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**Datasheet for the decision
of 29 March 2022**

Case Number: T 1385/19 - 3.4.02

Application Number: 11192405.6

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Language of the proceedings: EN

Title of invention:

Lamina comprising cube corner elements and retroreflective sheeting

Applicant:

3M Innovative Properties Co.

Relevant legal provisions:

EPC Art. 56, 123(2)

RPBA Art. 12(4)

RPBA 2020 Art. 13(1), 13(2)

Keyword:

Unallowable intermediate generalisation (main request and auxiliary requests 3 and 4: yes)

Inventive step (auxiliary request 1: no)

Admission of requests (auxiliary requests 2, 3A and 3B: no)

Decisions cited:

T 2010/15



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Case Number: T 1385/19 - 3.4.02

D E C I S I O N
of Technical Board of Appeal 3.4.02
of 29 March 2022

Appellant: 3M Innovative Properties Co.
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Decision under appeal: **Decision of the Examining Division of the
European Patent Office posted on 5 December 2018
refusing European patent application No.
11192405.6 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chairman R. Bekkering
Members: F. J. Narganes-Quijano
G. Decker

Summary of Facts and Submissions

- I. The appellant (applicant) lodged an appeal against the decision of the examining division refusing European patent application No. 11192405.6. The application was filed as a divisional application of the earlier European patent application No. 04737307.1.
- II. The following document was considered during the first-instance proceedings:

D2: US 3 923 378 A.
- III. In the decision under appeal the examining division held that
 - claim 1 of the main request and claim 1 of the then second and third auxiliary requests did not fulfil the requirements of Articles 76(1) and 123(2) EPC, and
 - the subject-matter of claim 1 of the first auxiliary request did not involve an inventive step over document D2 (Article 56 EPC).
- IV. With the statement setting out the grounds of appeal the appellant submitted a claim 1 according to a main request and auxiliary requests 1 to 4.
- V. In reply to the preliminary assessment of the case presented by the board in a communication pursuant to Article 15(1) RPBA 2020 annexed to summons to oral proceedings, the appellant filed with the letter dated 28 February 2022 further substantive submissions.
- VI. Oral proceedings were held on 29 March 2022.

During the oral proceedings the appellant submitted a claim 1 according to auxiliary requests 3A and 3B.

The appellant requested that the decision under appeal be set aside and that a patent be granted on the basis of the claims according to the main request or according to one of auxiliary requests 1 to 3 all filed with the statement of grounds of appeal, or according to one of auxiliary requests 3A or 3B filed at the oral proceedings on 29 March 2022, or according to auxiliary request 4 filed with the statement of grounds of appeal.

At the end of the oral proceedings the chairman announced the decision of the board.

VII. Claim 1 of the main request (with the feature labelling "a" to "f" and "h" to "j" in square brackets indicating the feature labelling adopted during the proceedings being inserted by the board) reads as follows:

"[a] Retroreflective sheeting comprising:

[b] a first and second row of preferred geometry cube corner elements that together form a pair of adjacent rows of preferred geometry cube corner elements in opposing orientation,

[c] wherein each preferred geometry cube corner element has at least one non-dihedral edge that (1) is nonparallel to a reference plane (26) that extends substantially coplanar with the retroreflective sheeting along which the preferred geometry cube corner elements are disposed; and (2) is substantially parallel to an adjacent non-dihedral edge of a directly adjacent cube corner element,

[d] each said preferred geometry cube corner element being defined by three groove faces formed by

first and second side grooves and a primary groove, wherein each preferred geometry cube corner element includes a 1-2 dihedral angle formed by the intersection of the primary groove face and the first side groove surface, a 1-3 dihedral angle formed by the intersection of the primary groove face and the second side groove surface, and a 2-3 dihedral angle formed by the intersection of the first and second side groove surfaces,

[e] wherein the 1-2 and 1-3 dihedral angles of at least one preferred geometry cube corner element deviate from 90° and the magnitude of the deviation from 90° is between 1 arc minute and less than 60 arc minutes,

[f] wherein adjacent elements in a row have at least one dihedral edge that ranges from being nominally parallel to nonparallel by less than 1° to the dihedral edge of an adjacent element; and

[h] two different matched pairs of preferred cube corner elements comprising a first matched pair (α , α') and a second matched pair (β , β'),

[i] the first matched pair (α , α') of preferred geometry cube corner elements comprises the first preferred geometry cube corner element (α) that is super-imposable when rotated 180 degrees about an axis normal to the reference plane onto a second preferred geometry cube corner element (α') in the second row;

[j] the second matched pair (β , β') of preferred geometry cube corner elements comprises the adjacent preferred geometry cube corner element that is super-imposable when rotated 180 degrees about an axis normal to the reference plane onto a second adjacent preferred geometry cube corner element in the second row."

Claim 1 of auxiliary request 1 differs from claim 1 of the main request in the deletion of feature "e".

Claim 1 of auxiliary request 2 differs from claim 1 of the main request in the replacement of feature "e" by the following features:

"said preferred geometry cube corner elements are in a first row and a first cube corner element is canted having an alignment angle between 60° and 120° and a second adjacent cube corner element is canted having an alignment angle between 240° and 300° ;

wherein canting is a tilt of a cube corner element indicated by the alignment angle that is the angle measured counterclockwise between a dihedral edge of the cube corner element and the projection of the symmetry axis of the cube corner element, in a plan view of the row of cube corner elements, the symmetry axis being the vector that trisects the first side groove surface, second side groove surface, and primary groove face and forming an equal angle with each of the three faces,".

Claim 1 of auxiliary request 3 differs from claim 1 of the main request in the replacement of feature "e" by the following feature:

"wherein the 1-2 and 1-3 dihedral angles of at least one preferred geometry cube corner element vary in opposition and deviate from 90° and the magnitude of the deviation from 90° is between 1 arc minute and less than 60 arc minutes,".

Claim 1 of auxiliary request 3A differs from claim 1 of the main request in the replacement of feature "e" by the following feature:

"wherein the 1-2 and 1-3 dihedral angles of the preferred geometry cube corner elements vary in opposition using skew and/or inclination and deviate from 90° and the magnitude of the deviation from 90° is between 1 arc minute and less than 60 arc minutes wherein skew refers to the deviation from parallel with reference to another reference plane (28) being orthogonal to the reference plane (26), and inclination refers to the deviation in slope in the other reference plane (28) of a particular side groove from the slope of the vector normal to the primary groove surface,,,".

Claim 1 of auxiliary request 3B differs from claim 1 of the main request in that the expression ", referred to as the X-Y plane," is inserted between the expressions "nonparallel to a reference plane (26)" and "that extends substantially coplanar" of feature "c", and in the replacement of feature "e" by the following feature:

"wherein the 1-2 and 1-3 dihedral angles of the preferred geometry cube corner elements vary in opposition using skew and/or inclination and deviate from 90° and the magnitude of the deviation from 90° is between 1 arc minute and less than 60 arc minutes, wherein skew refers to the deviation from parallel with reference to another reference plane (28) being orthogonal to the reference plane (26) and being referred to as the Y-Z plane, and inclination refers to the deviation in slope in the other reference plane (28) of a particular side groove from the slope of the vector normal to the primary groove surface,".

Claim 1 of auxiliary request 4 differs from claim 1 of auxiliary request 3 in that the term "and" in feature

"f" is deleted and the following feature is inserted between features "f" and "h":

"wherein the plane that divides the side groove into two equal parts is nominally parallel to nonparallel within 1° of the plane that divides the adjacent side groove into two equal parts, and".

Reasons for the Decision

1. The appeal is admissible.
2. *Main request - Article 123(2) EPC*
 - 2.1 Claim 1 of the main request is identical to claim 1 of the main request underlying the decision under appeal. In its decision the examining division held that the subject-matter of claim 1 extended beyond the content of the application as filed (Article 123(2) EPC). In particular, the examining division found that the specific combination of features "e", "f" and "h" of claim 1 was not disclosed in the application as originally filed, and added that feature "e" was disclosed in the description "in combination with further technical features (canting, skew, inclination ...)" and that these features could "not be considered to be 'not related or inextricably linked' together", so that the introduction of feature "e" in isolation in claim 1 was considered to result in an unallowable intermediate generalisation (reasons for the decision, point 24).

2.2 The board first notes that the description of the application as originally filed contains on pages 52 to 62 a series of embodiments disclosed in the form of independent and dependent items 1 to 105 (corresponding respectively to the independent and the dependent claims 1 to 105 of the earlier application as filed), and that some of these embodiments, and in particular the embodiment defined in dependent items 22 and 23 which refer back to independent item 21, and the embodiment defined in dependent items 26 and 27 which refer back to independent item 25, relate to an article comprising a plurality of cube corner elements in a row, wherein at least one element has dihedral angle errors having magnitudes between 1 and 60 arc minutes (compare with feature "e"), and the elements have dihedral edges ranging from being nominally parallel to nonparallel by less than 1 degree (compare with feature "f"). However, there is no basis in items 1 to 105 and in the sole claim 1 of the application as originally filed for an article comprising the mentioned features together with the remaining features of claim 1 of the main request, and in particular with the features of independent item 100 which is identical to the sole claim 1 of the application as originally filed and on which claim 1 of the main request is primarily based, the mentioned item 100 or, equivalently, the mentioned sole claim 1 defining a retroreflective sheeting comprising a pair of adjacent rows of cube corner elements, wherein adjacent elements in a row have at least one dihedral edge that ranges from being nominally parallel to nonparallel by less than 1 degree and wherein the pair of rows comprise at least two types of matched pairs (compare with features "b", "f" and "h" of claim 1 of the main request).

2.3 In addition, the paragraph bridging pages 26 and 27 of the description as filed also discloses a feature at lines 6 to 10 on page 27 ("[...] providing within a given cube corner [...] dihedral 1-2 and 1-3 errors (differences from 90°) that differ in magnitude and/or sign. The difference in magnitude is typically at least 1/4 arc minutes, more preferably at least 1/2 arc minutes, and most preferably at least 1 arc minutes.") which relates to feature "e" of claim 1 of the main request. However, the disclosure of the mentioned paragraph does - contrary to the appellant's submissions - not constitute a basis for the combination of feature "e" with the remaining claimed features for the following reasons:

2.3.1 The application as originally filed discloses

- retroreflective sheetings comprising a first and a second row of cube corner elements satisfying features "b", "c" and "d" of claim 1, wherein the cube corner elements have been canted (page 17, line 9, to page 18, line 14, together with Fig. 6 to 12 and the corresponding description) [in the following the "canted arrangement"], and
- retroreflective sheetings comprising a first and a second row of cube corner elements satisfying features "b", "c" and "d" of claim 1 and in which dihedral angle errors or deviations are used by providing skew and/or inclination in the grooves defining the cube corner elements (page 25, second paragraph, together with Fig. 21 and page 25, line 14, to page 26, line 18, for skew, and Fig. 23 and page 26, lines 19 to 28, for inclination) or by changing the half angles of the primary or side grooves forming the cube corner elements (page 27, line 14, to page 28, line 4), or by a combination of this change of the half angles of the primary or side grooves with skew and/or

inclination (page 27, line 31, to page 28, line 2) [in the following, for simplicity, all these variants will be referred to as the "skew and/or inclination arrangement"].

In addition, as submitted by the appellant, the application as originally filed discloses retroreflective sheetings involving both the canted and the skew and/or inclination arrangements (see, for instance, page 25, second paragraph, and page 26, line 29, to page 27, line 1, together with the examples disclosed in the description in connection with Fig. 27 to 31).

2.3.2 The mentioned paragraph bridging pages 26 and 27 discloses an embodiment involving the skew and/or inclination arrangement with or without the canted arrangement (page 26, line 29, to page 27, line 1), and it is in the specific technical context of

- the introduction of skew and/or inclination during the machining of the individual lamina with a tool used to cut the side grooves forming the cube corner elements (see page 27, lines 1 *et seq.*: "The use of skew and/or inclination [...] can be introduced during the machining of the individual lamina [...]. Furthermore, dihedral 1-2 and dihedral 1-3 may be varied in opposition using skew and/or inclination [...] intentionally providing within a given cube corner on a lamina dihedral 1-2 and 1-3 errors [...].") and/or

- the introduction of dihedral angle errors "by changing the half angles of the primary or side grooves during machining" (see page 27, line 14, to page 28, line 4)

that the feature mentioned above relating to the dihedral 1-2 and 1-3 errors is disclosed on page 27,

lines 6 to 10. The skilled person would therefore understand in the mentioned technical context that the feature on page 27, lines 6 to 10 is inextricably linked with the structural features of the skew and/or inclination arrangement. In addition, the mentioned feature is a direct consequence of the skew and/or inclination arrangement, but the feature is not technically equivalent to, or interchangeable with, the skew and/or inclination arrangement itself because the latter implies, by its definition (point 2.3.1 above, first paragraph, second sub-paragraph), a structural configuration of a plurality of cube corner elements satisfying predetermined geometrical conditions. Claim 1 of the main request, however, only requires in this respect feature "e", i.e. that "the 1-2 and 1-3 dihedral angles of at least one preferred geometry cube corner element deviate from 90° and the magnitude of the deviation from 90° is between 1 arc minute and less than 60 arc minutes", without however requiring the corresponding skew and/or inclination arrangement.

In other words, the mentioned "a given cube corner" referred to on page 27, lines 6 to 10, can be brought into correspondence with the "at least one [...] cube corner" mentioned in feature "e" and therefore be considered to constitute a basis for feature "e" alone; however, the skilled person would understand that the mentioned "a given cube corner" is disclosed in its context as a consequence of the skew and/or inclination arrangement which also imposes predetermined geometrical conditions to other cube corner elements, and there is no basis in the application as originally filed from which the skilled person could derive in a direct and unambiguous way the claimed combination of features, and in particular the insertion of feature "e" alone into claim 1 while omitting the skew and/or

inclination arrangement - i.e. without specifying that the geometry of other cube corner elements are also affected by the skew and/or inclination arrangement (see page 26, lines 29 to 31, and page 27, lines 1 to 6, of the description of the application).

The appellant submitted in this respect that the geometrical properties of the "at least one [...] cube corner element" mentioned in feature "e" of claim 1 were extended in the claimed subject-matter to adjacent cube corner elements by virtue of features "h", "i" and "j" of claim 1 relating to a first and a different, second matched pair of cube corner elements, wherein each of the cube corner elements in each of the pairs was super-imposable onto the other one of the cube corner elements within the same pair when rotated 180 degrees as specified in features "i" and "j". In the board's opinion, however, the geometrical configuration resulting from feature "e" in combination with features "h", "i" and "j" is not geometrically equivalent to, and therefore cannot be a substitute for, the skew and/or inclination arrangement, among other reasons because this arrangement relates to the cube corner elements of a lamina or row (see, for instance, Fig. 21, and page 26, lines 29 to 31, and page 27, lines 1 to 3, and lines 12 to 15; see also page 25, second paragraph) and features "i" and "j" only impose a geometrical condition within each pair of cube corner elements located in different rows or laminae (see, for instance, Fig. 6, 8 and 9 and the corresponding description, in particular page 19, second paragraph), and not to cube corner elements within a row or lamina.

2.3.3 For this reason, feature "e", understood as a feature extracted from the passage on page 27, lines 6 to 10,

of the description, results, when combined with the remaining features of claim 1 of the main request, in an unallowable intermediate generalisation.

- 2.4 According to a further argument of the appellant, the general idea of introducing small variations from parallelism or from orthogonality (page 13, lines 15 to 27, and paragraph bridging pages 24 and 25) ran along the whole application. In this context, features "e" and "f" of claim 1 were disclosed as being respectively related to the concept of introducing dihedral angle errors in terms of the skew and/or inclination arrangement and the concept underlying the canted arrangement (page 18, line 15, to page 19, line 23), and since these two concepts were disclosed in combination in the application as originally filed, the combination of features "e" and "f" was derivable from the application as originally filed. In addition, the fact that skew, inclination and the change of the half angles of the primary or side grooves were described as alternative specific ways of influencing the dihedral angles 1-2 and 1-3 (page 26, lines 29 to 31, page 27, lines 14 and 15, and page 27, line 31, to page 28, line 4) justified the general definition used in feature "e".

However, the specific feature "e" results from the arrangement involving skew and/or inclination and/or the change of the half angles of the primary or side grooves, but the feature is, as already mentioned in point 2.3.3 above, neither technically equivalent to, nor interchangeable with the mentioned arrangement, and for this reason the appellant's arguments in this respect are not found convincing by the board.

2.5 It follows from the above considerations that the combination of feature "e" with the remaining claimed features of claim 1 of the main request constitutes an unallowable intermediate generalisation of the content of the application as filed. Therefore, claim 1 of the main request is amended in such a way that it contains subject-matter which extends beyond the content of the application as filed (Article 123(2) EPC).

3. *Auxiliary request 1 - Article 56 EPC*

3.1 Claim 1 of auxiliary request 1 is identical to claim 1 of the first auxiliary request underlying the decision under appeal. The appellant disputed in several respects the examining division's view that the subject-matter of claim 1 did not involve an inventive step over document D2.

3.2 Document D2 discloses a retroreflective sheeting comprising an arrangement of cube corner elements (abstract, together with the figures and the corresponding description). In addition,

- according to a first embodiment the cube axis of at least some of the cube corner elements is inclined, i.e. tilted, at a predetermined angle other than 0 degrees (claims 1 and 33 together with the paragraph bridging columns 1 and 2), and

- according to a second, more specific embodiment the arrangement of cube corner elements comprises a first and a second row of cube corner elements in opposing orientation and determining pairs of matched pairs of cube corner elements as defined in features "c", "d", "h", "i" and "j" of claim 1 of auxiliary request 1 (see Fig. 15 to 21 of document D2 and the corresponding description, in particular that of Fig. 19; see also claim 7), the cube axes of the cube

corner elements being tilted at a predetermined angle (see angle between lines 168a and 168b of Fig. 17) the value of which is preferably between 6 and 13 degrees (column 10, lines 45 to 56).

3.3 In its decision the examining division held that the retroreflective sheeting of claim 1 of auxiliary request 1 differed from the retroreflective sheeting of the second embodiment disclosed in document D2 only in feature "f". The appellant did not dispute the examining division's finding in this respect, and the board concurs with the examining division that the claimed subject-matter is new over the second embodiment of document D2 only in feature "f" (Articles 52(1) and 54(1) EPC).

3.4 In its decision the examining division essentially held that

- the lack of parallelism of dihedral edges of adjacent cube corner elements defined in feature "f" was the consequence of the tilt angle of the cube axis,

- the role of the tilt angle of document D2 was to change the zone of reflectorization of the retroreflective sheeting, whereby a large increase of the mentioned zone resulted in a smaller overlap zone in which the intensity of the retro-reflected light was high,

- the objective technical problem solved by the claimed retroreflective sheeting was to adapt the sheeting to a particular, smaller zone of reflectorization,

- the angle between homologous dihedral edges of adjacent cube corner elements was significantly smaller than the tilt angle, and

- the skilled person aiming at adapting the zone of reflectorization would reduce the value of the tilt

angle and would therefore consider small tilt angle values of less than 1 degree when contemplating a smaller zone of reflectorization with an improved uniformity of the reflected intensity, and no surprising effect was associated with the maximum deviation from parallelism defined in feature "f".

- 3.5 According to a first argument of the appellant, the angle between two homologous dihedral edges of two adjacent cube corner elements of the retroreflective sheeting disclosed in document D2 with reference to Fig. 15 to 20 was, contrary to the examining division's opinion, not significantly smaller than the tilt angle of the cube corner elements, but about twice the tilt angle.

The board notes that two homologous dihedral edges, such as the edges 165 and 185 in Fig. 19 of document D2, of two non-tilted adjacent cube corner elements (elements 160 and 180 before tilting) are parallel and, upon tilting, the relationship between, on the one hand, the angle between the two mentioned edges and, on the other hand, the angle of tilting of the two adjacent cube corner elements is given by a complex mathematical expression and depends, as submitted by the appellant, on several geometrical factors, and in particular on the direction and the amount of tilting of each cube corner element. Notwithstanding, it can be said, following pure geometrical considerations, that

- the change of orientation of a dihedral edge cannot be bigger than the angle of tilting,
- the angle between the two mentioned homologous edges 165 and 185 remains zero (i.e. the edges remain parallel) when the two mentioned cube corner elements are tilted in the horizontal direction of Fig. 19, and is about twice, but not more than twice, the angle of

tilting of each cube corner element when the two cube corner elements are tilted by the same amount in opposite vertical directions in Fig. 19, and therefore

- the angle between the two mentioned edges has a value bigger than 0° and lower than twice the angle of tilting when the two cube corner elements are tilted as disclosed in document D2 (column 10, lines 28 to 56, and Fig. 15 to 19), i.e. are tilted by a same amount in the opposite oblique directions relative to both the vertical and the horizontal directions (see Fig. 19, and column 11, lines 11 to 39).

In view of these considerations - that are also valid for the remaining pairs of homologous dihedral edges of adjacent cube corner elements -, the board adheres to the appellant's submission to the extent that in the retroreflective sheeting of Fig. 15 to 20 of document D2 the angle between homologous dihedral edges of adjacent cube corner elements is - contrary to the examining division's view - not significantly smaller than the cube axis tilt angle, but - as submitted by the appellant - about twice, although not more than twice, the tilt angle of each cube corner element. Therefore, feature "f" of claim 1 corresponds to the retroreflective sheeting disclosed in document D2 when the angle of tilting of the cube corner elements is lower than about $0,5^\circ$.

During the oral proceedings the appellant disputed the above considerations - in particular, that the change of orientation of a dihedral edge could not be bigger than the angle of tilting - already expressed by the board in the communication annexed to the summons, without however submitting technical arguments to the effect that the angle between homologous dihedral edges of adjacent cube corner elements could be bigger than twice the tilt angle.

3.6 The appellant submitted that the examining division adopted an unallowable hindsight approach and relied on an incorrect interpretation of document D2 because there was no motivation for the skilled person to consider smaller tilt angles than those disclosed in document D2. In particular, document D2 only disclosed with respect to the second embodiment values of the tilt angle between 6 and 13 degrees and nothing in document D2 suggested the small claimed values which were far away from the range disclosed in document D2. Furthermore, document D2 was expressly directed to obtaining a wide zone of reflectorization. In addition, feature "f" related to the provision of small purposeful deviations from parallelism resulting - contrary to the examining division's assessment - in an additional and surprising effect, namely an improved observation angularity or divergence profile of the retroreflective sheeting (paragraph bridging pages 24 and 25 of the application), and no such effect was mentioned in document D2 which only disclosed the effect related to the provision of a combined wide zone of reflectorization of ± 26 degrees (column 12, lines 1 to 25).

3.6.1 The board first notes that the claimed retroreflective sheeting provides predetermined brightness characteristics and, in view of the statements in the paragraph bridging pages 24 and 25 of the description of the application and of the deviation from parallelism defined in feature "f", feature "f" provides - when compared with a retroreflective sheeting without the deviation from parallelism expressed by feature "f" - the technical effect of spreading the retro-reflected light relative to the source - i.e., using the language of the mentioned

paragraph of the description, endowing the retroreflective sheeting with a predetermined observation angularity or divergence profile -, while maintaining, to a predetermined extent, the brightness characteristics of the retroreflective sheeting. In addition, due to the relative low degree of deviation from parallelism required by feature "f", the spread of retroreflective light is only achieved to a relatively low degree and the brightness characteristics are only affected in a relatively minor extent when compared with the same retroreflective sheeting without the claimed deviation from parallelism.

As regards the additional effect mentioned by the appellant in connection with the paragraph bridging pages 24 and 25 of the description and relating to an improved observation angularity or divergence profile of the retroreflective sheeting, the board notes that this technical effect - to the extent that it might go beyond the technical effect already mentioned in the previous paragraph - is not - at least not expressly - directed to embodiments comprising feature "f" or to this feature as such. In particular, the description of the application is silent as to the technical significance of the geometrical condition expressed by feature "f" as such and, although some of the embodiments appear - as noted by the examining division in its decision - to intrinsically satisfy feature "f", none of them is expressly directed to this feature, and the same applies to the paragraph bridging pages 24 and 25 of the description. More particularly, the claimed retroreflective sheeting does - contrary to the appellant's submissions - not necessarily involve the specific canted arrangement of the embodiments to which the mentioned passage of the description refers back. Therefore, any such additional effect going beyond the

technical effect considered in the previous paragraph would be disclosed in the mentioned passage of the description as a result of a combination of features that is not reflected in claim 1 and would therefore not be supported by the claimed subject-matter.

The appellant submitted during the oral proceedings that in document D2 the angle response was created - contrary to the present invention, see for instance Fig. 13 and 14 - only in predetermined planes (D2, column 9, lines 61 to 66, and column 10, lines 6 to 10, and lines 50 and 51). The board, however, considers that this argument has no incidence on the technical effect achieved by the invention as claimed because claim 1 is silent as to any feature (angular distribution of the retro-reflected light, direction of the deviation from parallelism in feature "f", etc.) that would support an angular distribution of the retro-reflected light different than that achieved in document D2, and Fig. 13 and 14 of the application relate to particular embodiments involving specific features (page 8, lines 26 to 32 and page 19, line 24, to page 21, line 32) not defined in claim 1.

In view of these considerations and the fact that in the second embodiment of document D2 the mentioned technical effect, i.e. the spread of retro-reflected light relative to the source while maintaining, at least to a predetermined extent, the brightness characteristics of the retroreflective sheeting, is already achieved, but at a wide zone of reflectorization and in detriment of the brightness, the board is of the opinion that the objective technical problem solved by the claimed subject-matter is to be formulated as stated by the examining division, i.e. in terms of adapting the retroreflective

sheeting of document D2 to a smaller zone of reflectorization.

- 3.6.2 Document D2 generally discloses endowing the cube axes of the cube corner elements with a tilt angle other than zero degrees (claim 1) and, as regards the specific arrangement disclosed in connection with the second embodiment, the document discloses the range of the tilt angle between 6 and 13 degrees only as a preferred range and, in particular, a tilt angle of 6 degrees (column 10, lines 52 to 55). The skilled person would understand that the mentioned preferred range would be advantageous in particular technical contexts - for instance, when the retroreflective sheeting is to be specifically used on an automobile (see column 4, lines 16 to 19) -, but that the tilt angle is not necessarily confined to the mentioned preferred range. The appellant's argument that document D2 only teaches for the second embodiment that a wider zone of reflectorization could only be achieved within the tilt angle range between 6 and 13 degrees is at variance with the fact that this range is disclosed as being preferred and also at variance with the general teaching relating to the first embodiment and according to which a wider zone of reflectorization is already achieved for tilt angles different from zero.

In addition, document D2 teaches tilting the cube corner elements as disclosed with reference to Fig. 15 to 20 for the purpose of increasing the zone of reflectorization (column 9, line 60, to column 10, line 10). The board is of the opinion that the skilled person would understand in the technical context of the document that

- the bigger the tilt angle, the bigger the zone of reflectorization (see column 10, lines 45 to 56, and column 12, lines 1 to 25), and that

- as maintained by the examining division in its decision - and as a straightforward consequence of the principle of conservation of energy -, the bigger the zone of reflectorization, the lower the brightness of the retro-reflected light (see, for instance, decision under appeal, point 29 of the reasons).

Therefore, the skilled person would understand that extending the zone of reflectorization and maintaining the level of brightness run counter to each other, so that a modification of one of them necessarily involves a trade-off between both of them.

In addition, the zone of reflectorization considered in document D2 (see Fig. 1, together with column 3, line 58, to column 4, line 56) correlates with, and is a measure of, the spread of retro-reflected light relative to the source. Therefore, the skilled person confronted with the objective problem formulated above would, in view of the teaching of document D2, consider a reduction of the angle of tilting to obtain a corresponding reduction of the spread of retro-reflected light relative to the source, with the consequent change in the brightness characteristics of the retroreflective sheeting. It would therefore be obvious for the skilled person to consider selecting a relatively low value of the tilt angle and, in particular, depending on the circumstances - for instance, as noted by the appellant by reference to the paragraph bridging pages 30 and 31 of the description of the application, when the reflective sheeting is used in a sign for retro-reflecting the light from the lamps of a car towards the driver -, a value lower than 0.5° , in order to solve the objective problem

formulated above, thus arriving in an obvious way at the claimed retroreflective sheeting.

- 3.6.3 During the oral proceedings the appellant objected that the board was considering a different skilled person when addressing the issue of inventive step of auxiliary request 1 and the issue of whether claim 1 of the main request complied with the requirements of Article 123(2) EPC (see point 2.3.2 above).

However, these two issues address different and non-equivalent questions, i.e. what would directly and unambiguously be derivable for the skilled person when reading the application as originally filed for the issue under Article 123(2) EPC) and, for the issue under Article 56 EPC, what would be obvious for the skilled person in view of the disclosure of document D2. In addition, the board is assuming the same level of expertise and of skill of the skilled person working in the technical field of retroreflective sheetings when addressing these two issues - the mentioned level being, in addition, congruent with the presumed ability of the skilled person to understand the claimed invention and the technical effects achieved therewith in the light of the information provided in the description and the drawings of the present application.

- 3.7 In view of all these considerations the board concludes that the subject-matter of claim 1 of auxiliary request 1 does not involve an inventive step over document D2 (Article 56 EPC).

4. *Auxiliary request 2 - Article 12(4) RPBA 2007*

- 4.1 Claim 1 of auxiliary request 2 was submitted for the first time with the statement of grounds of appeal. This claim differs from claim 1 of auxiliary request 1 in the insertion in claim 1 of two additional features (see point VII above).
- 4.2 The appellant submitted that claim 1 of auxiliary request 2 was filed in response to the rejection of claim 1 of auxiliary request 1 by the examining division, that this claim was different from claim 1 of auxiliary request 1 pending in November 2016, and that the full understanding of how the examining division interpreted claim 1 of the present auxiliary request 1 and the content of document D2 could only be taken for the first time from the written decision. In addition, claim 1 of auxiliary request 2 was clearly allowable as it could be inferred from the examination and opposition proceedings relating to a parallel divisional application. For these reasons, the admission of auxiliary request 2 into the proceedings was justified.
- 4.3 The board first notes that no specific element in the decision under appeal was identified by the appellant that would justify filing, in reaction thereto, amended claim 1 of auxiliary request 2 with the statement of grounds of appeal. In particular, the appellant's submissions according to which the amended claim is a direct response to the rejection of auxiliary request 1 by the examining division does not constitute a sufficient reason justifying the submission of the amended request with the statement of grounds of appeal. It is noted in this respect that according to Article 12(2) RPBA 2020 (which applies in the present case, see Article 25 RPBA 2020) "[i]n view of the primary object of the appeal proceedings to review the

decision under appeal in a judicial manner, a party's appeal case shall be directed to the requests [...] on which the decision under appeal was based".

In addition, the reasons given by the examining division in its decision in support of its view that claim 1 of auxiliary request 1 did not involve an inventive step (Article 56 EPC) were not presented for the first time by the examining division during the first-instance oral proceedings, but were, in substance, already presented in point 2 of the communication dated 24 November 2016 in respect of claim 1 submitted with the letter dated 20 July 2016 - i.e. about two years before the first instance oral proceedings -, this claim containing - with the exception of the features relating to the definition of the dihedral angles and already implicit in the remaining claimed features relating to the cube corner elements being defined by three groove faces formed by first and second side grooves and a primary groove - all the features of claim 1 of auxiliary request 1 (see minutes of the oral proceedings, point 7, where "Auxiliary Request A" was subsequently re-labelled auxiliary request 1 in the decision under appeal, and where the communication referred to as being dated "21-11-2016" appears to refer to the communication dated 24 November 2016). In this context, the appellant has not identified any element of the examining division's interpretation of claim 1 of the present auxiliary request 1 and of the content of document D2 that was not already apparent in the discussion during the first-instance oral proceedings. Therefore, amended claim 1 of auxiliary request 2 could already have been presented during the first-instance proceedings within the meaning of Article 12(4) RPBA 2007 (*cf.* Article 25(2) RPBA 2020).

Furthermore, the question of whether claim 1 of auxiliary request 2 would be new and involve an inventive step as maintained by the appellant by reference to a parallel divisional application is not pertinent for the admission of the request into the present proceedings under Article 12(4) RPBA 2007.

4.4 In these circumstances, and since according to Article 12(4) RPBA 2007 the board has discretion not to admit requests which could have been presented in the first instance proceedings, the board decided, in the absence of reasons for doing otherwise, not to admit auxiliary request 2 into the proceedings.

5. *Auxiliary request 3 - Article 123(2) EPC*

Claim 1 of auxiliary request 3 corresponds to claim 1 of auxiliary request 2 underlying the decision under appeal.

Claim 1 of auxiliary request 3 differs from claim 1 of the main request only in the introduction of the expression "vary in opposition" in feature "e". The mentioned expression is based on the passage on page 27, lines 5 to 10, mentioned in point 2 above and specifying how the dihedral angles 1-2 and 1-3 are varied. However, the insertion of this expression in feature "e" has no effect on the considerations put forward in point 2 above relating to the objection that claim 1 of the main request involves an unallowable intermediate generalisation.

Therefore, the subject-matter of claim 1 of auxiliary request 3 extends beyond the content of the application

as filed (Article 123(2) EPC) for the same reasons given above in point 2 above.

6. *Auxiliary requests 3A and 3B - Article 13(2) together with Article 13(1) RPBA 2020*

6.1 Auxiliary requests 3A and 3B were filed during the oral proceedings before the board, i.e. after notification of the summons to oral proceedings, and the summons were issued after the date on which the RPBA 2020 entered into force. Therefore, the admittance of auxiliary requests 3A and 3B is governed by Article 13(2) RPBA 2020 (see Articles 25(1) and (3) RPBA 2020).

According to Article 13(2) RPBA 2020, "[a]ny amendment to a party's appeal case made [...] after notification of a summons to oral proceedings shall, in principle, not be taken into account unless there are exceptional circumstances, which have been justified with cogent reasons by the party concerned". In addition, when exercising its discretion under Article 13(2) RPBA 2020, the board may also rely on criteria set out in Article 13(1) RPBA 2020 (see, for instance, decision T 2010/15, Nr. 4.1 to 4.5 of the reasons), and one of the criteria set out in Article 13(1) RPBA 2020 in the case of an amendment to a patent application is "whether the party has demonstrated that any such amendment, prima facie, overcomes the issues raised [...] by the Board and does not give rise to new objections".

6.2 The amendments to claim 1 of auxiliary request 3A were made in order to overcome the objection raised under Article 123(2) EPC in respect of claim 1 of the main

request and of auxiliary request 3 (see points 2 and 5 above).

On the one hand, the board notes that the mentioned objection was already raised in the decision under appeal (see point 2.1 above) and also maintained by the board in its communication annexed to the summons to oral proceedings (point 1.2 of the communication), but that, as noted by the appellant, the objection was raised in the decision under appeal only in general terms. Moreover, in its communication the board, apart from noting some possible issues involved in the mentioned intermediate generalisation, did not further comment on the objection relating to the unallowable intermediate generalisation itself. Furthermore, it was only during the oral proceedings that the mentioned objection was clarified and formulated in detail by the board in more specific terms and that the appellant was confronted with the full and more precise arguments justifying the objection. In the board's opinion these circumstances constituted exceptional circumstances within the meaning of Article 13(2) RPBA 2020 that could in principle justify taking into account auxiliary request 3A.

On the other hand, however, the features introduced by way of amendment into claim 1 of auxiliary request 3A and directed to overcome the mentioned unallowable intermediate generalisation are, in the board's opinion, not clear (Article 84 EPC). In particular, claim 1 requires now that feature "e" is implemented "using skew and/or inclination", "wherein skew refers to the deviation from parallel with reference to another reference plane (28) being orthogonal to the reference plane (26), and inclination refers to the deviation in slope in the other reference plane (28)

[...]", but it is not clear what geometrical element deviates from parallel with reference to the mentioned another reference plane. The appellant submitted that the mentioned feature referred to the dihedral angles of the cube corner element deviating as claimed, but the claim is silent in this respect and, in addition, the dihedral angles of a cube corner element have - contrary to other geometrical elements such as, for instance, any of the edges of the cube corner elements or the direction of the grooves - no clear relationship of parallelism with a plane (Article 84 EPC). In addition, the mentioned amendment refers to "another reference plane (28) being orthogonal to the reference plane (26)", but there is an infinite number of planes orthogonal to the reference plane defined in feature "c" of claim 1 - and in the description of the application skew is defined in terms of lack of parallelism with respect to a specific plane (see plane 28 in Fig. 1), i.e. a plane orthogonal to both the mentioned reference plane (plane 26 in Fig. 1) and the direction of elongation of the lamina or of the corresponding row of cube corner elements (see direction "X" in Fig. 1 together with Fig. 21 and the corresponding description). Therefore, it is unclear what "another reference plane" is meant in claim 1 (Article 84 EPC).

It follows from the above considerations that the amendments made to claim 1 in order to overcome the objection under Article 123(2) EPC give rise to new objections under Article 84 EPC. Consequently, taking into account Article 13(2) RPBA 2020 and the criteria set forth in Article 13(1) RPBA 2020 (see point 6.1 above), the board concluded that the admission of auxiliary request 3A into the proceedings would not be justified.

Therefore, auxiliary request 3A was not admitted into the proceedings (Article 13(2) together with Article 13(1) RPBA 2020).

- 6.3 When compared with claim 1 of auxiliary request 3A, claim 1 of auxiliary request 3B contains further amendments made in order to overcome the objections raised under Article 84 EPC in point 6.2 above in respect of claim 1 of auxiliary request 3A.

However, the amendments do not overcome the two objections raised under Article 84 EPC in respect of claim 1 of auxiliary request 3A (see point 6.2 above, third paragraph). In particular, as regards the second objection, according to the amendments the "reference plane (26)" is "referred to as the X-Y plane", and the "another reference plane (28)" is "referred to as the Y-Z plane"; however, claim 1 does not specify the orientation of the retroreflective sheeting (for instance, of the rows of cube corner elements or of the primary grooves) with respect to the orthogonal coordinate axes X and Y (see Fig. 1), so that the orientation of the Y-Z plane with respect to the sheeting is indeterminate in claim 1 and the mere fact of designating the "another reference plane (28)" as the "Y-Z plane" does not overcome the second of the objections raised under Article 84 EPC in respect of claim 1 of auxiliary request 3A (see point 6.2 above, third paragraph).

Therefore, auxiliary request 3B was not admitted into the proceedings for analogous reasons to those given in point 6.2 above in respect of auxiliary request 3A (Article 13(2) together with Article 13(1) RPBA 2020).

7. *Auxiliary request 4 - Article 123(2) EPC*

Claim 1 of auxiliary request 4 corresponds to the third auxiliary request underlying the decision under appeal, and the claim differs from claim 1 of auxiliary request 3 only in the introduction of an additional feature (see point VII above). In addition, this additional feature has no incidence on the considerations put forward in point 5 above in respect of claim 1 of auxiliary request 3.

Therefore, the subject-matter of claim 1 of auxiliary request 4 extends beyond the content of the application as filed (Article 123(2) EPC) for the same reasons given in point 5 above in respect of auxiliary request 3.

8. The board concludes that, in the absence of an admissible and allowable request, the appeal is to be dismissed.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:



H. Jenney

R. Bekkering

Decision electronically authenticated