim 1 represented a new selection, since the range 0.5 to 6 was said to be critical and the limitation was intended as an important technical feature having a technical effect. The board observes that the figure of 0.5 for R and the range 0.5 to 6 are already stated in granted claim 1. However, no objection under

Article 100(c) EPC was raised by the opponents against the said range in their notice of opposition or during the opposition proceedings. This matter was also not dealt with in the decision appealed. Furthermore, this objection does not arise from the additional amendments introduced into claim 1 at the appeal stage. Therefore, the said objection amounts to a new ground of opposition. According to opinion G 10/91 (OJ EPO, 1993, 420) fresh grounds of opposition may be considered in appeal proceedings only with the approval of the patentee. As the patentee did not give his agreement, this objection is not taken into consideration by the board.

Main request

3. The question arises whether or not amended claim 4 of the main request meets the requirements of Article 123(2) EPC. According to claim 4, an amount of up to 10% by weight P_2O_5 is added to a starting composition containing substantially 45-65 wt% SiO_2 , 0.5-7 wt% Al_2O_3 , 0-5 wt% Fe_2O_3 , 15-40 wt% CaO , 0-20 wt% MgO and 0-6 wt% $Na_2O + K_2O$ and having a total amount of Al_2O_3 and iron oxide of 0.5 to 7 wt%. The lower amount of P_2O_5 added to the starting composition is defined by the ratio R. However, according to the application as filed, the specific ranges stated above for SiO_2 , Al_2O_3 , Fe_2O_3 , CaO , MgO , $Na_2O + K_2O$ and $Al_2O_3 +$ iron oxide are not those of the starting composition but those of the final composition, ie the composition including 0.5 to 10 wt% phosphorus oxide (see page 4, lines 18-25; original claim 5). Although the difference between the composition of the starting material and the composition of the final product might be small when the amount of added phosphorus oxide is low (ie close

to the lower limit of 0.5 wt% in the final composition), this is not the case when high amounts of phosphorus oxide (ie close to 10 wt%) are added to the starting composition. According to the application as filed the amounts of SiO₂, Al₂O₃, Fe₂O₃, CaO, MgO, Na₂O + K₂O and Al₂O₃ + iron oxide indicated above are not only those of the final composition instead of the starting composition but they are furthermore associated with an amount of P₂O₅ from 0.5 to 10 wt%. However, according to claim 4 the amount of phosphorus oxide which is added to the starting composition may be lower than 0.5 wt%. It is not clearly and unambiguously derivable from the application as filed that an amount of phosphorus oxide lower than 0.5 wt% can be added to a starting composition containing 45-65 wt% SiO₂, 0.5-7 wt% Al₂O₃, 0-5 wt% Fe₂O₃, 15-40 wt% CaO, 0-20 wt% MgO, 0-6 wt% Na₂O + K₂O, and 0.5 to 7wt% Al₂O₃ + iron oxide to increase the solubility of a mineral fibre material in a biological fluid. Therefore amended claim 4 of the main request contravenes Article 123(2) EPC and for this reason the main request cannot be granted.

First auxiliary request

4. Amended claims 1 to 3 meet the requirements of Article 123(2) and (3) EPC. Claim 1 of this request is based on a combination of the composition given on page 4, lines 18-25, of the application as filed (or in original claim 5) with the total amount of Al₂O₃ and iron oxide indicated on page 2, lines 19-21, of the application as filed. Furthermore, the combination of the two ranges 0.5 to 6 for the ratio R and 0.5 to 7% for the total amount of Al₂O₃ and iron oxide is directly and unambiguously derivable from original claims 1 to 4 and from page 2, lines 14-21, of the original

application. Original claim 4 which states the range of 0.5 to 7 wt% is appended to claim 3, the latter being itself appended to claim 1 and claim 2 which respectively disclose the ranges 0.4 to 6 and 0.5 to 2 for the ratio R, and thus 0.5 to 6 (see T 2/81, OJ EPO 1982, 394, point 3, and T 925/98 not published in OJ). It cannot be inferred from the application as filed that the range 0.5-7 wt% disclosed on page 2, line 20, can only be combined with the range 0.5 to 2 for the ratio R. Original claim 5 which discloses the specific composition stated in the present claim is not appended to original claims 2 to 4; however the skilled person would clearly and unambiguously derive from the application as filed that the disclosure on page 2, lines 14-21, also applies to the advantageous composition indicated on page 4, lines 15-25. The appellant's arguments that the disclosure of "circa 0.5 wt%" for the total amount of alumina and iron oxide and "circa 0.5" for the ratio R in the original application does not represent a clear disclosure of the precise value is not convincing. As pointed out by the respondent, the term "circa 0.5" first of all discloses the point value itself, ie the central point, and something around that value. The skilled person is not given any additional information when the claim is limited to the precise value, ie when deleting the undefined field around the central value.

The additional features in dependent claims 2 and 3 are disclosed in the application as filed, page 2, line 21 and page 4, lines 29-36, respectively. Furthermore the scope of protection is clearly restricted with respect to that of the granted claims.

5. The appellant contested that claim 1 of the first

auxiliary request was entitled to the priority date of 23 November 1990. Concerning the question whether or not the priority document P1 discloses that both Al_2O_3 and iron oxide have to be present in the mineral fibre composition, the board observes that the advantageous and the especially advantageous compositions disclosed in P1, page 4, lines 10-22, and lines 24-31, or in claims 4 and 5 both have a lower limit of zero for Fe_2O_3 , the lower limit for Al_2O_3 being 0.5 and 1 wt% respectively. Therefore, these preferred compositions may be iron-free. Claims 4 and 5 of P1 are appended to claim 1 in which it is stated that the composition "contains Al_2O_3 and iron oxide in a total amount of at least circa 0.5% by weight". The respondent argued in this respect that the word "and" used in claim 1 or at different other places in the description of P1 is always associated with **the total amount of alumina and iron oxide**, and thus does not mean that both Al_2O_3 and iron oxide must be present but that the total amount of alumina and iron oxide must be at least circa 0.5 wt%. On page 2, lines 6-9, of P1 the same wording is used as in claim 1. However on page 2, lines 14-15, which discloses the preferred range "circa 0.5 to 7% by weight" and thereby repeats the lower limit of circa 0.5 wt% indicated in claim 1, it is clearly stated that this limit represents the total amount of Al_2O_3 and iron oxide. Furthermore, both the method claim 6 and the corresponding passage on page 2, lines 18-25, of P1 also use the expression "a total Al_2O_3 and iron oxide content" in connection with the lower limit of circa 0.5 wt%. According to page 1, lines 35-39, of P1, the compositions are said to contain "a minimum amount of both aluminium and iron oxides, calculated together, and of...". Here again the expression "calculated together" strongly suggests that the total amount

aluminium and iron oxides is meant. Taking into account that the lower limit of circa 0.5 wt% is unambiguously defined as the total amount of Al_2O_3 and iron oxide on page 2, lines 14-15, of P1, that the value zero is disclosed for Fe_2O_3 in the preferred compositions, and that a construction of claim 1 of P1 different from that proposed by the respondent would lead to the preferred compositions being inconsistent with claim 1, the board considers that the ambiguous wording in claim 1 of P1 or on page 1 thereof can only be construed as meaning that the composition may be iron-free provided that the total amount of alumina and iron oxide is at least circa 0.5 wt%.

The appellant further argued that P1 did not disclose the combination of the range $R = 0.5-6$ with the range 0.5-7 wt% for the total amount of Al_2O_3 and iron oxide. These arguments are not convincing for the following reasons. Firstly in the board's judgement the disclosure of circa 0.5 for R and circa 0.5 wt% for the total amount of Al_2O_3 and iron oxide also discloses the precise value 0.5 (see the reasons given in point 4 above). Furthermore, the total amount of Al_2O_3 and iron oxide of 0.5 to 7 wt% is indicated on page 2 and in dependent claim 3 of P1, and this claim is appended to both claim 2 and claim 1 which disclose a ratio R of 0.5 to 2 and 0.4 to 6. Therefore, the combination of the range $R = 0.5-6$ with the range 0.5-7 wt% is directly and unambiguously derivable from claims 1 to 3 of P1. Regarding the lower limit of 0.5 for R , two ranges are defined in P1, namely 0.4-6 and 0.5-2. The range 0.5-6 is therefore clearly disclosed in P1 and cannot be considered as a new invention. For the preceding reasons claim 1 of the first auxiliary request validly claims the priority date of 23 November

1990. Dependent claims 2 and 3 are also entitled to the priority date.

6. It follows from the considerations in the preceding point that D1 (published on 4 December 1991) which has a priority date of 1 June 1990 and a filing date of 30 Mai 1991 forms part of the prior art as defined in Article 54(3) and (4) EPC only to the extent that its priority claim is valid. However this validity was disputed by the respondent.
- 6.1 D1 discloses mineral fibres which can decompose in a physiological medium and have the composition indicated on page 2, lines 28-43, and in claim 1. The ranges disclosed in the priority document P2 are, however, different from those specified in D1. For SiO_2 , Al_2O_3 , MgO , P_2O_5 and Fe_2O_3 they are narrower than those indicated in D1 (see P2, page 2, lines 27-34, and claim 1). Furthermore, neither the additional requirement $\text{CaO} + \text{MgO} + \text{Fe}_2\text{O}_3 > 25\%$ in D1 nor its effect, namely a good heat resistance of the fibres, are disclosed in P2. The preferred composition of D1 indicated on page 3, lines 2-16 (corresponding to claim 4 of D1), is also defined by ranges which are broader than those of the preferred composition disclosed in P2 (compare the ranges for SiO_2 , Al_2O_3 , CaO , MgO , Fe_2O_3 , $\text{Na}_2\text{O} + \text{K}_2\text{O}$). The second preferred composition given on page 3, lines 21-31, of D1 has no counterpart in P2. D1 does not only disclose broader ranges than in P2 but furthermore does not even mention the ranges stated in P2. For these reasons the compositions defined on page 2 and 3 of D1 or in claims 1 and 4 thereof are not entitled to the priority date of 1 June 1990. As the narrower ranges disclosed in P2 are not repeated in D1, they also cannot be relied upon as

prior art when assessing the novelty of the claimed subject-matter. Therefore, the appellant's objections against novelty, which are based on the composition ranges indicated in D1 or in P2 and in particular on the upper or lower limits thereof cannot be accepted. Regarding the examples in Table 1 of D1, the glass compositions n° 7 and n° 8 are not disclosed in P2 and are therefore not entitled to the priority date of 1 June 1990. Concerning the glass compositions n° 1-5 and 6, the question arises whether or not the priority date is valid since Table 1 of D1 does not state the TiO_2 content of the compositions contrary to Table 1 of P2, but instead gives the total amount of impurities including TiO_2 (see page 2, lines 44-48). However this question need not be decided since, even if it were considered in the appellant's favour that examples 1 to 5 and 6 of D1 are entitled to the priority date, then the outcome of the decision upon the novelty issue would be the same. Thus, for the sake of argument it is assumed that these examples form part of the prior art as defined in Article 54(3) and (4) EPC. It was not disputed that the compositions according to claim 1 differ from those of examples 1 to 4 and 6 of D1. Regarding example 5, the amounts of all the components stated in Table 1 fall within the claimed ranges. The ratio R is not mentioned in D1. However, the corresponding value can be calculated from the composition, and the calculated value is 0.45, ie slightly lower than the claimed limit of 0.5. The calculated value of R for examples 1 to 4 and 6 varies from 0.03 to 0.37. Thus, the value of 0.45 in example 5 is the highest value. D1 contains no indication from which it could be directly and unambiguously derived that the weight ratio of P_2O_5 to the sum of Al_2O_3 and iron oxide has to be maintained within certain limits.

In these circumstances, the value of 0.45 calculated from example 5 of D1 in the knowledge of the present invention can only be considered as a mere punctual disclosure. Therefore, example 5 does not destroy the novelty of the composition defined in claim 1.

6.2 The appellant further argued that the claimed subject-matter lacked novelty over the disclosure of D3. D3 discloses fibre compositions which are soluble in a physiological saline fluid: see the composition stated in claim 1. As pointed out by the appellant the broad ranges disclosed in this claim for SiO_2 , MgO , CaO and optionally Al_2O_3 completely encompass the ranges indicated in present claim 1. However, neither claim 1 of D3 nor the whole document disclose any range for the content of P_2O_5 . This component is not even mentioned in the 57 claims of D3 or in the summary of the invention on pages 5, 6 and 7, lines 1-18. Of the 215 examples reported in D1 to illustrate the invention described, only one contains P_2O_5 , namely fibre 172, whose P_2O_5 content falls within the claimed range. The ratio R is not indicated in D3. The ratio R for fibre 172 calculated on the basis of the knowledge of the patent in suit is 10.25, ie well above the upper limit of 6 stated in claim 1. The composition according to claim 1 differs from composition 172 in that its Al_2O_3 content is higher (0.5-5 wt% instead of 0.38 wt%) and the calculated ratio R is considerably lower. D3 does not disclose any range for the content of P_2O_5 . D3 teaches on page 14 that the inventive fibres can be assisted in withstanding the fire test by the inclusion of suitable crystal nucleating agents, such agents being TiO_2 , ZrO_2 , Pt, Cr_2O_3 , P_2O_5 and others. A range for the corresponding content of P_2O_5 which, in combination with the other components of the composition, would lead to the

desired result is not disclosed. Although fibre 172 contains 6.05 wt% P_2O_5 and 0.68% Cr_2O_3 , it fails the fire test. In these circumstances, it cannot be considered that D3 discloses ranges for the content of P_2O_5 , let alone for the ratio R. The appellant did not indicate which particular range would implicitly be disclosed in D3 for P_2O_5 or for R. Therefore, the present situation in connection with the content of P_2O_5 and the ratio R is not comparable to that of a selection invention where sub-ranges are selected from broader ranges or where the ranges overlap. The three criteria for a selection invention defined in decisions T 198/84 (OJ EPO 1985, 209) and T 279/89 of 3 July 1991 (not published in OJ) cited by the appellant cannot therefore be applied to the present case where no implicit range is defined in D3 for the content of P_2O_5 and for R. For the preceding reasons, the composition according to claim 1 is new over the disclosure of D3.

6.3 The claimed subject-matter is also novel with respect to the remaining documents cited during the opposition proceedings. Further considerations in this respect are not necessary since this was no longer in dispute at the appeal stage.

7. D3 represents the closest prior art. It discloses mineral fibres which are soluble in physiological saline solutions and have a composition consisting essentially of (a) 0.06-10 wt% of a material selected from the group consisting of Al_2O_3 , ZrO_2 , TiO_2 , B_2O_3 , iron oxides and mixtures thereof, (b) 35-70 wt% SiO_2 , (c) 0-50 wt% MgO , and (d) the remainder consisting essentially of CaO , ie 0-65 wt%. Such fibres have a silicon extraction rate of at least 5 ppm over a 5 hour period in physiological saline solutions (see claim 1).

D3 further discloses mineral fibres having a silicon extraction of at least 10 ppm over a 5 hour period, whose compositions vary within the broader ranges indicated above (see for example claims 30 to 40). The fibre compositions of D3 can be made from either pure metal oxides or less pure raw materials containing the desired oxides. At least a portion of the raw materials can be selected from the group consisting of talc, metallurgical slags, siliceous rocks, kaolin and mixtures thereof (see page 7, lines 20-28; page 61, claim 55). D3 teaches that an increase in the amount of amphoteric oxides, ie Al, Zr and Ti oxides, tends to increase the stability of the compositions against extraction. The amount of amphoteric oxides, iron oxide and manganese oxide should be limited to obtain the desired high solubility (see page 13). Accordingly, the exemplified fibres having the best solubility characteristics contain a relatively low amount of amphoteric oxides, ie 1.1 wt% or less, (see the examples having the highest solubility).

- 7.1 Starting from this prior art, the technical problem underlying the patent in suit can be seen in the provision of further mineral fibres which exhibit very favourable solubility characteristics in physiological fluids even in the presence of relatively high amounts of alumina, and which can be produced from a greater variety of raw materials (see patent in suit, page 2, lines 20-23 and lines 42-47).

The patent proposed to solve this problem by the mineral fibre composition defined in claim 1. This composition differs from that disclosed in claim 1 of D3 at least by the mandatory presence of P_2O_5 in such an amount that the ratio R is from 0.5 to 6. It differs

from fibre 172 by a lower ratio R and a slightly higher alumina content. The respondent's experimental report in Appendix A filed on 29 May 1998 shows that by increasing the amount of P_2O_5 and accordingly decreasing the amount of silica while maintaining the amount of the remaining components similarly, the solubility in a physiological solution is increased: see examples IA and IAA which illustrate the said improvement for compositions both containing 1.2 wt% Al_2O_3 and having R ratios within the claimed range; see also examples IIIA and IIIB illustrating the solubility improvement for compositions both containing 4.8 wt% Al_2O_3 and having a ratio R inside and outside the claimed range respectively. It can also be inferred from a comparison of example IAAA with example IA that, if the relative amounts of P_2O_5 , Al_2O_3 and iron oxide are controlled as defined in claim 1, the adverse effect of doubling the alumina content on the solubility is not as pronounced as might be expected. Examples IAA and IAAA further illustrate that the negative effect of doubling the alumina content on solubility can be compensated for by an increase of the amount of P_2O_5 . The appellant has not contested the reliability of these comparative examples nor shown by further experiments that P_2O_5 had no effect in solubilising fibres containing alumina and optionally iron oxide. Furthermore it is self-evident that the achieving of good solubility characteristics even with higher alumina contents of the fibres makes it possible to increase the variation possibilities in the choice of raw materials (see also patent in suit, page 2, lines 43-47). In these circumstances, the board considers it credible, in view of these comparative examples and in the absence of evidence to the contrary, that the technical problem stated above has actually been solved by the combination of R being from

0.5 to 6 with the specific compositional ranges defined in claim 1.

The appellant argued that the graph of Appendix 3 submitted with the grounds of appeal and plotting the solubility of SiO_2 versus P_2O_5 content showed no significant correlation of the solubility data with the P_2O_5 content and, thus, no improvement in solubility resulting from P_2O_5 . The board cannot accept these arguments for the following reasons. The said graph is based on the solubility data of examples Ia and IIa of the patent in suit and on the solubility data in the respondent's experimental report of 29 May 1998. However, as pointed out by the respondent, the two parameters plotted in this graph concern compositions which are not directly comparable, because there are significant other differences between the seven compositions considered. They did not only differ by the replacement of a part of the silica by P_2O_5 but also by their Al_2O_3 content, their CaO content and their MgO content. When so many parameters vary simultaneously, then it is not possible to draw meaningful conclusions about the effect of the P_2O_5 content on the solubility characteristics, all the more so since Al_2O_3 itself is known to have a strong influence on the solubility. As regards the appellant's experiments submitted on 19 February 2002, the appellant's representative indicated at the oral proceedings that he did not want to rely any longer on these experiments. Therefore the further information and explanation which would have been necessary to draw reliable conclusions from these experiments were not provided.

7.2 D3 itself does not contain any information suggesting that P_2O_5 has a positive effect on the solubility of

alumina containing mineral fibre in physiological saline solutions, or that the P_2O_5 content and the sum of Al_2O_3 and iron oxide have to fulfil a certain relationship to solve the problem stated above. As already pointed out in point 6.2, P_2O_5 is not an essential component of the composition, it is not mentioned in the 57 claims of D3, even in those dependent claims relating to fibres having silicon extraction of at least 50 ppm over a 5 hour period. Of the 215 examples only one (fibre 172) contains P_2O_5 . According to the paragraph bridging pages 14 and 15, P_2O_5 is used as crystal nucleating agent in order to assist the fibres in withstanding the fire test. The amounts of Al_2O_3 and amphoteric oxides in fibre 172 are low, namely 0.38 wt% and 0.48% respectively, as well as the amounts of iron oxide and manganese oxide (0.21 wt% iron oxide, no manganese oxide). In view of the teaching of D3 about the negative effect of these oxides on the solubility (see page 13), of the solubility data in the examples of D3 and of the function of P_2O_5 disclosed in D3, the skilled person would not have inferred therefrom that the good solubility of fibre 172 is due to the presence of P_2O_5 , all the more so since a number of other exemplified fibres not containing P_2O_5 but having a low content of amphoteric oxides exhibit better solubility characteristics. The skilled person would have rather attributed the good solubility of fibre 172 to the low content of amphoteric oxides. Therefore, he would have had no reason to consider this fibre, which does not exhibit the best solubility, as an interesting starting point from which it would be worth making further experimentation. As D3 does not teach that P_2O_5 might improve the solubility of alumina containing mineral fibre in a physiological fluid, it would not have

suggested that the negative effect of higher alumina contents on the solubility might be compensated by adding phosphorus oxide in suitable amounts, namely in an amount such that the weight ratio of P_2O_5 to the sum of alumina and iron oxide is 0.5 to 6.

- 7.3 The appellant further argued that it was obvious to arrive at the claimed subject-matter in view of the teaching of D7 and D8 combined with the disclosure of D3. D7 is a scientific article studying the effect of minor replacement of SiO_2 by Al_2O_3 , B_2O_3 , TiO_2 , P_2O_5 and ZrO_2 on the chemical durability of a sodium silicate glass in water, in NaOH and HCl of different concentrations and in different salt solutions. D7 discloses that the P_2O_5 -substituted glass was less durable than the other substituted glasses in water, N/10 NaOH and N/10 HCl at room temperature (see page 99, Table II, page 101, left-hand column, 5th paragraph, page 102, last sentence). Completely different results were obtained in the presence of a $CaCl_2$ solution at 95-98°C (see Table III), thus confirming the considerable influence of the temperature and/or composition of the leaching medium. The studied glasses are glasses containing between 85.1 and 87.4% SiO_2 and about 12.8% Na_2O (in mole %), ie glasses having a composition and a structure different from those of D3. Furthermore, D7 does not disclose the solubility in a physiological solution which contains various salts and components. As pointed out in D7 itself, the chemical corrosion of glass depends on factors such as the composition of the glass, the composition of the aqueous medium, the surface condition of the glass, the temperature and time of contact etc. and the decomposition of glass is highly complex involving the penetration of the glass by the

aqueous solution and the subsequent formation of compounds completely different from those originally present (see "Introduction", page 97, left-hand column and right-hand column, lines 1-7). Therefore, taking into account that D7, on the one hand, gives no information about the solubility in physiological saline solutions and, on the other hand, concerns the durability of completely different glasses, it would not have given the skilled person an incentive to use P_2O_5 in a specific amount in the glass compositions of D3, ie in an amount depending upon the alumina and the iron content of the glass, in order to solve the problem stated above. In particular there is no suggestion in D7 that the negative effect of alumina and iron oxide on the solubility in a physiological fluid might be compensated by P_2O_5 .

- 7.4 D8 does not concern the technical field of mineral fibres for heat or sound insulation at all but relates to radioactive waste glasses: see the title of the Symposium and of the article: "Scientific Basis for Nuclear Waste Management VII", "Stability of radioactive waste glasses assessed from hydration thermodynamics". The board has strong doubts that the skilled person would have looked for suggestions in this different technical field. Even if he had done this, the teaching of D8 would have been of little assistance to him for the following reasons. According to D8 the characterisation programs were focused on determining the performance of borosilicate radioactive waste glasses under conditions expected in geologic repositories, ie under conditions which are not comparable to those encountered in a physiological saline solution (see page 755, penultimate paragraph). The laboratory test performed with glasses of various

compositions such as vitreous silica, Pyrex, medieval window compositions, involved leaching the glass in deionized water at 90°C for 28 days according to the standard MCC-1 static leach test procedure (see page 757, 3rd paragraph). It cannot be inferred from D8 whether the said test is carried out on glass having a very high surface area or not. In any case the temperature of the test and the composition of the leaching solution greatly differ from those used for testing the solubility of fibres in a physiological solution, ie a solution containing a number of additional components not present in deionized water (see the composition indicated in D3 or in the patent in suit). Furthermore the hydration thermodynamics approach disclosed in D8 is based on the assumption that the hydration reactions are the predominant overall reactions taking place during glass leaching. However, as pointed out on page 759 (2nd paragraph) the reactions in Table I may not accurately represent the glass behaviour under other conditions where other reactions may also be important. It can be inferred from D8 that changes in the composition of the surface layers due to local changes of PH as well as additional reactions between the hydrated species leached from the glass and phases possibly present in the leaching medium should be taken into consideration (see page 759 and page 761, first paragraph). Therefore, although the correlation between the relative durability predicted from the hydration energies and the silicon release rates determined by the test in deionized water at 90°C was said to be excellent (see page 757, validation), it cannot be inferred therefrom that a similar correlation would be achieved in the case of physiological solutions containing a number of additional components, at a different temperature. In these circumstances, the

disclosure in Table I of D8 that the hydration of P_4O_{10} to H_3PO_4 has the highest negative free energy would not have encouraged the skilled person to use P_2O_5 in the compositions of D3 and to adjust its content in relation to the alumina and iron oxide contents since he could not have reasonably expected these measures in combination with the specific compositional ranges defined in claim 1 to solve the problem of solubility in physiological fluids stated above. Therefore, the teaching of D8 even in combination with the disclosure in D7 and D3 would not have rendered obvious the subject-matter of claim 1.

- 7.5 The remaining documents cited by the opponents and published after the priority date were not relied upon at the oral proceedings. The board has checked that they contain no additional information which would hint at the claimed composition in combination with D3, D7 and D8.
- 7.6 It follows from the above that the subject-matter of claim 1 according to the first auxiliary request meets the requirement of inventive step set out in Articles 52(1) and 56 EPC.
8. Claim 1 being allowable, the same applies to dependent claims 2 and 3, whose patentability is supported by that of claim 1.

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 maintain the patent with the following documents:

Claims 1 to 3 filed on 20 February 2002 as the first auxiliary request and a description to be adapted.

The Registrar:

The Chairman:

P. Martorana

R. Spangenberg