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D E C I S I O N
of 5 July 2000

Case Number: T 0244/99 - 3.2.3

Application Number: 94909502.0

Publication Number: 0682732

IPC: E04B 1/94

Language of the proceedings: EN

Title of invention:
Reinforced thermal protective system

Applicant:
THERMAL SCIENCE, INC.

Opponent:
-

Headword:
-

Relevant legal provisions:
EPC Art. 56

Keyword:
"Inventive step (yes)"

Decisions cited:
-

Catchword:
-

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Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number: T 0244/99 - 3.2.3

D E C I S I O N
of the Technical Board of Appeal 3.2.3
of 5 July 2000

Appellant: THERMAL SCIENCE, INC.
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Decision under appeal: **Decision of the Examining Division of the European Patent Office posted 23 October 1998 refusing European patent application No. 94 909 502.0 pursuant to Article 97(1) EPC.**

Composition of the Board:

Chairman: C. T. Wilson
Members: J. du Pouget de Nadaillac
M. K. S. Aúz Castro

Summary of Facts and Submissions

I. The appeal is directed against the decision dated 23 October 1998 of an Examining Division of the European Patent Office, which refused the European patent application No. 94 909 502.0 (Publication WO 94/18408) for lack of an inventive step of the claimed subject-matter, having regard to the disclosure of documents D3 and D1, among the following prior art citations which were considered during the examining proceedings:

D1: US-A-4 403 075

D2: DE-A-2 063 815

D3: GB-A-1 497 659

D4: WO-A-9 215 452

D5: EP-A-0 492 248

D8: EP-A-0 505 940

II. The appellant (applicant of the patent application) lodged the appeal on 15 December 1998 and paid the appeal fee the following day. In the statement of grounds filed on 25 February 1999, he essentially contested the reasons of the decision on appeal and submitted an amended set of claims and amended pages of the patent specification.

In reply to a phone call of 7 March 2000 by the rapporteur of the board of appeal and a subsequent short notification of the board, he filed on 19 June

2000 a complete set of pages concerning the patent application, i.e. description, claims and drawings.

III. Claim 1 of this set reads as follows:

"A system for providing improved protection for a substrate against hyperthermal heating and shear forces comprising an active thermal protective composition (105, 205, 305, 405, 503) and at least one layer of a foraminous cloth (107, 207, 307, 407, 507) embedded in the composition, wherein the composition includes a component which when exposed to thermal extremes undergoes an endothermic change to a gas, the composition exhibiting a volume increase through the formation of a continuous porosity (open cell) matrix, through which the gas passes to anbient, characterized in that the cloth comprises a graphite material, the system providing 20% to 30% longer protection than the same system in which the cloth is a fiberglass material under the same test conditions of high temperature and high shear forces."

Claim 15 reads as follows:

"A method for providing improved protection for a substrate from hyperthermal conditions and shear forces comprising a step of applying to the substrate an active thermal protective composition (105, 205, 305, 405, 503) which when exposed to thermal extremes undergoes an endothermic change and exhibits a volume increase through the formation of a continuous porosity (open cell) matrix, and a step of embedding a foraminous cloth (107, 207, 307, 407, 507) in the composition, characterized in that the cloth comprises a graphite material, the system providing 20% to 30%

longer protection than the same system in which the cloth is a fiberglass material under the same test conditions of high temperature and high shear forces."

IV. The appellant essentially argued that the amendments brought at the end of the new independent claims 1 and 15 make it clear that the object of the present invention is different from that mentioned in the decision on appeal. Only the system disclosed in D3 corresponds to that of the present invention; as far as the systems of D1 and D8 are concerned, they are fundamentally different, and there is no indication that the graphite used therein would work in the system according to the claims. Moreover, in these documents, graphite is cited together with other materials and there is no suggestion that it could provide an improved effect compared to these other materials. Therefore, the claimed invention is not obvious.

IV. The appellant requested the impugned decision to be set aside and the case to be referred back to the first instance or a patent to be granted on the basis of the following documents filed on 19 June 2000:

Claims: 1 to 17;

Description: Pages 1, 1a and 2 to 9;

Drawings: Pages 1/3 to 3/3.

Reasons for the Decision

1. The appeal is admissible.

2. *Allowability of the amendments*

The set of claims now on file differs from the set of claims under the contested decision by the limitation introduced in both independent claims 1 and 15 that the system and the method **provide improved** protection **for a substrate** against hyperthermal heating **and shear forces,** this amendment being further limited by the result added at the end of the claims, according to which 20% to 30% more protection is provided, compared to a system in which the cloth is a fiberglass material. This result is supported by the application as originally filed, page 4, lines 14 to 16, and is confirmed by the test results given in page 8 of the same document. Dependent Claims 2, 3, 5, 7 to 9 correspond respectively to the same numbered claims as originally filed, whereas Claims 11, 12 , 16 and 17 respectively correspond to Claims 13, 15, 18 and 19 as originally filed. Claims 4, 6, 10, 13 and 14 are respectively supported by the following passages of the description or drawings as originally filed: Page 3, lines 20, 21; Page 2, lines 5, 6; Page 4, lines 25 to 28 (or page 9, lines 3 to 8) and Figure 8. The description is also amended so as to be adapted to the new claims and to acknowledge the prior art more completely. All the passages relating to a cardo-polymer cloth are further deleted, since they do not correspond to the claimed subject-matter. Consequently, the requirements of Articles 84 and 123(2) EPC are met.

In the description, line 19 of page 3 is deleted by the board, since it is an obvious error, this line merely repeating the previous sentence.

3. None of the cited prior art documents discloses a

system or a method for providing protection for a substrate against hyperthermal heating, which comprises all the features of Claim 1 or 17, in particular a foraminous cloth made of graphite material and embedded in the kind of composition which is claimed. D6 (EP-A-0 600 651) and D7 (EP-A-0600 652), which are prior art under Article 54(3) and (4) EPC, both concern another kind of thermal protective composition, namely an **intumescent** composition which swells up to **ten to one hundred** times the original thickness of the coating to form a **closed** cell matrix. Thus, the subject-matter of the claims is new (Articles 52 and 54 EPC).

4. The prior art closest to the present invention is described in reference D3, which discloses a system and a method having all the features of the preamble of claims 1 and 17. When exposed to thermal extremes, the particular kind of composition disclosed in this prior art expands to about three to five times its original thickness due to the action of the gas producing component and forms with the gas a continuous porous (open cell) matrix, which protects the substrate against heat and flames. It is disclosed in this prior art that the composition can be applied by coating, impregnation and incorporation. No particular emphasis is put on the need of a cloth embedded into the composition. Only in Example 4 among the sixteen examples of D3, a woven fiberglass tape is said to be impregnated with the thermal protective composition. It is also indicated that other flexible clothes could be used, however without further explanations, and only some examples of clothes are disclosed, for example a PVC sheet in Example 3, on which however the composition is coated and which decomposes when exposed to flame. Important in the whole method of this prior

art is that the produced gas or vapour must be able to move through the matrix to the ambient. Thus, when a reinforcing cloth is used, it must permit this movement and, therefore, has to be foraminous or, possibly, to be decomposed, as is the case in Example 3. In Example 9, asbestos fibres are given as material for the mechanical reinforcement.

5. According to the specification of the patent application in suit, fiberglass or silicon sheets embedded in active thermal protective compositions have been found to embrittle with heat, and the composition may crack and fail under fire conditions. Other reinforcing structures such as a metal mesh are difficult to apply, and consequently until the present invention the use of these reinforcing structures was not completely successful. Therefore, the problem to be solved by the present invention is to provide a system or method which is more efficient.

6. According to the characterising part of Claims 1 and 15, this problem is solved by the use of a cloth made of graphite material. Comparative tests between samples of the system, which all correspond to the pre-characterising part of the Claims 1 and 15 and only differ in their use of loose weave graphite, wire mesh and fiberglass cloth as reinforcing material respectively, are described in the patent specification, and the test results of Figures 2 and 4 of the specification confirm the advantage explicitly given at the end of said claims.

7. It remains to examine whether this solution is obvious having regard to the cited prior art documents.

8. In the impugned decision, it is argued that reference D1 gives a hint for using a graphite fabric, since it describes glass fibers and graphite fibers as being interchangeable.

This prior art indeed concerns a flame resistant composition, however not an **active** thermal protective composition, since in this prior art it is a mixture of a polyamide or epoxy resin and polymeric phosphorylated amide additives which is used, and this mixture does not expand at high temperatures. Moreover, this document teaches that the composition itself, that is to say the resin char which is formed under thermal extremes, holds the fibers of the cloth to which the resin composition is applied, namely graphite or glass fibres or fabric; it is this composition which maintains the structural stability and integrity of the composite produced therefrom, preventing thereby the spreading of these fibres which had occurred in the prior art when graphite or glass fibres-epoxy compositions were used at high temperatures. Therefore, the thermal protective system involved in D1 is different from that of the present invention and the teaching of this prior art also is quite different, since it is the additive incorporated into the resin which is said to improve the strength of the composite, and not the kind of cloth. This corresponds to the teaching of the above mentioned closest prior art D3, which also indicates that additives introduced into the composition minimize or prevent cracking of the matrix, see D3, page 3, lines 107 to 115, or its Example 2. It is also noticed that, in D1, besides the graphite or fiberglass fibres or fabrics, other kinds of material, for example metals and the like, are suggested (column 4, lines 10 to 14).

Thus, even supposing that the person skilled in the art, starting from the composite known from D3, would have considered the prior art according to D1 in spite of the different thermal protective composition, he would have been directed to modify the composition itself, and not the cloth. Furthermore, nothing in this prior art gives him the slightest hint to use a graphite cloth in preference to a fiberglass cloth or to any other kind of cloth. Therefore, contrary to the statement made by the Examining Division in the impugned decision, the use of graphite material is not suggested in D1 to solve the problem underlying the present invention. In D1 as well as in D3, there is even no suggestion that a better choice of the cloth material could improve the efficiency of the fire-retarding system.

9. It is then argued in the impugned decision that, by giving a list of usable materials for the cloth, D1 in fact gives no hindrance to try any material out of this limited list, so that the person skilled in the art would obviously have tested all materials, which were known in this technical field as being appropriate for cloths embedded in a fire-retarding composition, and would thereby have arrived at the claimed system. The Examining Division then concluded that the unexpected result is to be considered as a mere bonus-effect.

First, the assertion of a "limited" list of appropriate cloth materials is doubtful, since D1 by using the expression "and the like" leaves this list quite open. D3 and D1 show that, as a matter of fact, inorganic materials as well as metals and plastic materials could be used for the cloths. Many examples of other materials, such as asbestos fibres, aramid fibres and

so on, are disclosed in other prior art documents (D2, D4 and D5, see in particular column 2, lines 32 to 50 of this last document) for mechanically reinforcing different thermal protective compositions, so that it is not possible to assert that, for the skilled person, only a limited number of materials was known. Thus, even if the person skilled in the art had conceived the idea of selecting the cloth material in order to improve the thermal protective system, he would still have had a wide range of possible materials at his disposal. Since, furthermore, as recognised by the Examining Division, none of the cited documents at least suggests that the graphite material *per se* would improve the whole system, it cannot be said that the solution as claimed is obvious. That the person skilled in the art could have tested this material does not mean that he would have done so in the hope of any advantage having regard to the cited prior art.

10. This conclusion is confirmed by document D2, which already in the 1970's disclosed that the efficiency of a fire-retarding intumescent composition could be improved by a reinforcing cloth. Although this idea was given, nobody apart from the inventor himself of the present invention has tried to test different kinds of cloth material in combination with the claimed thermal protective composition, although this composition was already known in 1978, which is the publication year of D3.

Another sign of non-obviousness of the present invention is given by the previous patents of the applicant himself, namely the closest prior art D3, already mentioned above, which is in the year 1982, that is to say ten years later, followed by

US-A-4 493 945, in which the same kind of composition is used, however combined with a metal mesh as reinforcing means. It shows that the inventor of the present invention has been dealing with the same composition and the same problem for twenty years before reaching the present invention.

Order

For these reasons it is decided that:

1. The impugned decision is set aside.

2. The case is remitted to the first instance with the order to grant a patent on the basis of the documents filed on 19 June 2000 (Description: pages 1 to 9 with line 19 of page 3 being deleted; Claims 1 to 17; Drawings: pages 1/3 to 3/3).

The Registrar: The Chairman:

A. Counillon C. T. Wilson