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D E C I S I O N
of 12 May 1999

Case Number: T 1061/96 - 3.3.5

Application Number: 93300704.9

Publication Number: 0560479

IPC: C04B 30/02

Language of the proceedings: EN

Title of invention:
Microporous thermal insulation material

Patentee:
Zortech International Limited

Opponent:
Wacker-Chemie GmbH

Headword:
Thermal insulation/ZORTECH

Relevant legal provisions:
EPC Art. 56

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

Decisions cited:
-

Catchword:
-

Case Number: T 1061/96 - 3.3.5

D E C I S I O N
of the Technical Board of Appeal 3.3.5
of 12 May 1999

Appellant: (Opponent)	Wacker-Chemie GmbH Hanns-Seidel-Platz 4 81737 München (DE)
Representative:	-
Respondent: (Proprietor of the patent)	Zortech International Limited Hadzor Hall Hadzor Droitwich Worcestershire WR9 7DJ (GB)
Representative:	Jackson, Derek Charles Derek Jackson Associates The Haven Plough Road Tibberton Droitwich Worcestershire WR9 7NQ (GB)

Decision under appeal: **Interlocutory decision of the Opposition Division of the European Patent Office posted 11 November 1996 concerning maintenance of European patent No. 0 560 479 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. 0 560 479 in amended form with claims 1 to 9 filed with letter dated 12 July 1995. Claim 1 thereof reads as follows:

"A microporous thermal insulation material comprising an intimate mixture of a dry particulate microporous material and reinforcing glass filaments, characterised in that the glass constituting the glass filaments has the following composition:

SiO_2 at least 50 per cent by weight
Al_2O_3 14 - 25 per cent by weight
B_2O_3 up to 8 per cent by weight
MgO up to 10 per cent by weight
CaO up to 21 per cent by weight
Na_2O up to 1 per cent by weight
K_2O up to 2 per cent by weight
Fe_2O_3 up to 1 per cent by weight
F_2 up to 1 per cent by weight."

II. In the decision, inter alia, the following prior art documents were considered:

D3: DE-A-3 935 031

D4: DE-A-2 744 079

D5: US-A-4 221 672

D8: DE-A-2 708 577

The Opposition Division held that the subject-matter of amended claim 1 was new and involved an inventive step in view of the available prior art documents. They stated that the object of the patent in suit was to provide a microporous thermal insulating material having good dimensional stability at elevated service temperatures in the order of 800°C, good flexural strength and low thermal conductivity. They acknowledged that glass fibre-reinforced microporous thermal insulating material was known in the art (D3) and that D8 disclosed thermal insulating material comprising glass fibres meeting the composition requirements of claim 1 (E-glass). They considered, however, that both D5 and D8 dissuaded the skilled person from using glass fibres at service temperatures around 800°C and that it was not evident from D8 that reinforcing fibres made of E-glass would reduce the shrinkage of microporous thermal insulating material.

III. In the statement of the grounds of appeal, the appellant (opponent) maintained that the subject matter of amended claims 1 to 9 lacked an inventive step over the prior art. With respect to the product of claim 1 the appellant relied on D3, D4, D5 and D8. The arguments can be summarized as follows:

Documents D3 and D4 disclosed the use of glass fibres to reinforce microporous thermal insulation material used in heating units for a smooth top cooker hob. From D5, relating to the same kind of insulation material for the same purpose it was known that some unspecified glass fibres caused shrinkage problems. From these documents the skilled person would conclude that not all but at least some glass fibres were suitable for the said purpose and would test available glass fibres for their suitability as reinforcing fibres in microporous insulation material. D3 gave the skilled person the incentive to use fibres only consisting of alumina and silica, from which the fibres according to present claim 1 only differed in the specification of the relative amounts of SiO_2 and Al_2O_3. Moreover, the skilled person knew from D8 that, E-glass, having a composition according to the requirements of present claim 1, was suitable for reinforcing fibres in thermal insulation material at temperatures up to 800°C. The skilled person, therefore, would seriously take into consideration the use of these E-glass fibres as reinforcing fibres in microporous thermal insulation material as disclosed in D3 or D4. Thus no inventive skill was required to come to the product of present claim 1.

IV. With the response to the grounds of the appeal the respondent submitted two sets of claims as auxiliary requests 1 and 2. The respondent's counterarguments can be summarized as follows:

D5 proposed the use of aluminosilicate fibres as reinforcing fibres in high temperature insulation material because glass fibres and mineral wool suffered from high shrinkage at about 700°C. Aluminosilicate fibres have, however, come under suspicion for health and safety reasons. The technical problem was to find a reinforcing fibre which was acceptable from the health and safety aspect and from the technical performance aspect. It was surprisingly found that glass fibres having the composition as required by present claim 1 fulfilled both requirements. The skilled person seeking to improve a microporous thermal insulation material would not turn to D8 because the material of D8 is obtained from a water containing mixture and the skilled person knows that water destroys the microporous structure. Moreover D8 indicated that E-glass fibres were effective only up to 700°C so that it was not obvious to use them to avoid shrinkage problems arising at temperatures of about 800°C.

V. The appellant requested that the decision under appeal be set aside and that the patent be revoked.

The respondent requested that the appeal be dismissed, or alternatively, that the patent be maintained in amended form according to auxiliary requests 1 or 2, submitted with the letter dated 8 July 1997.

Reasons for the Decision

1. The appeal is admissible.

2. Regarding the requirements of Articles 123 and 54 EPC, the Board concurs with the undisputed findings in the decision under appeal. The only remaining objection is lack of inventive step. Thus the sole issue to be decided in these appeal proceedings is that of inventive step.

3. *Main request*

3.1 The Board regards D3, the most recent available document relating to fibre reinforced microporous thermal insulation material, as the closest state of the art. D3 discloses as reinforcing fibres glass wool, rock wool, slag wool, asbestos fibres and ceramic fibres such as those obtained by melting aluminium oxide and silicon dioxide. Preferably ceramic fibres of the latter type are used (column 3, line 65 to column 4, line 3). In the examples only aluminosilicate fibres are used.

3.2 The patent in suit comprises comparative examples, whereby the shrinkage at 800°C, the thermal conductivity at 200°C and 400°C and the flexural strength of the material containing E-glass and R-glass fibres according to the patent in suit has been compared with material containing aluminosilicate fibres according to D3. The examples show that with the glass fibres according to present claim 1 the flexural strength is substantially increased (Figures 1, 2, 3 and 6) whereas the shrinkage and thermal conductivity are only insignificantly increased (Tables 1, 2 and 3). The appellant has not contested these results. Starting from D3, the problem underlying the invention can be seen in providing a fibre reinforced microporous thermal insulating material having improved flexural strength without substantial loss of thermal insulation properties and which is dimensionally stable at temperatures up to 800°C. This statement of the problem is in agreement with the statements in the patent in suit (page 2, lines 33 to 37 and page 9, lines 1 to 3). As a solution of this problem microporous thermal insulation material, comprising glass filaments according to present claim 1, is provided. In view of the uncontested comparative examples the Board is satisfied that the said problem is thereby solved.

3.3 It remains to be decided whether the claimed solution was obvious to a person skilled in the art in view of the available prior art documents.

D3 concerns in particular the construction of a radiation heating element comprising microporous thermal insulation material (claim 1). There is no mention of the problems of insufficient thermal stability and flexural strength of the insulation material. D3 mentions as possible reinforcing filaments amongst others glass wool but reveals no properties of materials reinforced therewith (see column 3, line 65 to column 4, line 3). The fact that glass wool was not the preferred type of fibre indicates that the properties of material comprising glass fibres were considered inferior to those comprising aluminosilicate fibres. Thus D3 certainly gives no incentive to use the special glass fibres according to present claim 1 for solving the above mentioned problem.

D4 is particular concerned with the construction of a flat cooker hob with heating elements comprising microporous thermal insulation material. This document, too, mentions amongst others also glass fibres as reinforcing filaments for the microporous thermal insulating material but discloses neither any composition nor any property of such material (see page 11, fourth paragraph). There is also no mention of the problem underlying the invention. Thus no incentive for the present solution can be found in D4.

In D5, more specifically concerned with the microporous thermal insulation material itself, the shrinkage problem of microporous thermal insulating material containing silica aerogel at high temperatures is discussed. It is indicated that when glass fibres or mineral wool fibres were tried to replace aluminosilicate fibres high shrinkage occurred at relatively low temperatures, e.g. around 700°C (column 1, lines 60 to 63). To overcome the problem of progressive sintering and shrinkage at high temperatures, D5 proposes to use alumina fibres for reinforcement or to use aluminosilicate fibres in combination with particulate alumina. There is no indication that with certain types of glass fibres the shrinkage problem does not exist. Neither is there any indication that the flexural strength can be increased by the use of certain type of glass fibres. Thus D5 gives no incentive for the claimed solution but rather teaches away from the use of glass fibres.

3.4 The Board cannot accept the appellant's argument that inconsistencies between D3 and D4 at the one hand and D5 at the other hand with respect to the suitability of glass fibres as reinforcing filaments in microporous thermal insulation material would be an incentive for the skilled person to further look for suitable glass fibre compositions. The Board can at most infer from the absence of any mentioning of a shrinkage problem in D3 and D4 that a considerable degree of shrinkage might have been tolerated, which was not the case in D5. Thus the teachings of these documents are not necessarily inconsistent. Since D3 and D4 do not disclose any composition or example containing glass fibres the skilled person will not, in view of the unambiguous disclosure in D5 that glass fibres are not suitable at temperatures above 700°C, consider the references in D3 and D4 to the use of glass fibres in the thermal insulation of heating elements in a smooth top cooker hob as a pointer towards a low degree of shrinkage. On the contrary, in view of D5 the skilled person would not expect that a solution of the above mentioned problem could be found in a particular glass composition, let alone a glass composition with extremely low sodium content as now claimed.

The appellant's argument that D3 discloses the use of fibres consisting only of alumina and silica so that it was obvious to look for glass compositions consisting essentially of said oxides as now claimed, cannot be accepted either. Molten compositions consisting essentially only of the said oxides do not form glasses when solidified but crystallise to ceramics. Although according to claim 1 each of the oxides other than silica and alumina may be absent, the requirement that the composition forms a glass implies that not all the other oxides may be absent and that at least some of them must be present in an amount sufficient to form a glass. Moreover, D3 does not disclose or suggest compositions containing 14 to 25 per cent by weight alumina as required by present claim 1. Thus D3 provides no incentive for the use of **glass** fibres of a composition as now claimed.

3.5 D8 discloses thermal insulation material in the form of rigid foams obtained by foaming an aqueous slurry comprising expanded perlite, bentonite and glass fibres, drying the wet foam and burning the dried foam at temperatures below 900°C (claim 1, paragraph bridging pages 2 and 3 and Figures 1 and 2). The only glass fibres specifically disclosed are E-glass fibres (claim 4 and page 4, first paragraph), which undisputably have a composition according to present claim 1. A foam according to D8 has not a microporous structure and the skilled person who wants to solve problems concerning microporous thermal insulating material, obtained by pressing and heating a dry mixture of microporous particles and reinforcing fibres, will not expect to find a solution in the technical field of macroporous foamed material formed from a wet mixture. But even if the skilled person turned to such a remote source of information as D8, he would not find therein an indication that the use of E-glass fibres would solve the above mentioned problem. Although D8 discloses that the insulation material has a very low shrinkage in use up to temperatures of 800°C (paragraph bridging pages 19 and 20), this can not be attributed to the presence of E-glass fibres. According to D8 (page 4) the dried foam should not be heated above their softening point, ie 720°C, if the E-glass fibres are to maintain their reinforcing function. For this reason the preferred burning temperature lies between 680 and 720°C (claim 3). The skilled person would not, therefore, expect that the E-glass fibres will contribute much to the dimensional stability of the insulation material at temperatures above 720°C. Without the benefit of hindsight, he will rather attribute the low shrinkage of the fibre reinforced foam observed at temperatures up to 800°C to the intrinsic stability of the other components of the burnt foam. The appellant's allegation that D8 gives the skilled person an incentive to use E-glass fibres in microporous thermal insulating material according to D3 or D4 is thus unfounded.

3.6 The other documents cited during the opposition proceedings are no longer relevant. Since the appellant only relied on the documents cited above, this was not in dispute, so that there is no reason to discuss them. The Board therefore holds that the product of claim 1 involves an inventive step within the meaning of Article 56 EPC. Claims 2 to 9 are dependent upon claim 1; the inventive step of their subject matter follows from their dependency of the broader claim 1.

4. Since the respondent's main request is allowable there is no reason to discuss the auxiliary requests.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

S. Hue R. Spangenberg