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D E C I S I O N
of 4 September 2003

Case Number: T 1005/00 - 3.2.6

Application Number: 94920529.8

Publication Number: 0714464

IPC: D04H 18/00

Language of the proceedings: EN

Title of invention:
Production of shaped filamentary structures

Patentee:
AEROSPACE PREFORMS LIMITED

Opponents:
SOCIETE NATIONALE D'ETUDE ET DE CONSTRUCTION DE MOTEURS D'AVIATION
Goodrich Corporation
Dunlop Limited

Headword:
-

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

Keyword:
"Admissibility of amendments - yes"
"Inventive step (main request and auxiliary request) - no"

Decisions cited:
-

Catchword:
-

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Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number: T 1005/00 - 3.2.6

D E C I S I O N
of the Technical Board of Appeal 3.2.6
of 4 September 2003

Appellant: (Proprietor of the patent)
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Decision under appeal: **Decision of the Opposition Division of the European Patent Office posted 9 August 2000 revoking European patent No. 0714464 pursuant to Article 102(1) EPC.**

Composition of the Board:

Chairman: P. Alting van Geusau
Members: G. Kadner
M.-B. Tardo-Dino

Summary of Facts and Submissions

I. The mention of the grant of European patent No. 714 464 in respect of European patent application No. 94920529.8 filed 4 July 1994 and claiming a US-priority from 17 August 1993 was published on 25 February 1998.

II. Three notices of opposition were filed against this granted patent. Grounds of opposition specified in Articles 100(a), (b) and (c) EPC were raised.

III. By decision of the Opposition Division announced during the oral proceedings on 18 May 2000 and posted on 9 August 2000 the European patent was revoked.

The Opposition Division was of the opinion that the subject-matter of claim 1 of the patent as granted and also in amended form as filed during the oral proceedings did not comply with the requirement of Article 56 EPC (inventive step).

IV. On 5 October 2000 a notice of appeal was lodged against this decision by the Appellant (Patentee) together with payment of the appeal fee. The statement of grounds of appeal was filed on the same day.

V. In a communication dated 30 June 2003 the Board pointed out that the reasons given by the Opposition Division in respect of Article 100(c), (b) and (a) in respect of novelty did not give rise to a different opinion by the Board. At the oral proceedings discussion would in particular focus on inventive step.

VI. Oral proceedings were held on 4 September 2003. Opponent 03 did not attend, as it had announced with letter dated 26 June 2003.

From the documents discussed during opposition proceedings only the following played a role in appeal proceedings:

D1: GB-A-1 549 687

D2: US-A-3 772 115

D3: WO-A-92/04 492

The Appellant requested that the decision under appeal be set aside and that the patent be maintained on the basis of the claims in accordance with the main or auxiliary request, both filed during the oral proceedings.

The Respondents I and II (Opponent 01 and 02) requested that the appeal be dismissed. Respondent III (Opponent 03) did not submit any requests

Claim 1 of the main request reads as follows:

"1. A method of manufacturing a shaped fibrous fabric structure from multiple layers of fibrous material and said layers including uni-directional filaments and staple fibres by stacking the layer on top of each other, comprising building a stack of layers with the uni-directional filaments extending generally in the plane of the layers and causing staple fibres to extend across said layers to interconnect the layers,

enriching initial layers added to the stack with additional staple fibres which are caused to extend across a plurality of layers, before continuing to add further layers to complete the building of the stack, whereby the enriched initial layers of the stack have a greater number of staple fibres interconnecting those initial layers than at least layers in a middle region of layers in the stack."

Claim 1 of the auxiliary request has the following wording:

"1. A method of manufacturing a shaped fibrous fabric structure from multiple layers of fibrous material and said layers including uni-directional filaments and staple fibres, comprising building a stack of layers by stacking the layers on top of each other without turning over the stack with the uni-directional filaments extending generally in the plane of the layers and causing staple fibres to extend across said layers to interconnect the layers, enriching initial layers added to the stack with additional staple fibres which are caused to extend across a plurality of layers, before continuing to add further layers to complete the building of the stack, whereby the enriched initial layers of the stack have a greater number of staple fibres interconnecting those initial layers than at least layers in the middle region of the stack."

VII. In support of its requests the Appellant essentially relied upon the following submissions:

The problem underlying the patent in suit was misinterpreted by the Opposition Division, and the

revocation of the patent was based on an ex post facto analysis.

Starting from the fibrous structure disclosed in D3 the solution of the invention provided the advantages that it could be produced in less time, and by needling always in the same direction the structure had an improved uniformity resulting in higher strength or, in case higher strength was not needed, a substantially lighter preform.

According to the examples given in D1 the first stack of the structure was turned over after the first needling pass or after each such operation. In addition, the fibrous layers added there were composed of 8 plies, each contrary to the opinion in the decision. D1 did not teach adding of staple fibre during build up in Example I. In Example II additional staple fibre was added after the complete stack had been built up.

The prior art teaching of D3 was also to build up the stack evenly. After the stack was built up staple fibres could be added on the top and then on the bottom by turning the stack over.

The disclosure of D2 was not more relevant than that of D3. That method did not include the step of turning over the stack and needling from the downside. An enrichment with additional staple fibers in a particular region of the stack was not included in that method.

Since the prior art did not lead to the subject-matter claimed, the subject-matter claimed in the main request or at least that claimed in the auxiliary request was allowable.

VIII. The arguments of the Respondents I and II are summarised as follows:

The method according to claim 1 of the main and auxiliary request was not novel with respect to D1. According to that method only the first layer was turned over and not the whole stack during formation. This sequence of method steps was not excluded by the wording of claim 1 of the patent in suit. Since the amount of staple fibers depended of the frequency of the needling operations those regions contained more staple fibers which were more often submitted to a needling step. The first layer was needled four times whereas layers in the middle region were needled only three times, and therefore as a direct result of such needling the first layer had a greater number of staple fibers than the layers in the middle region of the stack.

In any case, the claimed method did not involve an inventive activity because the prior art documents already disclosed the possibility to add an additional layer of staple fibers in layers of a particular region of the stack during building it up, and thus it was obvious to do it where it was needed, thereby arriving at the method of the patent in suit. The skilled person already had knowledge of the need of an enrichment of staple fibers in the outer layers from D3, and, applying the teachings of D1 or D2, would add

additional fibers in the layers of those regions where additional strength was desired.

Reasons for the Decision

1. The appeal is admissible.

2.1 *Admissibility of the claims*

Claim 1 of the main request is composed of granted claim 1 with two insertions which are disclosed in the patent specification (column 2, lines 47 to 48 and column 18, lines 53 to 58 in connection with column 20, lines 12 to 16) and in the corresponding text of the originally filed application. Claim 1 of the auxiliary request contains an additional insertion which is also disclosed in the patent description (column 9, lines 7 to 21 in connection with column 20, lines 16 to 18) and in the corresponding application documents. Therefore no objection arises under the requirements of Article 123(2) EPC

Since these insertions restrict the scope of protection of each of the respective claims the amendments are also admissible under Article 123(3) EPC.

2.2 *Novelty*

The Board notes that D1 does not explicitly disclose an enrichment of the outer layers with staple fibers during building up of the stack. As shown in the sketch annexed to the response dated 1 February 2001 by Opponent 01 the outer layer A and the middle layer D

are both passed four times through needling operation and therefore a different number of staple fibers cannot be expected.

In respect of D2 and D3 lack of novelty was not objected to by the Respondent. The Board has verified that none of those documents discloses a method including all features and process steps of claim 1 according to the main request and auxiliary request.

Consequently claim 1 of both requests meet the requirements of Article 54(1) EPC.

2.3 *Inventive step*

2.3.1 Main request

2.3.1.1 The closest prior art from which the method according to claim 1 starts is represented by D3. This document discloses a method of manufacturing a shaped fibrous fabric structure from multiple layers of fibrous material, said layers including uni-directional filaments and staple fibres by stacking the layer on top of each other, comprising building a stack of layers with the uni-directional filaments extending generally in the plane of the layers and causing staple fibres to extend across said layers to interconnect the layers (page 3, lines 9 to 31). Layers of pure staple fibers are added and needled together with the continuous filaments resulting in an enrichment of the outer layers with staple fibers (page 27, lines 14 to 21). In order to obtain an enrichment of the lower side the preform can be turned around and staple fibers

can be needled into the underside of the stack (page 28, lines 15 to 19).

2.3.1.2 Starting from this method of manufacturing a shaped fibrous structure the objective problem underlying the patent in suit is to improve the known process.

This problem is solved by a modified method which includes the step of enriching initial layers added to the stack with additional staple fibres which are caused to extend across a plurality of layers, before continuing to add further layers to complete the building of the stack, whereby the enriched initial layers of the stack have a greater number of staple fibres interconnecting those initial layers than at least layers in a middle region of layers in the stack.

2.3.1.3 D1 deals with improvements in the production of carbon fibre reinforced carbon composite materials, i.e.it belongs to the same technical field as D3 and the patent in suit. According to Example I (page 2, lines 23 to 57) a fibrous structure is formed by stacking woven layers of fibrous material on top of each other and exposing the stack in several passes to a needling operation. After the first pass the first layer is reversed and needled again, after that step the further layers are added without turning over.

In the process of Example II (page 2, lines 77 to 83) the stack is turned over after each needling pass.

According to the following description (page 2, lines 88 to 92) loose staple carbonised fibres can also be distributed on the surfaces of the woven layers to

be punched into the stack during the needle-punching operation.

Although this teaching immediately follows the second Example, the Board is of the opinion that the skilled person would consider the addition of staple fibres being applicable to both examples. The skilled person is considered to be aware of the fact that adding loose fibers and needle punching them into the structure contributes to the object of greater integrity and improved coherence between different areas of the substrate (page 1, lines 61 to 64) which is relevant for products made by each of the two methods according to Example I and II. Consequently D1 gives the general teaching to add staple fibres during each needle punching operation when building up the stack.

2.3.1.3 In practice both the upper and the lower surface of the finished product must resist higher strengths in the usual application as a brake disc of an airplane. In view of the problem to find an improved method by which an enrichment of the outer layers is achieved without disturbing the orientation of the staple fibres the skilled person is led to apply the teaching of D1 and would therefore add staple fibres during building up the stack in those regions of layers where a higher strength is desired. Thus starting from the known method disclosed in D3 adapted with the teachings of D1 a process is arrived at without the involvement of an inventive step which results in a fibrous structure having enriched layers with a greater number of staple fibres interconnecting those initial layers than layers in the middle region of the stack, all layers being needled from one side of the stack.

2.3.2 Auxiliary request

Claim 1 of the auxiliary request differs in substance from the main request by the additional insertion of the feature "without turning over the stack".

According to the teaching of D1 the first layer is turned over after the first needling operation. However, that does not mean that the stack is reversed during building up. The wording of claim 1 does not exclude the step of turning over the first layer because a stack is formed only when putting on a second layer. Since also the method disclosed in D3 does not necessarily include a step of turning over the stack (page 28, lines 15 to 16: "if desired")the reasons for lack of inventive step apply in the same manner as for the main request.

None of the requests being allowable due to lack of inventive step the revocation of the patent is confirmed.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

M. Patin P. Alting van Geusau