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Datasheet for the decision of 6 June 2024

Case Number: T 1795/22 - 3.2.08

Application Number: 16166782.9

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Title of invention:
MULTI-LAYERED ZIRCONIA DENTAL MILL BLANK AND PROCESS OF PRODUCTION

Patent Proprietor:
Solventum Intellectual Properties Company

Opponent:
Ivoclar Vivadent AG

Relevant legal provisions:
EPC Art. 56

Keyword:
Inventive step - (yes)

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Case Number: T 1795/22 - 3.2.08

D E C I S I O N
of Technical Board of Appeal 3.2.08
of 6 June 2024

Appellant: (Opponent)	Ivoclar Vivadent AG Bendererstrasse 2 9494 Schaan (LI)
Representative:	Uexküll & Stolberg Partnerschaft von Patent- und Rechtsanwälten mbB Beselerstraße 4 22607 Hamburg (DE)
Respondent: (Patent Proprietor)	Solventum Intellectual Properties Company 3M Center, 275-6E-21 2510 Conway Ave E Maplewood, MN 55144 (US)
Representative:	Brem, Roland 3M Healthcare Germany GmbH OIPC Espe Platz 82229 Seefeld (DE)
Decision under appeal:	**Interlocutory decision of the Opposition Division of the European Patent Office posted on 13 May 2022 concerning maintenance of the European Patent No. 3108849 in amended form.**

Composition of the Board:

Chairwoman	P. Acton
Members:	C. Vetter
	K. Kerber-Zubrzycka

Summary of Facts and Submissions

I. The appeal was filed by the opponent (appellant) against the interlocutory decision of the opposition division finding that, on the basis of Auxiliary Request 1 then on file, the patent in suit met the requirements of the EPC.

II. The opposition division had decided, *inter alia*, that the subject-matter of the claims of this request was novel and involved an inventive step.

III. Oral proceedings were held by videoconference before the Board.

IV. The appellant (opponent) requested that the decision under appeal be set aside and that the patent be revoked.

The respondent (patent proprietor) requested that the appeal be dismissed or that the decision under appeal be set aside and the patent be maintained on the basis of one of Auxiliary Requests 1 to 15 filed with the reply of 27 January 2023 (first filed on 20 January 2022 before the opposition division).

V. Claim 1 of the main request reads as follows (feature designation added by the Board):

1) A porous multi-layered coloured zirconia dental mill blank comprising
2) a bottom layer B having the composition COMP-B which comprises
2.1) ceramic components CER-COMP-B,
2.2) colouring components COL-COMP-B and

2.3) stabilizing components STAB-COMP-B,
3) a top layer E having the composition COMP-E which comprises
3.1) ceramic components CER-COMP-E,
3.2) colouring components COL-COMP-E
3.3) stabilizing components STAB-COMP-E,
4) at least one intermediate layer Ex
4.1) having the composition COMP-E of top layer E,
5) at least one intermediate layer Bx
5.1) having the composition COMP-B of bottom layer B,
4.2/5.2) x being an integer and indicating the number of intermediate layers,
characterized in that
6) the layers with compositions COMP-B and COMP-E are arranged in alternating order, and
wherein
7) the thickness of the individual layers B, Bx is decreasing from bottom to top and
8) the thickness of the individual layers E, Ex is decreasing from top to bottom.

VI. In the present decision, reference is made to the following documents:

D1: WO 2015/084931 A1
D2: US 2008/0303181 A1
D3: EP 1 900 341 A1
D4: WO 2015/011079 A1

VII. The arguments of the parties relevant to the decision are set out below in the Reasons for the Decision.

Reasons for the Decision

1. Main request - inventive step

1.1 D4 in combination with D3

1.1.1 It was undisputed that document D4 discloses in Examples 1 and 2 on page 19, line 13 to page 21, line 30 (references in parentheses refer to D4):

1) A porous multi-layered coloured zirconia dental mill blank (page 1, lines 3 to 13; Example 2) comprising

2) a bottom layer B (Example 2: "Layer 1 (bottom)", "MO2-4") having the composition COMP-B which comprises
2.1) ceramic components CER-COMP-B (Example 1: "TOSOH TZ-3YSB-C"),
2.2) colouring components COL-COMP-B ("coloring elements") and
2.3) stabilizing components STAB-COMP-B ("Y_2O_3"),

3) a top layer E (Example 2: "Layer 3 (top): White-2") having the composition COMP-E which comprises
3.1) ceramic components CER-COMP-E (Example 1: "TOSOH TZ-3YSB-C"),
3.2) colouring components COL-COMP-E
3.3) stabilizing components STAB-COMP-E ("Al_2O_3"),

4) at least one intermediate layer Ex (Example 2: "Layer 2 (middle)")
4.2) x being an integer and indicating the number of intermediate layers (x=1).

1.1.2 It was common ground that D4 does not disclose the following features:

4.1) [the intermediate layer Ex] having the composition COMP-E of top layer E,

5) [the zirconia dental mill blank further comprising] at least one intermediate layer Bx
5.1) having the composition COMP-B of bottom layer B,
5.2) x being an integer and indicating the number of intermediate layers,

wherein
6) the layers with compositions COMP-B and COMP-E are arranged in alternating order, and
wherein
7) the thickness of the individual layers B, Bx is decreasing from bottom to top and
8) the thickness of the individual layers E, Ex is decreasing from top to bottom.

1.1.3 According to the patent in suit, paragraphs [0075] to [0077], the effect of the layering concept according to these features was that the manufacture of a zirconia dental mill blank showing a smooth colour gradient after sintering was simplified by using only two batches of different zirconia powders.

However, as the appellant has rightly pointed out, the preparation of a mixture of two batches of zirconia powder is no more difficult or costly than the preparation of alternating layers made of zirconia powder of those two batches.

1.1.4 The objective technical problem, therefore, is to provide an *alternative* zirconia dental mill blank showing a smooth colour gradient after sintering.

1.1.5 Document D3 pertains to a multicoloured moulded body for the production of dental restorations with differently coloured layers, in which the colour boundaries between the individual layers are not visible to the naked eye (D3, paragraph [0012]). Hence, D3 deals with the above formulated objective technical problem.

1.1.6 D3 generally teaches in claim 1 and paragraph [0018], as a solution to this problem, a

> multicoloured moulded body with superimposed layers for the production of dental restorations, comprising
>
> (a) at least two successive and differently coloured main layers and
> (b) at least two differently coloured intermediate layers between at least two successive and differently coloured main layers,
>
> wherein a change in colour occurs between these intermediate layers in a direction opposite to the direction of the change in colour between the main layers.

1.1.7 According to D3, paragraphs [0021] to [0023], this layering concept counteracts an optical illusion: For the human eye, at the boundary between two differently coloured surfaces, the dark surface appears darker than in areas further away from the boundary, while the light surface appears lighter than in areas further

away from the boundary. This increases the contrast at the colour boundary and enhances the perception of the colour boundary.

D3 teaches that the insertion of specially designed intermediate layers, i.e. those fulfilling the above condition, compensates or even overcompensates this optical illusion, thereby achieving a colour gradient in which the boundaries of the differently coloured layers can no longer be perceived with the naked eye (D2, paragraph [0023]).

As correctly stated by the appellant, D3 further teaches that the intermediate layers between two successive and differently coloured main layers can alternate the colours of these main layers, and that exactly two intermediate layers between two successive and differently coloured main layers are preferred, wherein each of these intermediate layers has the colour of the main layer adjacent to the respective other intermediate layer (D3, paragraphs [0024] and [0025]).

1.1.8 D3 applies these teachings in the multicoloured moulded bodies of examples 1 to 3 (see paragraphs [0044] to [0056]). Each of these multicoloured moulded bodies comprises several differently coloured main layers. The smooth colour gradient between two successive main layers is achieved by one or two interposed intermediate layers in accordance with the above outlined layering concept.

1.1.9 However, the colour transition from the lowermost main layer to the uppermost main layer of the multicoloured moulded body is achieved by interposing layers having a composition which is a *mixture* of the materials of the

bottom and top layers. In fact, in all examples the bottom layer A is of 100% material M1 and the top layer D is of 100% material M2, while the interposed main layer B is of 2/3 M1 and 1/3 M2, and the interposed main layer C is of 1/3 M1 and 2/3 M2 (D3, paragraphs [0045], [0050] and [0055]). Hence, the general teaching of D3 for achieving a smooth colour gradient between the bottom layer and the top layer is to interpose layers in between which are made of a *mixture* of the materials of these outermost layers.

1.1.10 Starting from D4, where the smooth colour gradient between the bottom layer and the top layer is achieved by interposing a layer made of a mixture of the materials of the top and bottom layers, the skilled person had no motivation to deviate from this concept. Rather, the skilled person would have maintained this layer made of the mixture of the materials of the top and bottom layers and would have *added* intermediate layers according to the layering concept of D3 outlined above in order to achieve a smooth colour gradient between the existing layers.

Therefore, the skilled person starting from D4 and applying the teachings of D3 would not have arrived at a layer structure according to features **4.1**, **5**, **5.1**, **5.2**, **6**, **7** and **8** in an obvious manner.

1.1.11 Consequently, the claimed subject-matter is based on an inventive step over D4 in combination with D3.

1.2 D2 in combination with D3

1.2.1 It was undisputed that document D2 discloses in paragraphs [0002], [0056] to [0059], [0067] and [0103]

a multi-layered coloured zirconia dental mill blank according to features **1** to **3.3**.

1.2.2 The appellant argued that the most promising spring board for the skilled person was a dental mill blank having exactly two layers as disclosed in paragraph [0103]. These two layers form the bottom layer and the top layer of the dental mill blank, respectively.

1.2.3 The claimed subject-matter differs from that disclosure in features **4**, **4.1**, **4.2**, **5**, **5.1**, **5.2**, **6**, **7** and **8**, according to which

> **4)** [the zirconia dental mill blank further comprises] at least one intermediate layer Ex
> **4.1)** having the composition COMP-E of top layer E,
>
> **5)** at least one intermediate layer Bx
> **5.1)** having the composition COMP-B of bottom layer B,
>
> **4.2/5.2)** x being an integer and indicating the number of intermediate layers,
>
> wherein
> **6)** the layers with compositions COMP-B and COMP-E are arranged in alternating order, and
> wherein
> **7)** the thickness of the individual layers B, Bx is decreasing from bottom to top and
> **8)** the thickness of the individual layers E, Ex is decreasing from top to bottom.

1.2.4 These distinguishing features have the technical effect that a smooth colour gradient between the bottom layer and the top layer of the dental mill blank can be

provided. The objective technical problem can therefore be formulated as making the colour transition from the bottom layer to the top layer of the dental mill blank invisible, as suggested by the appellant.

1.2.5 D3 deals with this objective technical problem (see above point 1.1.5).

1.2.6 However, as discussed above, for achieving a smooth colour gradient between the bottom layer and the top layer of the dental mill blank, D3 teaches to provide additional layers interposed there between which consist of *mixtures* of the materials of the two outermost layers (see above point 1.1.9). There is no indication in D3 to make the interposed layers exclusively of the material of *one* of the bottom or top layers.

Therefore, starting from D2 and applying the teachings of D3, the skilled person would not have arrived at a layer structure according to features **4** to **8** in an obvious manner.

1.2.7 Consequently, the claimed subject-matter is based on an inventive step starting from D2 in combination with D3.

1.3 D1 in combination with D3

1.3.1 The disclosure of D1 lags behind that of D4 and D2, as D1 does not disclose a *multi-layered* mill blank.

1.3.2 It was undisputed that the subject-matter of claim 1 differs from the disclosure of D1 in features **1, 3, 3.1, 3.2, 3.3, 4, 4.1, 4.2, 5, 5.1, 5.2, 6, 7** and **8.** These distinguishing features include all the

distinguishing features over D2, i.e. features **4** to **8** (see above point 1.2.3).

1.3.3 As stated above in relation to D2 as the closest prior art, the skilled person considering the teachings of D3 would not have arrived at a layer structure according to these features **4** to **8** in an obvious manner (see above point 1.2.6).

1.3.4 Consequently, the claimed subject-matter is also based on an inventive step starting from D1 in combination with D3.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairwoman:

C. Moser P. Acton

Decision electronically authenticated