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Datasheet for the decision of 15 November 2007

Case Number: T 0746/04 - 3.2.03

Application Number: 96308166.6

Publication Number: 0843149

IPC: F41H 5/04

Language of the proceedings: EN

Title of invention:
Composite armor panel and manufacturing method therefor

Patentee:
MOFET ETZION

Opponent:
Rafael Armament Development Authority / Plasan-Sasa Limited Partnership
ETEC Gesellschaft für Technische Keramik mbH

Headword:
-

Relevant legal provisions:
EPC Art. 100 (a) and (b), 84

Keyword:
"Late-filed ground of appeal not admitted"
"Disclosure - sufficiency - (yes)"
"State of the art - availability (yes)"
"Novelty (yes)"
"Inventive step - (no)"
"Clarity of claims of auxiliary requests - (no)"
"Inventive step - (no)"

Decisions cited:
G 0009/91

Catchword: -

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Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number: T 0746/04 **-** 3.2.03

D E C I S I O N
of the Technical Board of Appeal 3.2.03
of 15 November 2007

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Decision under appeal: **Decision of the Opposition Division of the European Patent Office posted 17 March 2004 rejecting the opposition filed against European patent No. 0843149 pursuant to Article 102(2) EPC.**

Composition of the Board:

Chairman: U. Krause
Members: G. Ashley
J.-P. Seitz

Summary of Facts and Submissions

I. European Patent EP-B1-0 843 149 concerns a composite armour plate and was granted to the Respondent in this appeal. The grant was opposed by Rafael Armament Development Authority and Plasan-Sasa Limited Partnership (Opponent I) and ETEC Gesellschaft für Technische Keramik mbH (Opponent II) on the grounds of lack of novelty and inventive step (Article 100(a) EPC) and lack of sufficient disclosure (Article 100(b) EPC. In the letter of 28 August 2002 after the period given in Article 99(1) EPC for filing notice of opposition, Opponent I also raised the ground of added subject-matter (Article 100(c) EPC). The Opposition Division concluded that none of the cited grounds of opposition prejudice the maintenance of the patent as granted, and thus, in the decision of 17 March 2004, decided to reject the oppositions.

Appellants I and II (Opponents I and II) filed notices of appeal on 24 and 27 May 2004 respectively, paying the appeal fees on the same days. A statement of the grounds of appeal was submitted on 27 July 2004 on behalf of both Appellants.

II. Oral proceedings were held before the Board of Appeal on 17 April 2007, at the end of which the Board reached its conclusions concerning claim 1 of the main request with regard to the grounds of opposition under Articles 100(b) EPC, 100(c) EPC, and 100(a) EPC with respect to novelty. Given that both parties required further time to consider the issue of inventive step, the Board decided to continue the proceedings in writing and

appointed a second oral proceedings, which were held on 14 and 15 November 2007, to deal with this issue.

III. Requests

The Appellants requested that the decision be set aside and that the patent in suit be revoked.

The Respondent requested that the appeal be dismissed, and as a subsidiary request, that the decision under appeal be set aside and the patent be maintained on the basis of one of the following four auxiliary requests:
- first auxiliary request filed on 15 February 2007 as the then second auxiliary request;
- second auxiliary request filed on 15 February 2007 as the then fourteenth auxiliary request;
- third auxiliary request filed on 17 October 2007;
- fourth auxiliary request filed on 15 February 2007 as the then tenth auxiliary request.

IV. Claims

Claim 1 of the granted patent reads as follows:

"1. A composite armor plate for absorbing and dissipating kinetic energy from high velocity, armor-piercing projectiles, said plate comprising a single internal layer of high density ceramic pellets which are directly bound and retained in plate form by a solidified material such that the pellets are bound in a plurality of superposed rows and each of a majority of said pellets is in contact with at least four adjacent pellets, characterised in that the pellets have an Al_2O_3 content of at least 93% and a specific

gravity of at least 2.5, the majority of the pellets each have a major axis of a length in the range of from 3 to 12 mm, the solidified material, and hence the plate, is elastic at a temperature below 250°C, and the weight of said plate does not exceed 45 Kg/m^2."

Dependent claims 2 to 13 concern preferred embodiments of the composite armor plate of claim 1. Independent claims 14 with dependent claims 15 and 16, and independent claim 17 relate to methods of producing the armor plate of claim 1.

Claim 1 of the first auxiliary request contains the features of claim 1 of the main request and in addition requires that a projectile entering a valley formed between adjacent pellets is jammed between the flanks of three pellets, all of which participate in projectile arrest (the "valley contact feature").

Claim 1 of the second auxiliary request contains the features of claim 1 of the main request, and defines the pellets as being of round-ended cylindrical shape or flat-ended cylindrical shape.

Claim 1 of the third auxiliary request was filed with the letter of 17 October 2007 and, in addition to the features of claim 1 of the main request, contains both the valley contact feature of the first auxiliary request and the cylindrical shape feature of the second auxiliary request.

Claim 1 of the fourth auxiliary request contains the valley contact feature and also requires that the pellets are embedded in the solidified material so that

they form an internal layer and the outer faces of the plate are formed from the solidified material.

V. Documents

The following documents were cited during the opposition proceedings and are of relevance for this decision:

D5: GB-A-2 272 272

D9: EP-A-0 499 812

D16: Coors Ceramic Company, "Coors Ceramics-Materials for Tough Jobs".

D16a: Coors Ceramic Company, "Armor Products - Coors Alumina Armor Materials", Data Sheet 52-96 1, 1990.

D17: EP-A-0 699 887

D23: US-A-4 061 815

D24: Alcoa Product Data Sheet, "T-162 Tabular Alumina Balls"USA/3090-R01/0601.

D25: Proceedings of the American Society for Composites. Eleventh Technical Conference, 7 to 9 October 1996, Atlanta, USA.

D26: GB-A-1 260 111

The Appellants filed the following documents, amongst others, together with their grounds of appeal:

OA4: Contents Pages v to xv of the Proceedings of the American Society for Composites.

Eleventh Technical Conference.

OA5: Declaration of Prof. A. Rotem, dated 14 July 2004.

In reply to the notices of appeal, the Respondent referred, amongst others, to the following document:

P12: GB-A-1 341 720

VI. Summary of the Submissions of the Parties

Main Request

(a) Article 100(b) EPC

The Appellants argued that the claimed subject-matter is so broad that it encompasses embodiments that would never be considered by the skilled person. Claim 1 requires that the pellets have an Al_2O_3 content of at least 93% and a specific gravity of at least 2.5. A fully dense pellet containing 93% Al_2O_3 has a specific gravity of 3.62, and therefore it is not possible to have a pellet with at least 93% Al_2O_3 and a specific gravity of less than 3.62 without it being porous. For such pellets to have a specific gravity of 2.5, they must contain about 30% porosity and the skilled person would never consider such material for ballistic purposes. Porous pellets account for about 75% of the claimed range and the patent provides no indication how the required ballistic properties can be achieved when such pellets are used. Although there is a reference to grinding pellets as being suitable for use in the invention, none are commercially available with such a low specific gravity. It is therefore an undue burden on the skilled person to determine which combination of features would enable him to use low density Al_2O_3 pellets in the armour plate of the invention.

Claim 1 also requires that the solidified material, and hence the plate is elastic. The Appellants submitted that claim 1 was amended during the examination phase to include the expression "and hence the plate", yet there is no disclosure of a plate having any specific elasticity. Since a plate produced in accordance with the disputed patent undergoes essentially plastic deformation, and there is no indication in the specification of the conditions under which elasticity should be determined, the skilled person has no means of knowing how to make the plate elastic, as required by claim 1.

The Appellants also submitted that the patent specification teaches that the plate of claim 1, ie containing a single layer of ceramic pellets, is capable of stopping projectiles. However, since it is apparent that such a plate *per se* is incapable of arresting a projectile, the skilled person is not taught how the invention can be realised.

The Respondent replied that the patent specification provides an indication of the materials to chose from in order to make the claimed plate and therefore the invention is sufficiently disclosed. Pellets having a low specific gravity can be used because of the remaining features defined in claim 1 and this is the surprising effect of the invention. Al_2O_3 with a low specific gravity is commercially available, albeit not for grinding purposes, as shown for example in GB-A-1341720 (P12) for use in kilns and furnaces. To the Appellants' argument that the skilled person would not consider using low density Al_2O_3, the respondent

replied that he would, because the patent instructs him to do so.

The Respondent was of the view that the skilled person would be readily able to make an elastic plate in accordance with the invention. The description provides specific examples of solidified materials that meet the requirement of elasticity; suitable ceramic materials are also indicated, and if the skilled person made a plate following the instructions set out in the patent specification, the result would be an elastic plate in accordance with the invention. The fact that under certain conditions the plate undergoes plastic deformation merely indicates that it has been subjected to stress that has exceeded the elastic limit; this does not mean, however, that the plate is not elastic.

Regarding the stopping power of the plate, claim 1 is directed to a plate for absorbing and dissipating kinetic energy from high velocity, armour-piercing projectiles, and therefore does not require the plate to be able to stop completely any or all projectiles. Whether or not a projectile is stopped completely depends on, amongst others, the velocity, mass, shape and hardness of the projectile.

(b) Novelty (Articles 100(a) and 54 EPC)

(i) GB-A-2 272 272 (D5)

Claim 1 defines "a single internal layer of high density ceramic pellets which are directly bound and retained in plate form by a solidified material". The Appellants reasoned that this definition of the

internal layer of pellets is so broad that it covers the arrangement shown in the figures of D5, in which the pellets, and their fragments if shattered, are retained in position by a casing of elastomeric material, ie the pellets form an internal layer. In addition, on page 3, third paragraph, it said that the ceramic material is "encased" in the elastomeric material, which the Appellants understood to mean "covered completely" or "enclosed".

In reply, the Respondent submitted that D5 does not disclose internal embedding of the ceramic pellets. "Encase" means to place or enclose in as if in a case and Figure 1 of D5 shows that the ceramic pellets are "encased in", ie in a case of, elastomeric material; it does not show that the pellets are directly bound and retained in a solidified material. Rather, the pellets of D5 are retained in position by gluing them to a backing plate.

D5 also teaches that the ceramic members are made from aluminium oxide, which according to the Appellants means that, except for unavoidable impurities, the Al_2O_3 content is close to 100%. The Respondent submitted that merely stating that the ceramic members are made from alumina does not disclose an Al_2O_3 content of at least 93%.

(ii) US-A-4 061 815 (D23)

The Appellants interpreted the term "majority" in claim 1 as meaning that "more than 50%" of the pellets are in contact with at least four adjacent pellets. Figures 2 and 4 of D23 show that at least 50% of the

filler particles 20 are in contact, and given that these figures represent cross-sections of the material, it is apparent that each particle would be in contact with at least four adjacent particles. Reference was made to the disclosure at column 4, lines 57 to 60 of D23 that the particles are in such close relationship that the maximum distance between abutting faces of neighbouring particles is not greater than about 0.125 inches. According to the Appellants, this does not mean that there is a distance between the particles, but teaches the skilled person that the particles abut, ie are in contact; nevertheless, in practice a distance between particles is unavoidable, but this should be limited to the given amount. This is the same situation as in the armour of the disputed patent, where the practical reality is that not all pellets are in contact, and this is recognised by requiring that only slightly more than 50% are in contact with four neighbours.

At column 4, lines 20 to 21 of D23 it is said that the preferred material for the particles is available as T-162 Tabular alumina from Alcoa Chemicals, which is known to have an alumina content of 99.7% (see D24).

Concerning the weight of the armour plate, the Appellants argued that since the remaining material parameters given in claim 1 are met by the armour of D23, it would be inevitable that the weight would also be the same. In addition, in order to make a correct comparison, the armour of D23 should be compared with the armour panel of the disputed patent ie the armour plate together with its backing plate (see Figure 4 of the disputed patent); given that the backing plate

would add substantial weight, it is apparent that there is no difference in weight between the plate as defined in claim 1 and that of D23.

The view of the Respondent was that, although figures 2 and 4 appear to show some particles in contact, this is in contradiction to the wording of the description of D23, and it is the description that should take precedent. Column 4, lines 27 to 29 describes the particles as being in "close proximity"; column 4, lines 58 to 60 defines the distance between the particles; the teaching is therefore that the particles are not in contact. The word "abut" is of both French and Germanic origin, and "abut" in this context takes its Germanic meaning of "facing" rather than the French meaning of "touching".

The Respondent also argued that D23 does not disclose the weight of the armour plate, which is limited in claim 1 to 45 Kg/m^2. D23 is directed to multilayer armour (see abstract) and the filler particles are optional. The armour is used for vehicles (column 2, lines 24 to 30) to provide projection from shells, ie not lightweight armour as described in the disputed patent. The limit of 45 Kg/m^2 given in claim 1 corresponds to about 9 lbs/ft^2, which can be compared with the limit of not greater than 35 lbs/ft^2 given in D23 (column 1, lines 59 to 60); although the range of D23 includes that of claim 1, it is clear that it relates to heavy armour.

(iii) Proceedings of the American Society for Composites. Eleventh Technical Conference, 7 to 9 October 1996, Atlanta, USA. (D25)

- Admission of D25 into the Appeal Proceedings:

The Respondents submitted that D25 should be excluded from the appeal proceedings. It only came to light when Opponent I (Appellant I in this case) conducted an additional literature search more than four and a half years after the end of the opposition period, and was filed only 6 days before the oral proceedings before the Opposition Division. Since Opponent I could have conducted the search earlier, and given the fact that the document is not prima facie relevant, it should not be admitted into the appeal proceedings.

The Appellants argued that D25, although filed late, is highly relevant, and hence should be admitted. Although D25 had not been admitted into the proceedings by the Opposition Division because of doubts about the public availability of the document, evidence (OA4 and OA5) submitted with the grounds of appeal shows that it was in the public domain before the filing date of the disputed patent.

- Novelty in Light of D25:

The Appellants referred to the method set out in the disputed patent of making the armour plate of claim 1. This involves using a mould having a width that is 1.2 to 1.8 times the size of the major axis of the pellets (page 4 of the specification, lines 16 to 18). Since the mould is wider than the pellets, the centres of the pellets would not be aligned to produce a single layer of uniform thickness corresponding to the size of the pellets, but instead the layer would be uneven, having

a thickness of up to 1.8 times the size of the particles. Such a layer corresponds to that disclosed in Figure 7 and in sample 3 (Table 1, page 952) of D25.

The Respondent argued that the claim defines a single layer of pellets and this is precisely the meaning that should be ascribed to the feature, and it does not include overlapping layers as disclosed in D25.

The Appellants further argued that since the spheres of D25 are arranged in a near close-packed form, with a sphere volume fraction of approximately 60% (D25, page 950 "Materials and Design Parameters"), it is inevitable that the majority of spheres would be in contact with four neighbours. The Respondent stated that "nearly in contact" means "not in contact", and hence "near close-packed" provides no disclosure of the degree of contact between the spheres.

Concerning the alumina content, the Appellants submitted that D25 (Figure 7) teaches that the ballistic limit can be increased by increasing the areal density. Although the aluminium oxide spheres mentioned in section 3.1 of the "Experimental" (page 950) can be shown to have an Al_2O_3 content of 85%, it is within the common general knowledge of the skilled person that the areal density depends on the specific gravity of the ceramic, and hence the use of ceramics having a higher Al_2O_3 content, within the claimed range, is directly derivable from D25. The Respondent denied this, stating that D25 only discloses aluminium oxide spheres corresponding to those designated AD-85 in D16, and these have an Al_2O_3 content

of 85%; since no other alumina contents are disclosed in D25, the content of at least 93% in claim 1 is novel.

(iv) GB-A-1 260 111 (D26)

The Appellants submitted that Figure 5 of D26 shows armour plate in which a single layer of pebbles is embedded in a resin. According to embodiments e) and f) and page 2, lines 76 to 77, ceramic balls containing at least 95% alumina can be used instead of the pebbles. D26 teaches that the thickness of the layer of reinforcement should correspond to the cross-section of the projectiles it is seeking to resist, which in the case of the disputed patent is given as 7.62 mm calibre. This would result in an armour plate having dimensions and weight which fall within the claimed ranges.

The view of the Respondent was that the weight of the plate is not disclosed in D26, and given that D26 is directed to vehicle armour (page 1, lines 11 to 14), it concerns plates heavier than those of the disputed patent. According to embodiment e) the balls are packed close together, ie they are close but not touching. The word "likewise" in the description of embodiment f) (see page 1, lines 48 to 50) relates to how the pebbles are packed; it does not indicate anything further, and in particular does not mean that "balls" can be read for "pebbles" in the remainder of the specification. The rigid pieces of D26 are sandwiched, ie squashed, between two layers of resin material, rather than being embedded in it, as is the case with the ceramic pellets of claim 1. D26 also teaches that when armour plate for use against armour-piercing bullets is required, there are two layers of ceramic reinforcement (page 2, lines

81 to 83), and a single layer is used only for ball bullets (page 2, lines 55 to 56).

(c) Inventive Step (Articles 100(a) and 56 EPC)

The Appellants considered D25 to be the closest prior art, starting from which they defined the problem to be solved as how to improve the efficacy of the armour plate without increasing the thickness. The latter aspect is rightly included in the problem, as the purpose of the invention, as set out in the introduction to the disputed patent, is to improve armour in terms of weight, cost and compactness.

D25 teaches that the spheres are arranged with a sphere volume fraction of approximately 60%. This equates to the theoretical maximum packing density, which is not achieved by any of the embodiments given in D25, but does indicate that the spheres should be packed as closely together as possible. It is also self-evident to the skilled person that tight packing is important, as voids and matrix regions are not effective at stopping bullets.

D25 states that the materials were obtained from Coors Ceramics Company. Since the skilled person would be expected to look up appropriate products sold by the company, technical brochures from Coors (D16 and D16a) are considered as part of the general knowledge of the skilled person. D16a concerns alumina products for armour applications and therefore is more relevant than D16, which merely refers to "Materials for Tough Jobs". D25 describes the use of alumina spheres containing 85% Al_2O_3 in armour for protection against .30 calibre ball

projectiles. It is readily apparent to the skilled person that against harder armour-piercing projectiles, the alumina spheres must themselves be harder and tougher, ie he would select the materials in D16a that have higher Al_2O_3 contents; in addition, the designations CAP2 and CAP3 refer to "Coors Armour Piercing" and indicate materials especially suitable for this purpose.

The Appellants emphasised that the armour plate of claim 1 is not intended to arrest a projectile, but simply to absorb and dissipate kinetic energy. In summary, it is obvious to a skilled person wishing to adapt the ceramic plate of D25 for such a purpose, that it is necessary to use harder, tougher alumina spheres, ie having an Al_2O_3 content in excess of 93%, and to ensure that the spheres are closely packed together to provide maximum protection, which would result in a majority of the spheres being in contact with at least four neighbours.

The Respondent considered D25 to be an inappropriate starting point for assessment of the invention, as it deals with .30 calibre spherical bullets, rather than armour piercing projectiles. Prior art documents that concern armour piercing bullets, such as D9, D6 and D26, teach that for this type of application two layers of ceramic pellets are required. This is also in line with the understanding of the skilled person that more layers result in better protection. A skilled person wishing to adapt the armour of D25 for use against armour-piercing bullets would therefore not use a single layer of ceramic pellets. In addition, D25 teaches that the thickness of the backing layer is more

important than that of the ceramic layer, hence incentive here is to increase the thickness of the backing layer, and this points away from the invention.

The Respondent disputed the assertion that it is obvious to reduce gaps between the pellets to form a close-packed structure, arguing that the mechanism of absorbing energy from projectiles is not clearly understood. For example, D17 shows that it is not just the shattering of the bullet that is important, but also the dissipation of energy, so in D17 the spheres are not in contact, so that they can be deflected to create a ripple effect that dissipates energy. The Appellants were of the view that D17 does not clearly show that this type of armour is effective in practice, it being more of a theoretical document; in addition, D17 is only one document mentioning a possible advantage of gaps compared with the bulk of the prior art that points to the opposite.

Concerning the Al_2O_3 content, the Respondent referred to D16, which is also a brochure from Coors and shows that there is no clear relationship between hardness and the purity of the alumina. Since D16 is entitled "Materials for Tough Jobs", it would also be taken into consideration by the skilled person. Given the element of doubt, it is not inevitable that the skilled person would expect an increase in hardness in pellets having a higher Al_2O_3 content. In addition, document D15 actually points away from using high purity alumina, stating that purer aluminium oxides do not show sufficient promise ballistically. The Appellants were however of the view that the author of D15, which was published some 10 years before D16a was available, was

not aware of the materials from Coors, which were available at the filing date of the disputed patent; once these higher grade materials were available, they were the obvious choice for the skilled person.

The Respondent summarised by saying that there is no incentive for the skilled person adapting the armour of D25 for armour-piercing applications to use a close-packed single layer of alumina spheres of higher purity. In addressing the problems of weight and compactness, alumina is not the first choice material because it is relatively heavy; however, the patentee has discovered the unusual result that less of it is required to provide adequate protection against armour-piercing projectiles if it is in the form of a thin, single layer, as defined in claim 1.

First, Third and Fourth Auxiliary Requests

Claims 1 of these requests all contain the additional feature that a projectile entering a valley formed between adjacent pellets is jammed between the flanks of three pellets, all of which participate in projectile arrest (the "valley contact feature").

The Appellants submitted that it is impossible for a projectile to jam between the pellets, and hence there is an objection under Article 83 EPC, since there is no explanation in the disputed patent of how this can be achieved.

Since the patent specification fails to disclose how valley contact is obtained, the inclusion of this feature in claim 1 leads to addition of subject-matter

beyond that originally filed, contrary to Article 123(2) EPC. In addition, three modes of contact, namely centre, flank and valley are described at page 3, line 2 to page 4, line 4 of the patent specification. There is, however, no basis for saying that one mode has any advantage over the others, and isolating one way of contact whilst excluding the other two amounts to a selection that has not been disclosed, also contrary to Article 123(2).

The Appellants submitted that the valley contact feature is not a constructional feature of the armour plate, and defines the plate only when struck by the projectile. Since this depends on the size of the projectile, its speed and angle of contact, it is not possible to determine the feature, and consequently it lacks clarity contrary to Article 84 EPC.

The Respondent replied that the claims do not require that the plate must stop a projectile intact. As explained in the disputed patent on page 5, lines 14, 15 and 30, the jammed projectile shatters and the fragments are retained by the backing plate; the requirements of Article 83 EPC are therefore met. Although the valley contact feature is defined, the claims do not exclude the other modes of contact and there is no added subject-matter contrary to Article 123(2) EPC.

The valley contact feature requires that each valley is surrounded by three pellets, ie it is a constructional and not a functional limitation. Irrespective of how the projectile arrives at the surface of the plate, the claim requires that it is jammed between three pellets.

The size of the valley is defined in relation to the projectile so, for example, the specification describes armour plate for protection against 0.22" calibre projectiles; the skilled person thereby knows that the valleys must be sufficiently small to jam such projectiles, and consequently there is no objection under Article 84 EPC.

Second Auxiliary Request

Claim 1 of the second auxiliary request defines the pellets as being of round-ended cylindrical shape or flat-ended cylindrical shape. The inclusion of this feature in the claim was objected to by the Appellants under Article 123(2) EPC, arguing that the specification does not disclose any technical significance that can be placed on cylindrical shaped pellets, especially as the specification makes it clear that spherical shaped pellets are best (page 5, lines 6 to 8); hence the selection of this particular shape has no basis in the application as filed.

The Appellants also considered that claim 1 of the second auxiliary request lacked inventive step (Article 56 EPC), since the prior art discloses an array of shapes capable of dissipating kinetic energy, amongst which cylindrical shapes are well known; in support of their submission, the Appellants referred to D5 (figures), D6 (column 2, lines 5 to 18), D9 (column 2, line 14), D17 (figure 3), D23 (column 4, line 18 to 20) and D26 (page 1, lines 33 to 39). Limitation of claim 1 to this shape is merely an arbitrary choice of an alternative shape to dissipate kinetic energy.

The Respondent indicated that support for round-ended cylindrical pellets can be found in Figure 1, and that definition of the shape in claim 1 does not amount to a selection invention, but is simply a limitation in scope of the claim.

Regarding inventive step, the Respondent argued that, although cylindrical shaped pellets are known in the art, the subject-matter of claim 1 cannot be arrived at in an obvious way. D25 only deals with spheres and there is no suggestion that other shapes should be considered. In addition, given that the results presented in D25 show that spheres produced the desired effect, there is no motivation to replace them by other shapes. The object problem is to find an alternatively shaped pellet, and it should be borne in mind that there is no requirement that the invention results in technical progress (see the EPO Guidelines, Chapter C IV 1.3). In order to arrive at the claimed subject-matter, it is necessary to combine the teachings of three documents with no indication that this should be done, and this is a strong indication of the presence of an inventive step.

Reasons for the Decision

1. The appeals are admissible.

Main Request

2. Article 100(b) EPC

Article 100(b) EPC requires that the patent should disclose the invention in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art.

The disputed patent gives two examples of how to make the armour plate of the invention, setting it out in steps A to E (pages 5 and 6 of the specification). Suitable ceramic pellets are mentioned and indicated as being commercially available, being typically used as grinding media. The specification also indicates appropriate materials for the solidified material, eg certain aluminium alloys or epoxy materials. There is thus sufficient information presented in the specification to enable the skilled person to construct an armour plate according to claim 1, and consequently the requirements of Article 100(b) EPC are met.

The Appellants argued that the invention is not disclosed over the whole of the claimed range, because the skilled person would not consider using pellets containing at least 93% Al_2O_3 and having a specific gravity of less than 3.6 for ballistic purposes, as these would be porous, and it is not apparent how the required level of protection could be achieved using such pellets. Although, as pointed out by the Appellants, the specification only refers to ceramic pellets used as grinding media, the skilled person is aware of alumina having a lower specific gravity; porous Al_2O_3 is used in other technical fields, for

example for furnace linings and filters, and is commercially available. Since the patent encompasses such materials and these are readily available, the skilled person is in a position to construct a plate out of them. It may or may not be the case that an armour plate comprising porous Al_2O_3 does not perform particularly well, but this is outside of the scope of Article 100(b) EPC, which only requires that the skilled person can make the plate of the invention.

The Appellants' allegations that a plate made in accordance with the invention is not elastic, and that a plate having a single layer of ceramic particles would not by itself be able to stop projectiles, do not give rise to objections under Article 100(b) EPC for the following reasons.

The specification (page 3, lines 26 to 29) indicates suitable materials for the solidified material, the use of which will result in a plate having some degree of elasticity. The statement in claim 1 that the plate is elastic has itself little meaning without defining the elasticity quantitatively, but it can be fairly assumed that a plate made using the materials suggested in the specification would exhibit elasticity, as defined in claim 1.

Claim 1 merely requires that kinetic energy is absorbed and dissipated and not that a projectile is fully stopped. Any plate made in accordance with the teaching of the specification will exhibit some ability to absorb and dissipate energy from a projectile, and hence this feature would also be achieved.

3. *Article 100(c) EPC*

An objection that granted claim 1 contains a feature not disclosed in the application as originally filed was raised for the first time during the opposition proceedings by Opponent I in the letters of 25 February 2002 (section 2.2) and 28 August 2002, that is more than three years after the end of the nine month period for filing an opposition, as provided for in Article 99(1) EPC.

It appears from the minutes (pages 1 and 2) that Article 100(c) EPC was discussed during the oral proceedings before the Opposition Division, and that the Opposition Division did not concur with the Opponents' submission; in addition this ground is not mentioned in the decision. It is therefore clear that the Opposition Division had concluded that the ground did not *prima facie* prejudice maintenance of granted claim 1, and, exercising its discretion following G 9/91, decided not to admit the ground into the proceedings. Consequently, the Board of Appeal is not in a position to deal with this ground without the consent of the Respondent, which was not given (see G 9/91, paragraph 18 of the Reasons).

4. *Novelty (Article 54 EPC)*

The Board finds that the subject-matter of claim 1 of the main request is novel in light of documents D5, D23, D25 and D26 for the following reasons.

4.1 GB-A-2 272 272 (D5)

Claim 1 requires that the ceramic pellets are directly bound and retained in plate form by the solidified material. D5 discloses ceramic pellets that are encased in an elastomeric material (page 3, third paragraph) that is in the form of strips 16 glued around the edges of a backing sheet of composite material; optionally, there is also a cover made from a thin metal sheet 22. The ceramic pellets are themselves secured to a backing sheet 12 by a polyurethane adhesive (page 5, second paragraph).

The elastomeric material therefore, as argued by the Respondent, forms a box around the ceramic pellets; it does not directly bind and retain the pellets in plate form, since this function is carried out by the polyurethane adhesive gluing the pellets to the backing sheet. This adhesive cannot, however, be equated to the "solidified material" of claim 1, as suggested by the Appellants. This feature must be interpreted in light of the description (see method steps A to E on page 5 and Figures 1 and 5), which shows that molten material is poured and solidified around the pellets, so that the pellets are within a matrix of solidified material. Neither the adhesive nor the elastomeric material of D5 surround the ceramic members in the same manner as the solidified material of the disputed patent. Consequently, the feature of having ceramic pellets directly bound and retained in plate form by the solidified material is not disclosed in D5.

D5 discloses that the ceramic pellets are made from aluminium oxide (page 1 second paragraph and page 4,

paragraph three), which the Appellants argue that, except for the presence of unavoidable impurities, means that they have an Al_2O_3 content close to 100%, especially as no other components are mentioned, and thus the Al_2O_3 content falls within the claimed range. However, there is no explicit disclosure in D5 of the chemical content of the ceramic members, other than that they are said to be aluminium oxide. For the chemical content to be disclosed implicitly in D5, it must be beyond doubt that the expression "aluminium oxide" is not just a general expression, but has a particular meaning in terms of the purity of the ceramic. There is no evidence that there is any difference in this sense between the expressions "aluminium oxide", "alumina" or "Al_2O_3", and consequently, it cannot be said with any degree of certainty that they have an Al_2O_3 of at least 93%, as required by claim 1.

4.2 US-A-4 061 815 (D23)

D23 discloses a laminated armour sheet containing particles with a diameter of about 0.25 to about 0.75 inches (6.4 to 19 mm), preferably in the form of T-162 Tabular alumina from Alcoa Chemicals (column 4, lines 11 to 13 and 20 to 22), which the Appellants have shown by reference to D24 to contain 99.7% Al_2O_3.

The embodiment of the invention of D23 shown in Figure 2 shows reinforcing particles in contact. This embodiment is described in detail in column 4 of D23, where at lines 27 to 29 it is said that "the individual particles within the layer lie in close proximity to their surrounding neighbors", and at lines 57 to 60,

"said particles being disposed within said layer 14 in such close relationship that the maximum distance between abutting faces of neighboring particles is not greater than about 0.125 inches". The emphasis here is therefore that the particles are near each other, ie in "close proximity", and this is underlined by defining a maximum distance within which the particles must lie, but importantly there is no requirement that they should be in contact.

Ambiguity arises in that the faces of neighbouring particles are said to be "abutting". In standard English this term means that the particles are touching, however, the overall teaching in column 4 is that the particles are merely near each other. Although the etymological explanation given by the Respondent is interesting, it seems more likely that the drafter of the patent inadvertently used the word to mean "facing", since any other meaning is in contradiction to the remaining description of the embodiment.

Further ambiguity arises in that Figure 2 seems to show particles in contact. Figures in patent documents are often approximate, serving only to give a schematic explanation of the written disclosure, and it is the written teaching that must take precedent. In this case, the description of the embodiment shown in Figure 2 teaches that the particles lie in close proximity, and no further information can be derived unambiguously from the figures.

It is therefore concluded that D23 does not disclose with the required degree of certainty that each of a

majority of pellets is in contact with at least four of its neighbours.

D23 defines the weight of the laminated armour sheet as being not greater than 35 lbs/ft^2, whereas claim 1 requires the weight of the plate not to exceed 45 Kg/m^2, corresponding to about 9 lbs/ft^2; the range defined in claim 1 therefore represents only about 25% of that disclosed in D23. It is, however, necessary to determine whether the skilled person would nevertheless consider D23 to disclose a weight of 9 lbs/ft^2. No lower limits are given in either D23 or the patent, so theoretically the lower limit is close to zero, but it is clear that in practice no armour would have a weight in this lower part of the range. There are no specific examples in D23 to help decide which parts of the range should be considered. D23 is directed to vehicle armour (column 2, lines 19 to 40), whereas the patent in question concerns lighter armour encompassing body armour (page 2, first paragraph of the specification). Therefore it might be expected that D23 would work in the upper parts of the range, but as to whether its discloses a weight 9 lbs/ft^2 cannot be established with any degree of certainty. Since the weight of the plate is not unambiguously derivable from D23, this feature as defined in claim 1 is also considered to be novel.

4.3 Proceedings of the American Society for Composites. Eleventh Technical Conference, held 7 to 9 October 1996 (D25)

Document D25 concerns the proceedings of a conference held shortly before the filing date of the disputed patent (12 November 1996). It was filed by Opponent I

six days before the oral proceedings before the Opposition Division, who did not admit it into the proceedings because of doubts as to whether it had been made available to the public in time. The Appellants filed, together with their appeal, a declaration (OA5) from Prof. A. Rotem, who had also presented a paper at the above conference (see the contents of the proceedings (OA4), page xiii). According to the declaration (point 4), the conference proceedings were handed out to participants at the time of the conference (ie 7 to 9 October 1996). There is no reason to doubt the statement made by Prof. Rotem, and hence it is taken that D25 is prior art in accordance with Article 54(2) EPC.

The purpose of an appeal is to decide on the correctness of a decision of the department of first instance with respect to either the facts or the applied law. In this case, the Opposition Division exercised its discretion under Article 114(2) EPC and properly did not admit D25 because of doubts about its availability to the public. The appeal procedure gives the Appellants an opportunity to correct this, which they did in the grounds of appeal, and since the Board is of the view that D25 is highly relevant, it has decided to admit it into the proceedings.

Sample 3 of D25 (see Table 1, page 952) concerns an armour plate of 0.5 inch (4/8 inch) thickness in which 3/8 inch spheres are embedded. The Board agrees with the submission of the Appellants that this corresponds to the single layer of claim 1, since according to the patent specification, the layer can be made by casting the solidified material around the pellets in a mould

having a width of 1.8 times the size of the pellets; in both the disputed patent and D25 the layer of ceramic pellets is not uniform.

The spheres of D25 are arranged in a near close-packed form, with a sphere volume fraction of approximately 60% (see page 950 "Materials and Design Parameters"). Whereas the Appellants argue that such packing would inevitably lead to the majority of spheres being in contact with at least four neighbours, the Respondent submits that "near close-packed form" is not the same as requiring the spheres to be in contact.

It is clear that the expression "near close-packed" refers not to the distance between spheres, but to the density in packing the spheres. A sphere volume fraction of approximately 60% corresponds to the theoretical maximum packing density for a single close packed layer of spheres. According to the examples given in D25, the thickness of the ceramic layers is greater than that of the spheres themselves, and there is no exact disclosure as to how the spheres are packed in the matrix resin; it is therefore apparent that the theoretical maximum packing density is not achieved.

Whether or not each sphere lies in contact with at least four of its neighbours cannot be determined with complete certainty, and hence this feature is considered to be novel. Of course, it is highly likely that this will be the case, but, given the strict standard required in assessing novelty, this is a matter for inventive step.

According to section 3.1 of the "Experimental" (page 950), the aluminium oxide spheres were obtained from Coors Ceramics Company and have a density of 3.4 g/cm^3, a modulus of 227 GPa and a hardness of 1800 kg/mm^2. Document D16 is sales brochure from Coors and shows that the spheres that meet the above set of criteria are designated AD-85 and have an Al_2O_3 content of 85%. Since claim 1 requires the pellets to have at least 93% Al_2O_3, the claimed alumina content is novel. A feature must be directly and unambiguously derivable from a document, and thus the argument of the appellants that it would be immediately apparent to the skilled person to use ceramics having a higher specific gravity in order to increase the ballistic limit also belongs in the realm of inventive step.

4.4 GB-A-1260111 (D26)

D26 discloses sheet armour material in which ceramic material is incorporated in resin. Various embodiments of the armour are shown in the figures and these are summarised on page 1, lines 25 to 50. In particular, embodiment e) concerns balls packed close together and f) concerns natural pebbles "likewise" packed together and shown in Figure 5. Contrary to the argument of the Respondent, the Board considers that on the natural reading of lines 48 to 50 on page 1, the term "likewise" provides a link between embodiments e) and f), meaning that balls are packed close together in a single internal layer in the manner shown in Figure 5. The preferred ceramic employed in D26 contains at least 95% alumina (page 2, lines 76 to 77).

D26 teaches that the minimum thickness of the ceramic pieces should be 1/10 inch (2.54 mm), and thus discloses a range that broadly overlaps the claimed range of 3 to 12 mm.

The armour plate of D26 is manufactured by making a backing, to which is applied an adhesive resin and then the pieces of ceramic are pressed into place (page 2, lines 114 to 118). A cover layer is formed on top of this; the covering layer is optional and the hard pieces may be exposed (page 2, lines 67 to 71). There is therefore no clear disclosure of embedding the ceramic pieces in the manner described in the disputed patent.

The armour of D26 is for use in aircraft, land vehicles and boats, the lightest version of which has a weight of 9.5 lbs/ft^2 (46.4 kg/m^2) (page 2, lines 55 to 66), which is outside of the limit given in claim 1. The weight as defined in claim 1 is therefore also a novel feature.

5. *Inventive Step (Article 56 EPC)*

5.1 D25 discloses composite armour plate in which alumina spheres are embedded in an epoxy resin matrix, and was considered by the Appellants to be the closest prior art. The Respondent held the view that D25 only refers to conventional projectiles, particularly .30 calibre ball-type bullets, and since the disputed patent concerns armour for use against armour-piercing projectiles, D25 cannot be the closest prior art.

D25 is a conference paper exploring the effectiveness of alumina spheres on the ballistic properties of multifunctional composite armour against small calibre bullets (see the abstract and first paragraph of the introduction on page 947 of D25). Although the experiments themselves were conducted using conventional projectiles, the Board considers that the discussions and teachings of the document would be seen by the skilled person as being relevant for the development of composite armour plate for absorbing and dissipating energy from any small-calibre projectile, including armour-piercing projectiles. Consequently, D25 provides an appropriate starting point for the assessment of inventive step.

5.2 Starting from D25, the Appellants, noting that compactness and weight reduction is the purpose of the invention, formulated the problem to be solved as how to improve the efficacy of the armour plate at providing protection against armour-piercing bullets without increasing the thickness of the plate. The Respondent argued that, in referring to the thickness of the plate, the skilled person is artificially steered towards some plausible solutions and away from others; the problem is seen by the Respondent as how to improve the efficacy of the armour plate at shattering armour-piercing bullets.

The Board considers that inclusion of "thickness" in the definition of the problem does prod the skilled person to go down certain routes. However, the problem is not to create armour capable of shattering armour-piercing bullets, as suggested by the Respondent, since the claim only requires that kinetic energy is absorbed

and dissipated. It is clear from the introduction to the disputed patent (see page 2, lines 1 to 21) that the invention relates to improving the efficacy of lightweight armour against armour-piercing projectiles. Although such armour comprises a ceramic sphere layer and a composite backing layer (as shown in both D25 and the disputed patent), the invention defined in claim 1 only concerns the layer of ceramic spheres. The objective problem is therefore more accurately defined as how to improve the efficacy of the ceramic layer disclosed in D25 so that it would be suitable for absorbing and dissipating kinetic energy from armour-piercing projectiles.

5.3 Three forms of the ceramic layer are compared in D25, in which alumina spheres of different diameters, namely 1/8", 7/32" and 3/8", are embedded in epoxy resin to form a layer 1/2" thick. The first two samples result in multiple layers of spheres within the resin, but, as set out above in the discussion of novelty (paragraph 4.3), the latter sample is considered to be a single layer within the meaning expressed in the disputed patent.

The plate of claim 1 differs in that there is no express disclosure in D25 of a majority of pellets being in contact and in that the ceramic pellets of claim 1 have a higher content of Al_2O_3.

5.4 D25 teaches (page 950, third paragraph) that the spheres are arranged in a near close-packed form with a sphere volume fraction of approximately 60%. This almost corresponds to the theoretical maximum packing for a single layer of spheres, and whilst this, being a

hypothetical value, seems unlikely to be achieved in practice for the samples of D25, the Board agrees with the Appellants that this is a clear teaching that the spheres should be packed as close together as possible. In addition, as put forward by the Appellants, it is generally undesirable to have armour plate containing gaps or voids, as these are not effective at stopping projectiles. The express instruction of D25 to achieve close packing and the general view that this is the way to achieve optimum ballistic properties seems to outweigh the disclosure in D17 that gaps between pellets might have some advantageous effect. It is therefore considered that it is obvious for the skilled person to pack the spheres as closely as possible, with the result that such that the majority (ie more than 50%) would be in contact with at least four neighbouring spheres.

The Respondent argues that, faced with the problem of increasing the efficacy of the armour of D25, the skilled person would firstly increase the backing layer, as D25 teaches that this significantly improves the ballistic properties of the armour (see page 955). It may be the case that the skilled person would increase the thickness of the backing layer in accordance with this teaching; such a layer is not excluded by claim 1, and indeed, a backing layer is used to arrest fragments of shattered projectile that pass through the ceramic layer, as shown in Figure 4 of the disputed patent. However, as mentioned above, claim 1 only concerns the ceramic layer and it is the teachings of D25 with respect to this layer that are important.

The Respondent also submits that the skilled person wishing to develop armour capable of providing protection against armour-piercing projectiles would employ at least two layers of ceramic pellets, in accordance with the general teaching of the prior art. The skilled person would therefore turn to those embodiments shown in D25 as having multiple layers of ceramic spheres.

Table 1 of D25 shows that whether the ceramic layer is in the form of a single layer of spheres or several layers of smaller spheres, there is a minimal effect on the ballistic properties. Given that D25 discloses only three sizes of spheres, the choice of one of them cannot realistically be associated with any inventive activity. It may well be the case that the cited prior art indicates a tendency to use more than one layer of ceramics when armour-piercing bullets are involved, but unlike the cited documents, which are concerned with stopping bullets, the armour plate of claim 1 is only required to absorb and dissipate kinetic energy from an armour-piercing projectile. This is a much lower requirement, and it is clear that the single layer of ceramic spheres described in D25 would absorb and dissipate kinetic energy, even though it may not fully arrest the projectile; the skilled person is therefore not dissuaded from using the embodiment having a single layer of spheres, simply because armour-piercing projectiles are involved.

5.5 Turning now to the Al_2O_3 content of the spheres, section 3.1 of the "Experimental" (page 950) indicates that the aluminium oxide spheres were obtained from Coors Ceramics Company. Documents D16 and D16a concern

data sheets for alumina products made by Coors, with D16 entitled "Coors Ceramics-Materials for Tough Jobs", and document D16a "Armor Products" is subtitled "Coors Alumina Armor Materials". Whilst the Board would not go as far as saying that the contents of D16 and D16a are part of the general knowledge of the skilled person, as suggested by the Appellants, the clear pointer in D25 to products from Coors Ceramic means that these documents would certainly be consulted by the skilled person.

The emphasis in D16a is on alumina materials for armour applications, it is thus clear that the skilled person would consult this document in preference to D16 in order to find suitable materials. The Board does not agree with the submission of the Respondent that the general indication that D16 materials are for "tough jobs" means that the skilled person would consult this document on an equal basis as D16a, given that D16a is specifically directed to armour applications.

Document D16a indicates four alumina materials of increasing hardness and toughness, which are associated with increasing Al_2O_3 content. Notwithstanding that "CAP-2" and "CAP-3" in D16a appear to refer to "Coors Armour-Piercing" materials, it is apparent that the most suitable materials for applications involving armour-piercing bullets are those having high hardness and toughness values. These are indeed the materials indicated as "CAP-2" and "CAP-3", which have alumina contents of 96.0% and 99.5% respectively, this being above the 93% requirement defined in claim 1. It would take no inventive skill for the skilled person to select these materials for the ceramic layer of D25

when armour-piercing projectiles are under consideration.

The Respondent put forward D15, which states that "purer aluminium oxides have not shown sufficient promise ballistically", as indicating that the skilled person would not automatically turn to high purity alumina for providing the best protection against armour-piercing bullets. D15 represents the thinking in the art in 1980, ie some 10 years before the Coors materials of D16a were available specifically for this purpose; the Board therefore agrees with the Appellants that the skilled person would turn to the materials of D16a rather than be dissuaded by the general indication given in D15.

5.6 In summary, D25 discloses a single layer of alumina ceramic spheres bound in plate form by epoxy resin; this layer is capable of absorbing and dissipating kinetic energy from high velocity, armour-piercing projectiles. It is clear to the skilled person that for such an application the spheres must be packed as close as possible. D25 informs the reader that suitable materials for the spheres are available from Coors Ceramics, and a data sheet (D16a) from this company indicates alumina materials particularly suitable for armour against armour-piercing projectiles. These materials have a high Al_2O_3 content (above 93%), and use of these materials in accordance with D25 would lead to a plate having the mechanical properties given in claim 1. The subject-matter of claim 1 of the main request thus lacks an inventive step.

6. *Auxiliary Requests*

6.1 First, Third and Fourth Auxiliary Requests

These requests all contain the feature that a projectile entering a valley formed between adjacent pellets is jammed between the flanks of three pellets, all of which participate in projectile arrest (the "valley contact feature"). The amendment of granted claim 1 to include this feature was objected to by the Appellants under Articles 123, 83 and 84 EPC, of which Article 84 EPC is considered by the Board to be the most relevant.

The Respondent argued that the valley contact feature is a constructional feature of the armour plate, as it requires that the pellets are arranged in such a way that each valley is surrounded by three pellets.

The Board, however, agrees with the Appellants that the valley contact feature is not a feature of the plate *per se*. Claim 1 is directed to a composite armour plate, whereas the feature in question relates not to the plate, but to the course of events that takes place when a projectile enters the plate. As described in the disputed patent (page 3, line 44 to page 4, line 2), an incoming projectile may encounter the pellets in one of three ways. Firstly, it may contact the centre of a pellet, allowing the full volume of the pellet to contribute to its arrest. Secondly, it may strike the flank of a pellet, which causes the projectile to yaw sideways. Thirdly, it may be jammed between the flanks of three pellets (valley contact).

Which of these modes of contact is applicable is determined, amongst other things, by the point at which the bullet happens to strike the plate, the size of the bullet, its speed and the angle of contact. The Respondent submitted that the size of the projectile determines the size of pellets required to cause valley contact, and the angle, speed etc is irrelevant, so long as the pellets are arranged such that the projectile jams between three of them. However, if a product is defined by a feature, it must be clear how the feature is determined, and in this case there is almost no way of predicting in advance whether or not valley contact will take place. If a piece of armour plate is lying on a table, the skilled person has no means of knowing whether the feature is present or not. In short, it lacks clarity, contrary to Article 84 EPC.

The valley contact feature is present in claims 1 of the first, third and fourth auxiliary requests, hence these requests are not allowable for failure to meet the requirements of Article 84 EPC. It is therefore not necessary to consider the other objections raised by the Appellants under Articles 123 and 83 EPC.

7. *Second Auxiliary Request*

Inventive Step (Article 56 EPC)

Claim 1 of the second auxiliary request contains the features of claim 1 of the main request together with a definition of the shape of the pellets as round-ended cylindrical or flat-ended cylindrical.

As is the case for claim 1 of the main request, the closest prior art for the armour plate of claim 1 of the second auxiliary request is D25.

Starting from D25, the objective problem to be solved is, as defined by the Respondent, to find an alternative shape for the pellets.

The figures of D5 show pellets having a flat-ended cylindrical shape. D23 (column 4, line 19) refers to "capsules", which are considered to be round-ended cylinders, and Figure 3 of D17 shows both round-ended and flat-ended cylinders. It is therefore apparent that flat-ended and round-ended cylindrically shaped pellets are well known in the art as being suitable for use in armour.

Several documents identify spherical pellets as having the preferred shape for providing protection (see for example D9, column 2, lines 18 to 19), but no particular advantage can be ascribed to cylindrical shaped pellets. The Respondent emphasised that there is no requirement for technical progress for the recognition of inventive step, and this is correct, but in this case there are numerous documents, indicated above, listing cylinders along with spheres, tablets, pyramids etc as suitably shaped pellets; the selection of cylindrical shapes is merely an obvious choice from the list of possible shapes on offer. The Respondent also argued that there is no incentive for the reader of D25 to seek alternatively shaped pellets; this, however, ignores the "problem - solution" approach, which in this case actually defines the problem as choosing a different shaped pellet.

The Respondent submitted that, starting from D25, the skilled person must consult two more documents, ie D25, D16a and a document showing cylindrical shaped pellets, in order to derive the claimed subject-matter. The necessity of combining teachings of three documents is a strong indication of inventive step. However, the use of cylindrically shaped pellets in armour is mentioned in several documents, not limited to those mentioned above, such that it is considered to be so well known as to be part of the general knowledge of the skilled person. Document D25 expressly tells the reader to consult Coors Ceramics Company (D16a) for suitable materials; the replacement of the spheres of D25 by cylinders is not associated with any particular technical effect and as an obvious alternative is within the capability of the skilled person. The subject-matter of claim 1 of the second auxiliary request therefore lacks an inventive step, contrary to Article 56 EPC.

Since the second auxiliary request is not allowable for lack of inventive step, it is not necessary to consider the issue of added subject-matter (Article 123(2) EPC).

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The patent is revoked.

The Registrar: The Chairman:

A. Counillon U. Krause