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# D E C I S I O N
## of 23 February 2000

**Case Number:** T 0416/98 - 3.2.3

**Application Number:** 91918627.0

**Publication Number:** 0554312

**IPC:** F41H 1/02, F41H 5/04

**Language of the proceedings:** EN

**Title of invention:**
Three dimensional fiber structures having improved penetration resistance

**Patentee:**
AlliedSignal Inc.

**Opponent:**
Akzo Nobel N.V.

**Headword:**
-

**Relevant legal provisions:**
EPC Art. 54

**Keyword:**
"Novelty (no)"

**Decisions cited:**
-

**Catchword:**
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**Case Number:** T 0416/98 - 3.2.3

**D E C I S I O N**
**of the Technical Board of Appeal 3.2.3**
**of 23 February 2000**

**Appellant:** (Opponent)
Akzo Nobel N.V.
Patent Department
Velperweg 76
PO Box 9300
6800 SB Arnhem (NL)

**Representative:**
Kraak, Hajo
Akzo N.V.
Patent Department
PO Box 9300
6800 SB Arnhem (NL)

**Respondent:** (Proprietor of the patent)
AlliedSignal Inc.
101 Columbia Road
PO Box 2245
Morristown
New Jersey 07962-2245 (US)

**Representative:**
Lawrence, Peter Robin Broughton
GILL JENNINGS & EVERY
Broadgate House
7 Eldon Street
London EC2M 7LH (GB)

**Decision under appeal:** **Decision of the Opposition Division of the European Patent Office posted 13 February 1998 rejecting the opposition filed against European patent No. 0 554 312 pursuant to Article 102(2) EPC.**

**Composition of the Board:**

**Chairman:** C. T. Wilson
**Members:** J. B. F. Kollar
J. P. B. Seitz

## Summary of Facts and Submissions

I. With the present appeal, the appellant (opponent) contested the decision dated 16 January 1998 and posted with written reasons on 13 February 1998 of the Opposition Division rejecting his opposition to the European patent No. 0 554 312 based on lack of novelty and/or inventive step according to Article 100(a) EPC.

II. Claim 1 of the European patent reads as follows:

"1. A penetration resistant article (10) comprising two or more flexible fibrous layers (12a-12j) wherein the fibers in each layer (12) are arranged parallel or substantially parallel to one another along a common fiber direction, with each layer (12) aligned at an angle with respect to the common fiber direction of the fibers in an adjacent layer, characterised in that said layers (12) are substantially free of matrix material, and in that said at least two layers (12) are secured together by a securing means (14,16), said securing means (14,16) extending along a first set of at least two adjacent paths wherein the distance between said first paths is less than 1/8 in. (0.3175 cm)."

III. Within the opposition procedure eleven documents were filed. The objections were essentially based upon

D1: Textile Month, April 1984, pages 9 and 11, and

D5: Rubber World, May 1986, pages 8 and 9.

IV. A notice of appeal was lodged against the said decision on 7 April 1998 with payment of the prescribed fee. Four further documents, in particular

D12: A Guide to Designing and Preparing Ballistic Protection of Kevlar® Aramid, Du Pont Memo No. 440 (22 pages), dated January 1983,

were filed with the statement of grounds of appeal received on 15 June 1998.

V. During the oral proceedings held on 23 February 2000, after a discussion of the question whether the subject-matter of claim 1 as granted met the requirements of novelty pursuant to Article 54 EPC, the parties formulated their requests as follows:

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

The respondent (patentee) requested that the appeal be dismissed and the patent be maintained as granted.

VI. In support of his request the appellant argued substantially as follows:

The subject-matter of claim 1 relates to a penetration resistant article comprising ballistic material according to the preamble of said claim. As to ballistic material the person skilled in the art distinguishes between

- soft ballistic material which also is called "fabric" and is comprised of a multitude of plies of fabric without any resin, and

- hard ballistic material which also is called "composite" and is comprised of a multitude of plies of fabric combined with resin binder

(reference is made in this respect to Section III, paragraph "Soft (fabric) armour" and paragraph "Composite nonstructural armour" at page 2 of document D12).

The penetration resistant article of claim 1 comprises two or more flexible fibrous layers (12a to 12j) and is characterised in that

- said layers 12 are substantially free of matrix material, and

- said layers are secured together by securing means (14,16) extending along a first set of at least two adjacent paths, wherein the distance between said first paths is less than ⅛" (0,3175 cm).

Document D1 relates to a penetration resistant article. This is revealed in the left column at page 9 of this document in which it is claimed by company Hi-Tech that the Multi Axial Spanply System (MASS), when used with Kevlar aramid yarns, can produce body armour that stops bullets with only 25 per cent of penetration that occurs at present (1984) with the best available woven fabrics.

According to page 9, left column, paragraph 3 of D1 a MASS fabric comprises multiple plies of parallel yarns, the most important aspect being that in a Spanply construction each yarn in each ply is positioned at a precise angle in relation to the other plies above and/or below.

Although in the title of the article published in D1 the word "composite" is mentioned, the term "fabric", especially MASS-fabrics, is used throughout the article (see page 9, left column, paragraph 3; middle column, paragraph 1; right column, paragraph 2 and page 11, left column, paragraph 1; right column, paragraphs 1 and 3).

Moreover, document D1 by mentioning (at page 11) that "the company Hi-Tech developed a range of standard products for various application, such as...soft...ballistic armour" (e.g. Armorply fabric) confirms that product which forms the firm's soft ballistic armour fabric is free of matrix material in contrast to "hard ballistic material" (see in this respect the afore-mentioned passage in document D12).

Also in the light of the comparison between Kevlan 713 and Armorply at page 11, right column, second paragraph of D1 the person skilled in the art would understand that the soft ballistic armour according to D1 is substantially free of resin.

Thus, the first characterising feature of claim 1 relating to layers being substantially free of matrix material is anticipated by D1.

In the paragraph bridging the right and middle columns at page 9 document D1 teaches that the plies are held in position by vertical rows of stitching yarns and suggests in the penultimate paragraph of the right column at page 9 stitching in widths between rows of 12 stitches per inch, i.e. less than 0,3175, so inside the range of claim 1 of the patent in suit. Thus, the second characterising feature of claim 1 relating to the layers being substantially free of matrix material is anticipated by D1.

Therefore, the subject-matter of claim 1 of the patent in suit is not novel.

VII. In his response the respondent argued substantially as follows:

The title of the article published in document D1 reading: "Bullet-stopping strength of new composite fabrics" already reveals that the material discussed in the article relates to fabrics used in a composite and thus to resin bounded material. In paragraph 1, left column and in the section "Fewer weak spots" at page 9 of D1 there is mentioned that less resin is needed for a given construction and that materials such as carbon fibers are impregnated after being tape-wrapped (cf. right column, page 9 of D1). Document D1 thus does not teach "resin free" ballistic material as claimed in claim 1 of the patent in suit.

Document D1 specifies at page 9, under the heading "Stitch variations" that the stitching density is 6 or 12 stitches per inch and thus more than ⅛" (0,3175 cm) or less than ⅛" (0,3175 cm). Half of the stitching density according to D1 thus lies out of the claimed parameter. The person skilled in the art is not taught by D1 which of the stitching density, 6 or 12 stiches per inch, he has to use for penetration resistant article.

The subject-matter of claim 1 of the patent in suit is thus novel over the disclosure of document D1.

## Reasons for the Decision

1. The appeal is admissible.

2. Document D1 relates to the improvement by company Hi-Tech of a fabric that is very much stronger than an ordinary cloth and which is suitable for fabrication into penetration resistant articles such as body armour, for example bullet-proof vests.

According to page 11 said company has developed a range of standard products for various applications, such as "soft and hard ballistic armour". This ballistic armour for body armour is thus soft (fabric), at least in the meaning of the patent in suit. Soft (fabric) armour is by definition an armour that is comprised of a multitude of plies of fabric without any resin binder. The fact that document D1 makes a distinction between a "soft" ballistic armour without matrix material and a "hard" ballistic armour, which also is a fiber based material, however with a resin binder, cannot lead to a different conclusion.

The aforementioned distinction between soft and hard types of armour is confirmed by document D12 - (see particularly Section III. Definitions at page 2).

In the prior art document D1, the object is to achieve a ballistic article having improved penetration resistance and being thinner, lighter and more flexible as compared to articles having a differing securing means. This problem is solved in that the body armour is comprised of Hi-Tech material, e.g. Armorply, which is the firm's ballistic armour fabric, comprised of a multitude of plies of fabric without any binder. This is confirmed by the statement in the right-hand column at page 11 of D1 according to which the Hi-Tech

material from multi-axial plies of Kevlar yarn is thinner, lighter and more flexible than the 18 layers of woven Kevlar known in the prior art as Type 713 which was bullet-proof matrix free material on the market.

That Armorply is matrix free is even clearer when one realizes that state of the art material, i.e. Kevlar 713, is a matrix-free material, which fact was also submitted during the oral proceedings. The fact that Armorply is said to be lighter and more flexible than Kevlar 713 is further proof of the matrix free character of Armorply.

In D1 it is set out more specifically that the Hi-Tech material produces body armour that stops bullets with only 25 per cent of the penetration that occurs at present with the best available woven fabrics and that in a test the Armorply fabric showed only one layer of penetration compared with four layers of Kevlar 713, (see for example the left-hand column at page 9, the right-hand column at page 9 and the right-hand column at page 11).

It is indicated in the section "Stitch variations" at page 9 of D1 that normally Hi-Tech offers stitching in widths between rows of 6 or 12 stitches per inch.

3. All the features of the subject-matter of claim 1 of the patent in suit are therefore found in document D1 and solve the same problem, namely to provide an article having improved penetration resistance.

4. The respondent has argued that the Opposition Division was right when it held in its decision that document D1 disclosed no explicit reference to the matrix-free

nature of either fabric used in this citation and that the first-mentioned alternative of the stitching structure, namely 6 stitches per inch, according to D1 was outside the parameter claimed in claim 1 of the patent in suit.

The Board, however, holds these two arguments as not pertinent, since the explicitly offered stitching in widths between rows of 12 stitches per inch at page 9 of D1 lies by 0,2116 cm with a wide margin within the parameter of less than 0,3175 cm claimed in claim 1 of the patent in suit and, as seen in point 2 above, the soft ballistic armour used in D1 character is to be unambiguously interpreted as being matrix-free particularly in the light of the comparison between Armorply and Kevlar 713 presented at page 11 of D1.

5. Therefore, the subject-matter of claim 1 of the patent in suit is not new having regard to this prior art D1 (Articles 52 and 54 EPC).

In result, the patent cannot be maintained.

## Order

**For these reasons it is decided that:**

1. The decision under appeal is set aside.

2. The European patent No. 0 554 312 is revoked.

The Registrar: The Chairman:

A. Counillon C. T. Wilson