



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:  
**07.10.2020 Bulletin 2020/41**

(51) Int Cl.:  
**A44C 17/04 (2006.01)**      **A44C 17/02 (2006.01)**  
**B22D 25/02 (2006.01)**      **A44C 27/00 (2006.01)**

(21) Application number: **19167168.4**

(22) Date of filing: **03.04.2019**

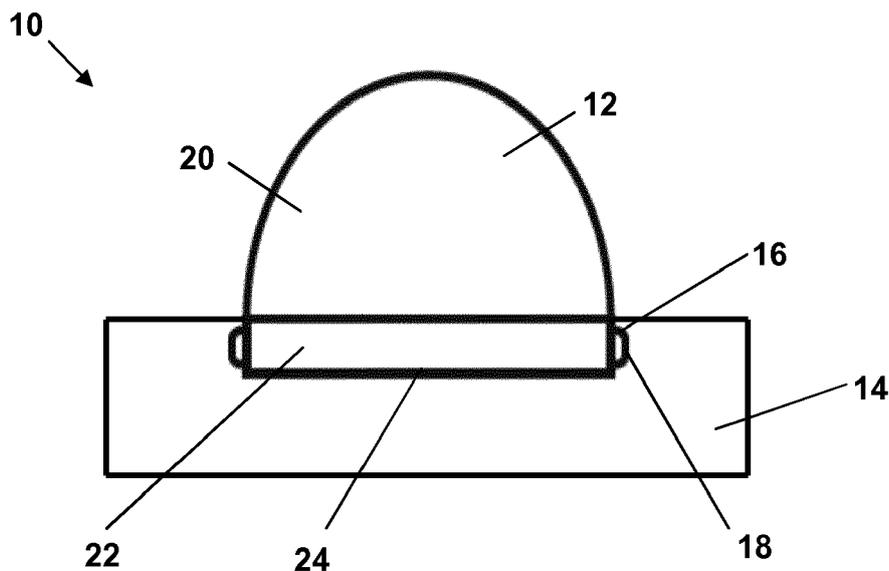
(84) Designated Contracting States:  
**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR**  
 Designated Extension States:  
**BA ME**  
 Designated Validation States:  
**KH MA MD TN**

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(54) **DECORATIVE ELEMENT FOR AN INVISIBLE SETTING**

(57) A method of making a decorative element for use in an invisible setting is disclosed. The decorative element comprises a presentation portion, a base and a setting portion extending between the presentation portion and the base, wherein the setting portion comprises an anchoring feature. The method comprises providing a mould arrangement comprising a mould comprising a presentation surface for forming the presentation portion

of the decorative element and a setting surface for forming the setting portion of the decorative element, and a former for forming the anchoring feature, the former being located adjacent to the setting surface. The method further comprises arranging an element-forming material into the mould to surround the former and performing a heat treatment to form a decorative element with an anchoring feature.



**Figure 2a**

## Description

### Field of the Invention

[0001] The present disclosure relates to a decorative element, such as a gemstone, comprising an anchoring feature that allows the decorative element to be set within a decorative article, such as a jewellery piece, with an invisible setting, and to a method of making such a decorative element. Also encompassed is a decorative article, such as a jewellery piece, that incorporates said decorative element, and a method of making said decorative article.

### Introduction

[0002] Decorative articles such as items of jewellery are often adorned with decorative elements. These elements may often be gemstones that require some form of setting such that they are held securely in place within the decorative article. There are many known ways to set a gemstone within a jewellery piece, with the type of setting chosen often influenced by the nature of the gemstone to be set.

[0003] Transparent precious and semi-precious gemstones, such as diamonds, rubies, sapphires, emeralds and cubic zirconia, are often carefully cut so that the gemstone has a multi-faceted surface; this is referred to as a facet cut. Within a facet-cut gemstone, light is refracted inside the gemstone and reflected off the outer surfaces to create a pleasing optical effect.

[0004] A variety of techniques are used to set such transparent facet-cut gemstones within jewellery pieces, all of which are well known in the state of the art. Invisible setting is one such technique and involves setting a stone in such a way that the mounting for the stone remains unseen in the finished piece, with only a presentation portion of the gemstone visible to a viewer. This is in contrast to other common settings such as a prong setting, where prongs extend from a base to hold a stone in place, the prongs being visible above the presentation portion of the gemstone.

[0005] The invisible setting effect is created by machining a groove into a lower portion the stone, into which a rail of an underlying metal framework can be fitted to hold the stone in place without the framework protruding. This type of setting allows the gemstone to be shown off particularly effectively, with no visible setting to distract the eye.

[0006] The gemstones are typically set into the invisible setting using a cast-in-place method. According to this method, a gemstones is set into a wax model of the article, with a rail of the wax model fitted into the groove in the gemstone, a gypsum mould is made around the wax model and gemstone. The wax is then burnt out, and molten metal is poured into the mould and allowed to set, leaving the gemstone set into the metal article. This 'cast in place' method is only possible if the gemstones have

a sufficiently high melting point (i.e. higher than the melting point of the metal that will be used for casting). Gemstones such as diamonds, rubies, sapphires, emeralds and cubic zirconia that are typically used for facet cuts all have a sufficiently high melting point, meaning that facet cut gemstones are generally considered suitable for cast-in-place methods.

[0007] In contrast to the facet cut employed for transparent gemstones, semi-transparent and opaque gemstones such as opal, lapis lazuli, turquoise, onyx and moonstone are often cut and polished into a cabochon, which leaves the presentation portion of the stone with a smooth, flat finish. For stones such as opal, which often displays many colours, or lapis lazuli, which may have pyrite inclusions, such a finish is often the best way to show off the natural beauty of the gemstone.

[0008] Cabochons are typically manufactured with a flat back and usually glued into place. This is a cheap and straightforward process, and is effective for semi-transparent and opaque gemstones as they do not have the same reliance on light passing through the stone to enhance their beauty as transparent gemstones do. Gemstones that are typically cut into cabochons also typically have relatively low melting points, meaning that cast-in-place methods are not considered suitable for cabochons, and the gluing method is generally the most cost-effective alternative.

[0009] However, cabochons that are glued into place are often not stable and can fall out of the setting. Design restrictions for jewellery pieces can also often rule out options for other conventional settings used for transparent gemstones.

[0010] The process according to the present invention aims to solve at least some of the problems associated with the prior art.

### Summary of the invention

[0011] According to a first aspect of the invention, there is provided a method of making a decorative element for use in an invisible setting. The decorative element comprises a presentation portion, a base and a setting portion extending between the presentation portion and the base, with the setting portion comprising an anchoring feature. The method comprises providing a mould arrangement comprising: a mould, which comprises a presentation surface for forming the presentation portion of the decorative element and a setting surface for forming the setting portion of the decorative element; and a former for forming the anchoring feature, the former being located adjacent to the setting surface. The method further comprises arranging an element-forming material into the mould to surround the former and performing a heat treatment to form a decorative element with an anchoring feature.

[0012] By using a mould to form the anchoring feature, costs associated with machining like anchoring features for invisible settings can be eliminated, and an anchoring

feature can therefore be provided inexpensively. As a result, it is economically viable to provide an anchoring feature in a relatively inexpensive decorative element. Such a method also allows for great flexibility in the shapes that the decorative element can form whilst still supporting an anchoring feature.

**[0013]** The element-forming material may comprise a powder, which may optionally be a ceramic powder, preferably zirconia (ZrO<sub>2</sub>), alumina (Al<sub>2</sub>O<sub>3</sub>) or a spinel. The element-forming material may also optionally comprise a binder, preferably an organic binder, and/or a pigment.

**[0014]** The element-forming material may comprise a ceramic material and/or may optionally have a paste-like consistency. The paste-like consistency results in the combination of the powder with the binder

**[0015]** By using a ceramic material, further processing routes are made available when making a decorative article comprising the decorative element due to the high melting point of many ceramics. Many ceramic compounds are readily available as powders at low cost.

**[0016]** The heat treatment may comprise a sintering step, which preferably comprises heating the decorative element to a temperature of between approximately 1000°C and approximately 1500°C, preferably approximately 1200°C for a time of between approximately 2 hours and approximately 20 hours.

**[0017]** The sintering step provides densification of the ceramic powder, allowing for the reduction of internal surface area of the decorative element to produce a stronger final product more resistant to failure in compression.

**[0018]** The heat treatment may further comprise a debinding step, which preferably comprises heating the decorative element to a temperature of between approximately 300°C and approximately 500°C for a time of between approximately 1 hour and approximately 10 hours. The debinding step drives off the binder and allows for initial densification of the powder precursor to form a green body that is suitable for sintering and further densification.

**[0019]** The anchoring feature may be an opening or recess in the setting portion and the former may be arranged to protrude from the setting surface. Alternatively the anchoring feature may be a protrusion on the setting portion and the former may be a recess in the setting surface.

**[0020]** In certain embodiments, the former may be integral with the mould. This allows the mould to be made as one part, simplifying the assembly and manufacturing process.

**[0021]** The setting portion may define the widest region of the decorative element, with the decorative element optionally having a height in a direction extending away from the base. The setting portion may define between approximately 2% and approximately 20%, preferably between approximately 3% and approximately 5%, of the height of the decorative element. The setting portion may have sides that are substantially perpendicular to the base.

**[0022]** A dimension defined by the anchoring feature may differ from a dimension of the remainder of the setting portion adjacent to the anchoring features by at least 0.05 mm, preferably at least 0.25 mm.

5 **[0023]** At least a portion of the presentation portion of the decorative element may have a substantially curved surface, and the base of the decorative element may be substantially planar.

**[0024]** The decorative element may be a cabochon.

10 **[0025]** A method is also provided for making a decorative article, the decorative article comprising a body and a decorative element set in the body with an invisible setting, made according to the method discussed above. The method for making the decorative article may comprise casting the body around the decorative element to engage the body with the anchoring feature of the decorative element to set the decorative element in place.

**[0026]** The casting process may be a cast-in-place process.

20 **[0027]** The invention also extends to a decorative element for use in an invisible setting made according to the method described above.

**[0028]** According to another aspect of the invention, there is provided a decorative element for use in an invisible setting. The decorative element comprises a presentation portion, a base and a setting portion extending between the presentation portion and the base, with the setting portion comprising an anchoring feature, wherein the decorative element is a sintered element and the anchoring feature is a moulded feature.

25 **[0029]** There may be provided a decorative article comprising a body and said decorative element, or a decorative element made according to the method discussed above. The body may be engaged with the anchoring feature of the decorative element to set the decorative element into the body in an invisible setting.

**[0030]** The presentation portion of the decorative element may be substantially unobstructed by the body, while the anchoring feature, and optionally the setting portion, may be substantially shielded by the body, such that the anchoring feature, and optionally the setting portion, cannot be seen by an observer.

**[0031]** The decorative article may be an article of jewellery, a watch or a decorative household item.

45 **[0032]** Features of any aspect or embodiment may be applied, alone or in appropriate combination, with other aspects and embodiments.

### Brief Description of the Drawings

50 **[0033]** Embodiments of the invention will now be described, by way of example, with reference to the accompanying drawings, in which:

55 Figure 1 is a perspective view of a decorative article in accordance with an embodiment of the invention;

Figure 2a is a cross sectional view of a decorative

article in accordance with another embodiment of the invention, and Figures 2b and 2c are plan views from above and side views respectively of the decorative element of the decorative article of Figure 2a;

Figures 3a, 4a, 5a, 6a and 7a are respective cross sectional views of articles according to other embodiments, and Figures 3b, 4b, 5b, 6b and 7b are corresponding plan views from above of decorative elements forming parts of the decorative articles of Figures 3a, 4a, 5a, 6a and 7a; and

Figures 8a and 8b are perspective views of mould assemblies for making the decorative elements of Figures 2b and 3b respectively.

### Detailed Description of Embodiments of the Invention

**[0034]** Figure 1 illustrates a decorative article 10, exemplified here as a jewellery piece. The decorative article 10 comprises a decorative element 12, exemplified here as a gemstone, and a body 14 into which the decorative element 12 is set.

**[0035]** The decorative article 10 of Figure 1 is a jewellery piece in the form of a pendant, but it will be appreciated that the decorative article could be any other jewellery piece, such as a bracelet, necklace, pendant, earring or ring, or may be another decorative article such as a watch or a decorative household item.

**[0036]** Figure 2a shows a similar decorative article 10 in cross section, and reveals that the decorative element 12 comprises an anchoring feature 16, which engages with a corresponding anchoring feature 18 on the body 14 to set the decorative element 12 in place in the article 10. Unlike the anchoring features of the prior art, which are machined features, the anchoring feature 16 of the decorative element 12 of Figure 2a is a moulded anchoring feature, as will be described in more detail below.

**[0037]** Figures 2b and 2c illustrates the decorative element 12 in isolation, and show that the decorative element 12 comprises a presentation portion 20, a setting portion 22 and a base 24. As best seen in Figure 2a, when set into the body 14 of the article 10, the presentation portion 20 is visible above the body 14 and unobscured from view, while the setting portion 22 and the base 24 are received within and shielded by the body 14, so that the element 12 is set in the article 10 with an invisible setting.

**[0038]** In this example, the decorative element is a cabochon. In this way, the presentation portion 20 has a smooth appearance and has a curved surface, and the base 22 is substantially planar. The entire surface of the presentation portion 20 may be curved to define a convex surface, or alternatively only a part of the presentation portion 20 may be curved, with some regions being planar.

**[0039]** The setting portion 22 is defined by the portion

of the decorative element extending between the presentation portion 20 and the base 24. Sides 26 of the setting portion extend substantially perpendicularly between the base 24 and the presentation portion 20.

**[0040]** The decorative element 12 defines a height  $h_d$  rising from the base 24 to the uppermost point of the presentation portion 20. The setting portion 22 is relatively small compared to the presentation portion 20, and therefore has a height  $h_p$  that is less than 50% of the overall height of the decorative element 12. For example, the setting portion 22 may have a height  $h_p$  that corresponds to approximately 5% of the height  $h_d$  of the decorative element 12. In other embodiments, between 2% and 20% of the height  $h_d$  of the decorative element 12 may be represented by the setting portion 22.

**[0041]** The setting portion 22 comprises a main setting portion 28 and at least one anchoring feature 16 that can be used to set the decorative element 12 securely in place in use. In the embodiment of Figure 2b, each anchoring feature 16 is defined by a protrusion on the form of a lug that protrudes outwardly, away from the side 26 of the main setting portion 28. Four lugs 16 are included in total, positioned on two opposite sides of the main setting portion 28, with two lugs 16 on each side to define four anchoring features.

**[0042]** The lugs 16 protrude from the main setting portion 28 by a distance that is sufficient to anchor the decorative element 12 securely in the body 14 when the decorative element 12 is set. For example, the anchoring features may protrude from the main setting portion 28 by at least 0.05 mm and preferably by at least 0.25 mm. Said another way, a dimension of the setting portion 22 in the region of the anchoring feature 16 differs from a dimension of the setting portion 22 in a region immediately adjacent to the anchoring feature 16 by at least 0.05 mm and preferably by at least 0.25 mm.

**[0043]** The decorative element 12 is made from a material that can resist high temperatures. In particular, the decorative element 12 is made from a material having a melting point that is higher, preferably at least 20 °C higher, than the melting point of the metal that is to form the body 14 of the decorative article 10. In this way, the decorative element 12 can be set into the decorative article 10 using a cast-in-place method, as will be later described. The material of the decorative element 12 may therefore be selected to match the material of the body 14, or vice versa. In one example, the decorative element 12 is made from a material having a melting point that is higher than 1200°C. In this particular embodiment the decorative element 12 is made from sintered zirconia, though the decorative element 12 may be made from other materials, particularly other sintered materials, such as alumina, a spinel, or another suitable ceramic material.

**[0044]** When the decorative element 12 is set in the article 10, as shown in Figure 2a, the body 14 of the decorative article 10 surrounds the entire setting portion 22 of the decorative element 12. The body 14 includes

four anchoring features 18, defined by recesses, which are filled by the four lugs 16 of the decorative element 12. In use, the co-engagement of the recesses 18 defining the anchoring features of the body 14 and the lugs 16 defining the anchoring features of the decorative element 12 prevents the decorative element 12 from falling out of the body 14 and sets it securely in place.

**[0045]** Figures 3a and 3b show an alternative embodiment of the decorative article 110, which is substantially the same as the decorative article of Figures 1, 2a and 2b, except for the form of the anchoring features. More specifically, in the embodiment of Figures 3a and 3b, the anchoring feature 116 of the decorative element is defined by a recess provided in the setting portion 122, which is engaged with a corresponding protrusion 118 that defines the engagement feature in the body 114 of the decorative article 110 (visible only in Figure 3a). In this example, four recesses 116 are positioned on two opposite sides of the setting portion 122 of the decorative element 110, with two recesses 116 on each side to provide four anchoring points.

**[0046]** Each recess 116 extends into the main setting portion 128 by a distance that is sufficient to hold the element 112 securely in place in the article 110. To this end, in this example, the recess 116 has a depth of at least 0.05 mm. In this way, as with the embodiment of Figures 2a and 2b, a dimension of the setting portion 122 in the region of the anchoring feature 116 differs from a dimension of the setting portion 122 in a region immediately adjacent to the anchoring feature 116 by at least 0.05 mm.

**[0047]** As with the embodiment shown in Figures 2a and 2b, the body 114 of the decorative article 110 surrounds the entire setting portion 122 of the decorative element 112, with four corresponding anchoring features 118 of the body 114 in the form of protrusions extending into the four recesses 116 that define the anchoring features of the decorative element 112. In use, the co-engagement of the protrusions 118 that define the anchoring features of the body 114 and the recesses 116 that define the anchoring features of the decorative element 112 prevent the decorative element 112 from falling out of the body 114 and sets it in place.

**[0048]** Figures 4a and 4b show yet another embodiment of the decorative article 210, in which each anchoring feature 216 of the decorative element 212 is defined by a recess in the form of an elongate groove that extends along a side of the setting portion 222 of the decorative element 220. In this example, there are two elongate grooves 216, positioned on opposite sides of the setting portion 222, such that the decorative element 210 has two anchoring features 216. The body 214 of the decorative article 210 again surrounds the entire setting portion 222, with two protruding anchoring features 218 of the body 214 filling the elongate grooves 216 such that co-engagement of the grooves defining the anchoring features 216 of the decorative element 212 and the protruding anchoring features 218 of the body 214 sets the

decorative element 212 in place.

**[0049]** Figures 5a and 5b show a further embodiment of the decorative article 310, in which each anchoring feature 316 of the decorative element 312 is defined by a protrusion in the form of an elongate ridge that extends along a side of the setting portion 322 of the decorative element 312. In this example, there are two elongate ridges 316, positioned on opposite sides of the setting portion 322, such that the decorative element 312 has two anchoring features 316. The body 314 of the decorative article 310 again surrounds the entire setting portion 322, with two anchoring features 318, defined by elongate recesses in the body 314, being filled by the elongate ridges 316 such that co-engagement of the recesses 318 defining the anchoring features of the body 314 and the ridges 316 defining the anchoring features of the decorative element 312 sets the decorative element 312 in place.

**[0050]** Figures 6a and 6b show a still further embodiment of the decorative article 410, in which the anchoring feature 416 of the decorative element 412 is defined by a protrusion in the form of a rim that extends around the entirety of the setting portion 422. In this example, the rim is flared to define a sloping upward-facing surface (i.e. a sloping surface that faces generally in the same direction as the presentation portion 420 of the decorative element 412). In this way, the setting portion 422 is widest nearest the base 424, at the bottom of the decorative element 412, and narrowest nearest the presentation portion 420. However, it will be appreciated that other rim shapes may also be used, for example in which the rim is not flared, but defines a flat upward-facing surface.

**[0051]** When the decorative element 412 is set into the article 410, the body 414 of the decorative article 410 again surrounds the entire setting portion 422, with an anchoring feature 418, defined by a correspondingly shaped recess in body 414, engaging the flared rim 416 of the decorative element 412, such that the decorative element 412 is set in place.

**[0052]** Figures 7a and 7b show a yet further embodiment of the decorative article 510, in which each anchoring feature 516 of the decorative element 512 is defined by a sloped protrusion 516 extending outwardly from the sides of the main setting portion 528 of the decorative element 512. Each sloped protrusion 516 has an upwardly-facing surface that slopes from the base 524 towards the presentation portion 520 of the decorative element 512. In this example, there are four anchoring features 516 in total, positioned on two opposite sides of the setting portion 522, with two anchoring features 516 on each side.

**[0053]** When the decorative element 512 is set into the article 510, the body 514 of the decorative article 510 again surrounds the entire setting portion 522, with four anchoring features 516 of the body 514, defined by correspondingly sloped recesses 518, filled by the sloped protrusions 516 of the decorative element 512, such that co-engagement of the anchoring features 516 of the dec-

orative element 512 and the anchoring features 518 of the body 514 sets the decorative element 512 in place.

**[0054]** The decorative elements 12, 112, 222, 312, 412, 512 described above are made using appropriate mould assemblies. A mould assembly for making the decorative element of Figure 2b will now be described with reference to Figure 8a.

**[0055]** As shown in Figure 8a, the mould assembly 40 comprises a mould 42 and at least one former 44. The mould 42 comprises a mould body 46 having a moulding surface 48 that surrounds an interior moulding volume 50. The moulding surface 48 defines a presentation surface 52 which will form the surface of the presentation portion 20 of the decorative element 12, and a setting surface 54, which in combination with the former 44 will form the surface of the setting portion 22 of the decorative element 12.

**[0056]** The formers 44 are responsible for forming the anchoring features 16 of the decorative element 12, and as such are a negative impression of the corresponding anchoring feature 16. The formers 44 are positioned such that they are located adjacent to the setting surface 54 of the mould 42, so as to form the anchoring formation 16 as part of the setting portion 22 of the decorative element 12.

**[0057]** In this example, the mould assembly 40 is for use in forming the decorative element of Figure 2b and hence the formers 44 take the form of recesses in the setting surface 54, to allow formation of protruding anchoring features 16 of the decorative element 12 in the form of lugs. The recesses 44 have a depth of at least 0.05 mm, to form a corresponding protrusion 16 with a length of at least 0.05 mm.

**[0058]** In this example, the formers 44 are integral with the mould 42 to form a unified mould assembly 40. However, it should be understood that the formers 44 may not be integral with mould 46 and may be separate components to the mould assembly 40.

**[0059]** Figure 8b shows an alternative example of a mould assembly 140 for making the decorative element of Figure 3b, comprising a mould 142, which again comprises a mould body 146 having a moulding surface 148 surrounding an interior moulding volume 150. The moulding surface 148 defines a presentation surface 152 which will form the surface of the presentation portion 120 of the decorative element 112, and a setting surface 154, which together with the former 144 will form the setting portion 122 of the decorative element 112.

**[0060]** The mould assembly 140 additionally comprises formers 144, located adjacent to the setting surface 154 to form the anchoring features 116 of the decorative element 112.

**[0061]** In this example, the mould assembly 140 is for use in forming the decorative element 112 of Figure 3b, wherein the anchoring features 116 are recesses in the setting portion 122. As such, the formers 144 in this example are protrusions that are provided on the setting surface 154 to protrude into the moulding volume 150.

The protrusions 144 have a length of at least 0.05 mm, preferably at least 0.25 mm to form a corresponding recess 116 in the decorative element 112 with a depth of at least 0.05 mm, preferably at least 0.25 mm.

**[0062]** As with the example shown in Figure 4, the formers 144 in Figure 5a are integral with setting surface 154 of the mould assembly 140. However, in other embodiments, the formers 144 may be provided as separate insert pieces that can be inserted into the mould 142.

**[0063]** It will be appreciated that the configuration of the formers can be adapted as necessary so as to form differently shaped anchoring features, such as the anchoring features of the decorative elements of Figures 4b, 5b, 6b and 7b. Generally, the formers take the form of protrusions provided on, or recesses provided in, the setting surface of the mould, the protrusion or recess being any suitable shape or size.

**[0064]** A method of making the decorative elements using the mould assemblies described above, and a finished decorative article, will now be described, with particular reference to the decorative element of Figure 2b, and the mould assembly of Figure 8.

**[0065]** In the first stage of production, an element-forming material that will form the decorative element 12 is first provided, in the form of a feed stock. The element-forming material comprises a powder; in this example, the powder is powdered  $ZrO_2$  (zirconia), though it will be appreciated that other suitable powders may be used, such as other powdered ceramics, including powdered alumina ( $Al_2O_3$ ) or powdered spinels, particularly transparent spinels.

**[0066]** The powdered zirconia is mixed with a binder, such as an organic binder, and optional additives such as pigments, to form the element-forming material. In this example, the resulting element-forming material has a paste-like consistency. The element-forming material is then poured into the mould assembly 40 so as to fill the moulding volume 50. The element-forming material is packed against the presentation surface 52 and setting surface 54 of the mould 42, and is also packed around and into the former 44, such that the element-forming material takes the desired form of the decorative element 12, including the anchoring feature 16.

**[0067]** With the element-forming material in the mould 42, a two-stage heat treatment is performed.

**[0068]** The heat treatment comprises an initial debinding step, which provides initial densification and drives off the binder. The debinding step comprises heating the element-forming material inside the mould to a temperature of between approximately 300 °C and 500 °C for a time of between approximately 1 hour and 10 hours to form a green body.

**[0069]** The heat treatment additionally comprises a sintering step, in which densification is completed and a blank is formed. The sintering step comprises heating the green body to a temperature of between approximately 1000 °C and 1500 °C, preferably approximately 1200 °C for a time of between approximately 2 hours and

20 hours.

**[0070]** The blank is then de-moulded, and finally, undergoes a surface finishing treatment to create the finished decorative element 12.

**[0071]** By virtue of the former 44, the blank, and hence the final decorative element 12, is formed with the anchoring feature 16 moulded into the setting portion 22 of the decorative element 12. In this way, the anchoring feature 16 is a moulded feature. The anchoring feature 16 is thereby formed as an inherent part of the process of making the decorative element 12, without the need for a separate machining step to make the anchoring feature 16, which would otherwise be labour and cost intensive. In this way, a decorative element 12 with an anchoring feature 16 can be made particularly quickly, efficiently and cost effectively.

**[0072]** It will be appreciated that materials used for cabochons are generally inexpensive compared to materials used for facet cut stones. Machining an anchoring feature is a comparatively expensive process, and thus would increase the cost of a cabochon significantly. As a result, cabochons are not typically used in invisible settings, as the cost of providing the required anchoring feature is prohibitive. By moulding the anchoring feature 16 using the former 44 in the manner described above, the anchoring feature 16 that is essential for providing an invisible setting can be formed in a cost-effective way in a relatively inexpensive cabochon element, thereby allowing a cabochon element to be used in an invisible setting without adding prohibitively to the cost of the article.

**[0073]** By virtue of the use of a powder processing method involving sintering, the decorative element 12 is a sintered element, made of a material with a relatively high melting point. As a result of this high melting point, the cast-in-place method can be used to set the decorative element into a decorative article, as will now be described.

**[0074]** The body 14 of the decorative article 10 is typically made of a metallic material, such as silver, gold, bronze, copper, steel, aluminium, or another suitable casting metals or alloys.

**[0075]** To cast the body 14 using a cast-in-place process, liquid wax is first injected into a rubber mould to form a wax model of the body 14. The decorative element 12 is then positioned on the wax model as it would be in the finished decorative article 10. The wax model is then placed in a crucible and filled with investment, typically in the form of gypsum, which surrounds the wax model and the decorative element 12. The crucible, containing the gypsum, wax model and decorative element 12 is then heated in an oven, typically at a temperature between approximately 650°C and 750°C for a time of between approximately 1 and 3 hours to burn out the wax while leaving the decorative element 12 in place.

**[0076]** The space left by the wax is filled by pouring in molten metal into the mould to surround the decorative element 12 and form the body 14. The crucible, now con-

taining the gypsum, metal and the decorative element 12, is then allowed to cool before being placed in water to dissolve the gypsum, leaving the now-solidified body around the decorative element 12. The body 14 is polished and finished to leave the completed decorative article 10.

**[0077]** It should be noted that the decorative element 12 need not be made and set into the decorative article 10 in the same manufacturing location. Instead, a first stage in which the decorative element 12 is formed may take place in a first manufacturing location, and a second stage in which the body 14 is cast around the decorative element 12 to form the decorative article 10 may take place in a second manufacturing location different to the first.

**[0078]** The cast-in-place method, made possible by the relatively high melting point of the decorative element 12, allows a fast and cost-effective method of setting a decorative element 12 into an invisible setting. The cast-in-place method also provides a particularly secure setting of the decorative element 12 in the decorative article 10, providing a high-quality finished product that is resistant to normal wear.

**[0079]** It will be apparent to the skilled person that many variations of the above embodiments are possible without departing from the scope of the appended claims.

## Claims

1. A method of making a decorative element for use in an invisible setting, the decorative element comprising a presentation portion, a base and a setting portion extending between the presentation portion and the base, wherein the setting portion comprises an anchoring feature, the method comprising:

providing a mould arrangement comprising:

- a mould comprising a presentation surface for forming the presentation portion of the decorative element and a setting surface for forming the setting portion of the decorative element; and
- a former for forming the anchoring feature, the former being located adjacent to the setting surface;

arranging an element-forming material into the mould to surround the former;  
performing a heat treatment to form a decorative element with an anchoring feature.

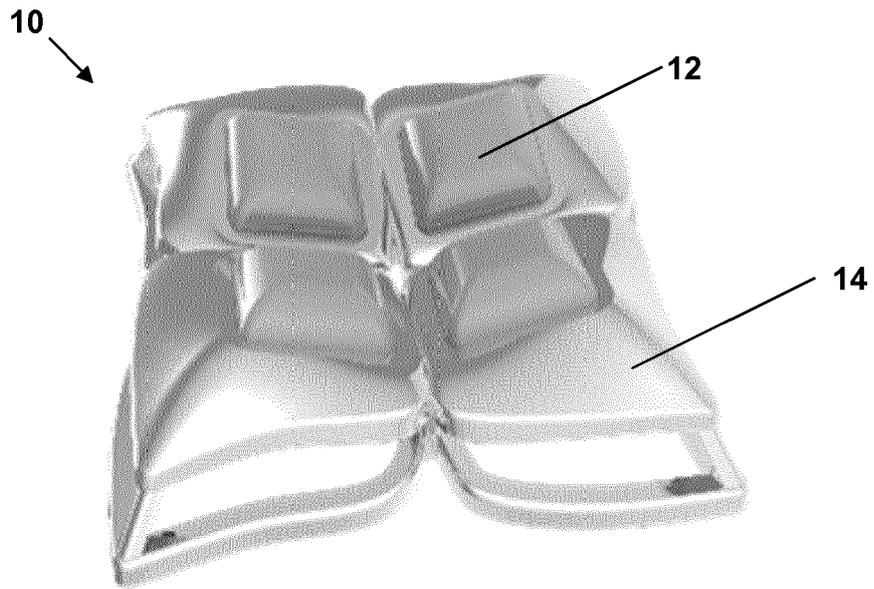
2. The method of Claim 1, wherein the element-forming material comprises a powder, which is optionally a ceramic powder, preferably zirconia (ZrO<sub>2</sub>), alumina (Al<sub>2</sub>O<sub>3</sub>) or a spinel and optionally wherein the element-forming material further comprises a binder,

preferably an organic binder, and/or a pigment.

3. The method of Claim 1 or Claim 2, wherein the heat treatment comprises a sintering step, which preferably comprises heating the decorative element to a temperature of between approximately 1000°C and approximately 1500°C, preferably approximately 1200°C for a time of between approximately 2 hours and approximately 20 hours. 5
4. The method of Claim 3, wherein the heat treatment comprises a debinding step, which preferably comprises heating the decorative element to a temperature of between approximately 300°C and approximately 500°C for a time of between approximately 1 hour and approximately 10 hours. 10
5. The method of any preceding claim, wherein the anchoring feature is an opening or recess in the setting portion and the former is arranged to protrude from the setting surface, or wherein the anchoring feature is a protrusion on the setting portion and the former is a recess in the setting surface. 15
6. The method of any preceding claim, wherein the former is integral with the mould. 20
7. The method of any preceding claim, wherein the setting portion defines the widest region of the decorative element. 25
8. The method of Claim 7, wherein a dimension defined by the anchoring feature differs from a dimension of the remainder of the setting portion adjacent to the anchoring features by at least 0.05 mm, preferably at least 0.25 mm. 30
9. The method of any preceding claim, wherein at least a portion of the presentation portion of the decorative element has a substantially curved surface, and/or wherein the base of the decorative element is substantially planar. 35
10. The method of any preceding claim, wherein the decorative element is a cabochon. 40
11. A method of making a decorative article, the decorative article comprising a body and the decorative element of any preceding claim set in the body with an invisible setting, the method comprising, casting the body around the decorative element to engage the body with the anchoring feature of the decorative element to set the decorative element in place. 45
12. The method of Claim 11 wherein the casting process is a cast-in-place process. 50
13. A decorative element for use in an invisible setting,

the decorative element comprising a presentation portion, a base and a setting portion extending between the presentation portion and the base, wherein the setting portion comprises an anchoring feature, wherein the decorative element is a sintered element and wherein the anchoring feature is a moulded feature.

14. A decorative article comprising a body and the decorative element of Claim 13, or a decorative element made according to the method of any of Claims 1 to 10, wherein the body is engaged with the anchoring feature of the decorative element to set the decorative element into the body in an invisible setting. 55
15. The method of Claim 11 or Claim 12, or the decorative article of Claim 14, wherein the decorative article is an article of jewellery, a watch or a decorative household item. 60



**Figure 1**

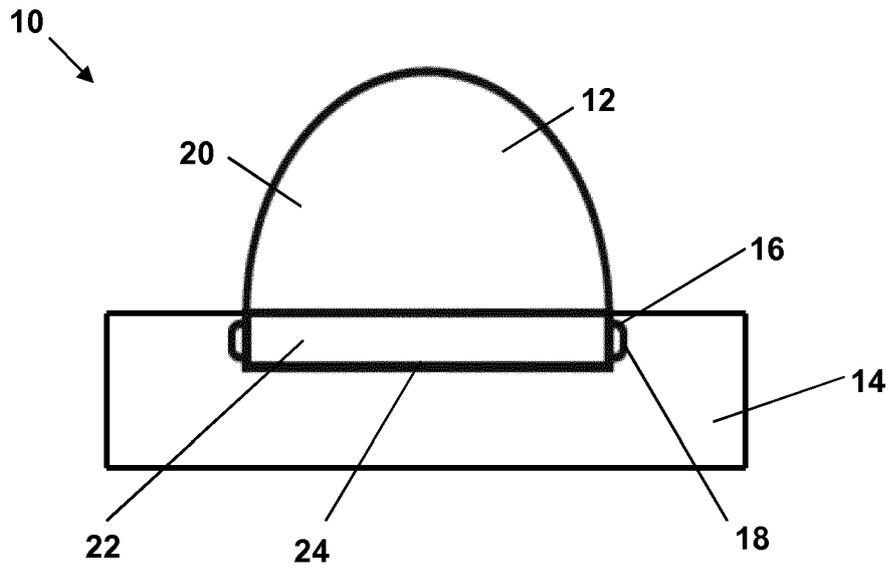


Figure 2a

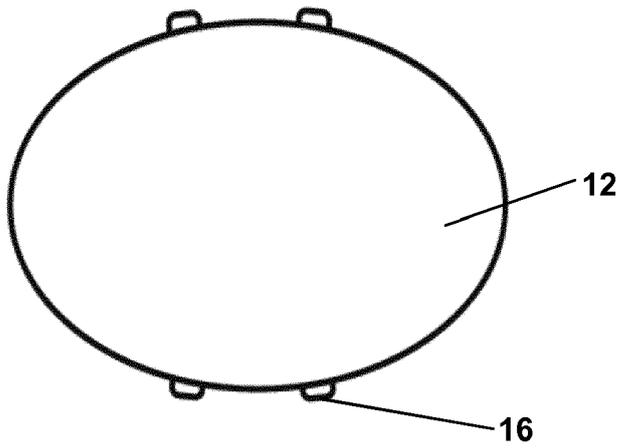


Figure 2b

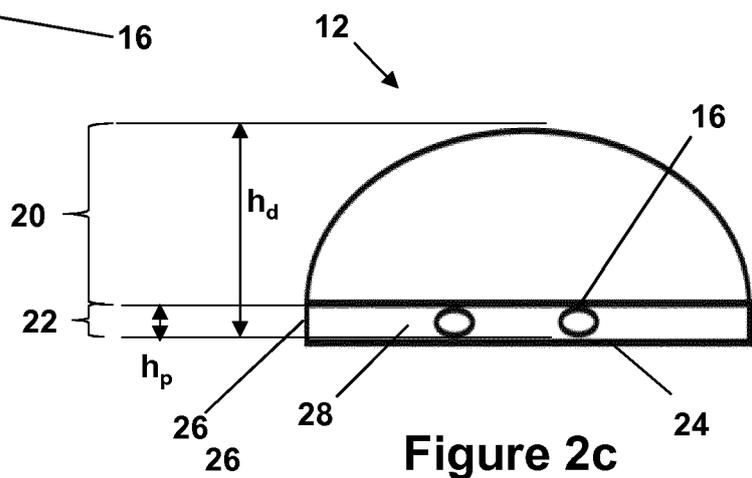


Figure 2c

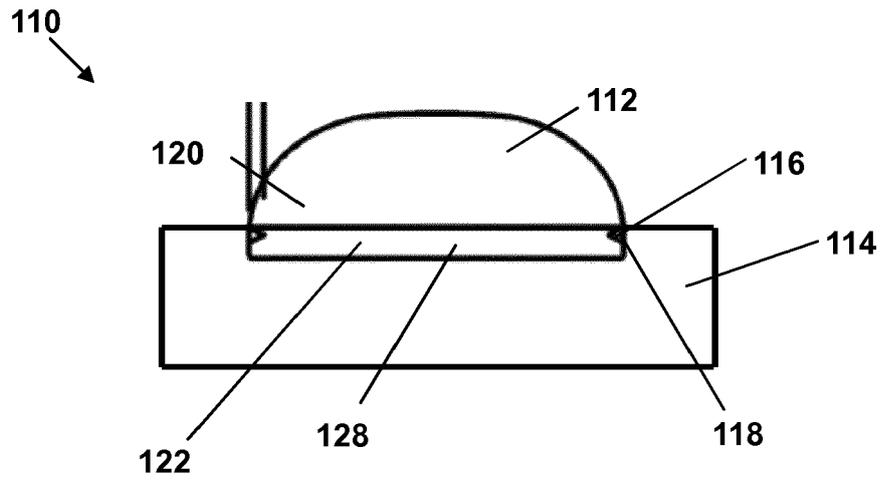


Figure 3a

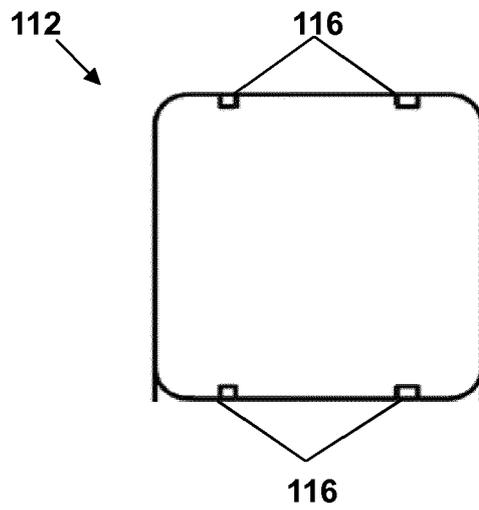
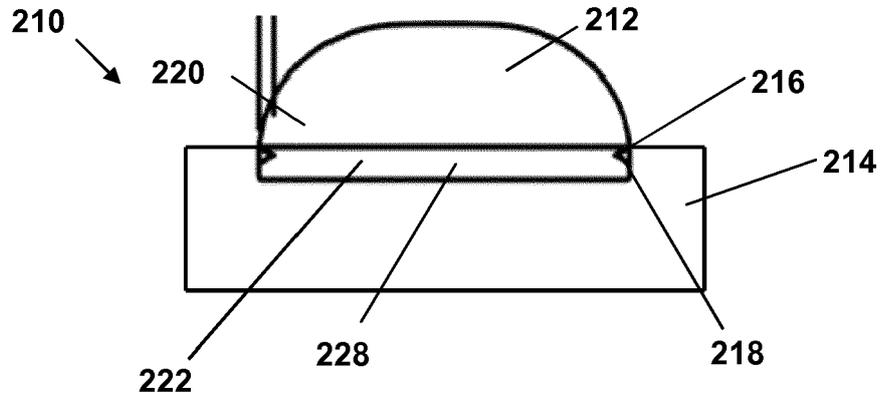
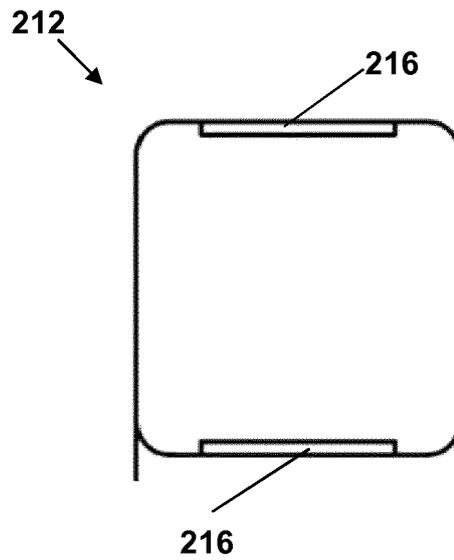


Figure 3b



**Figure 4a**



**Figure 4b**

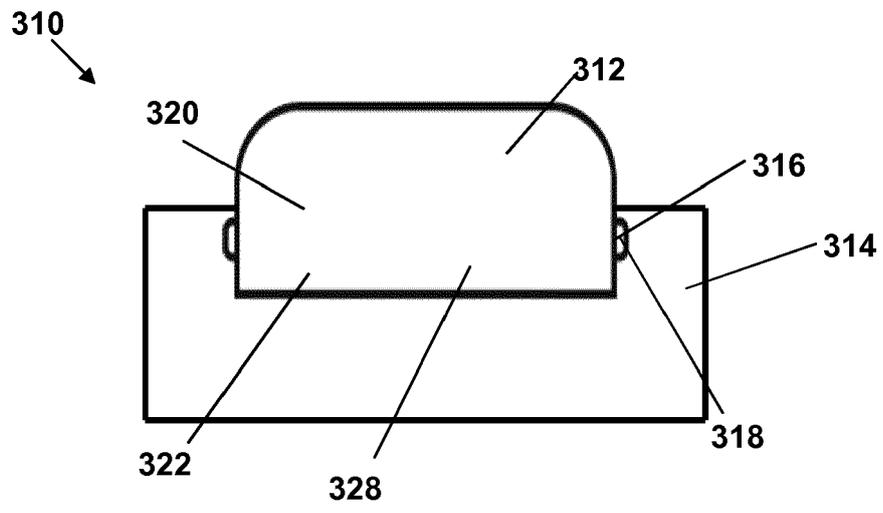


Figure 5a

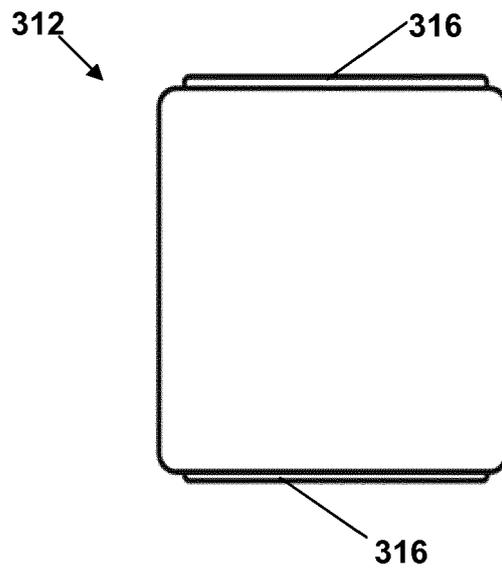


Figure 5b

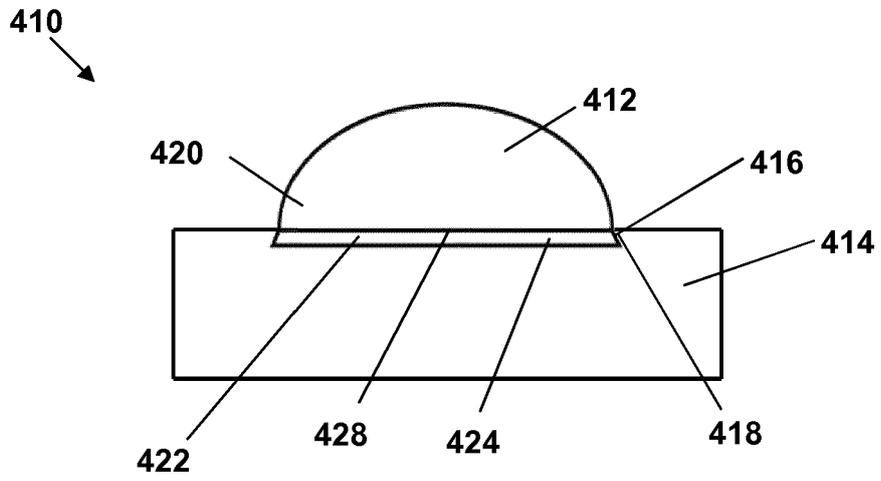


Figure 6a

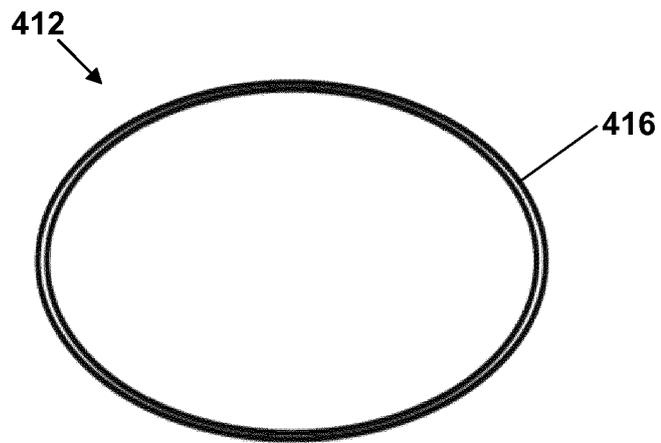
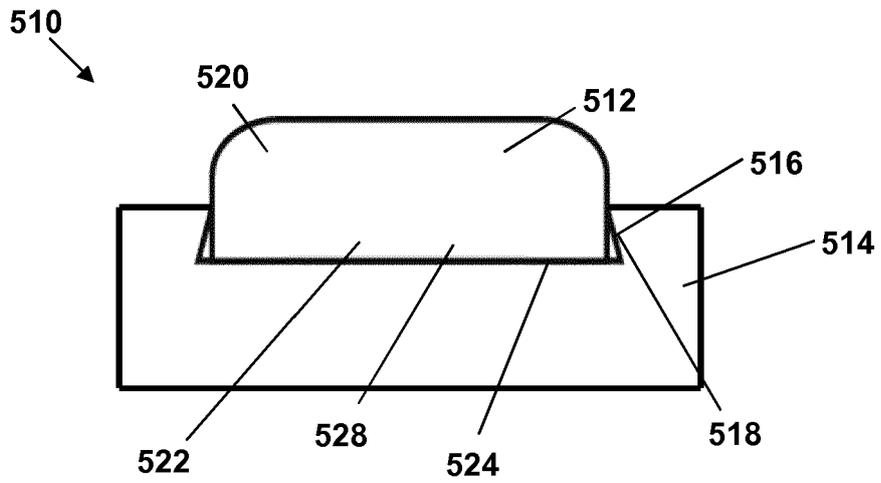
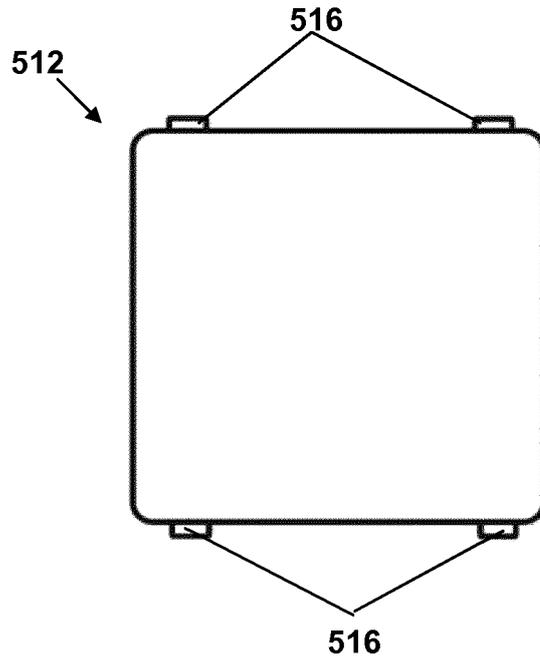


Figure 6b



**Figure 7a**



**Figure 7b**

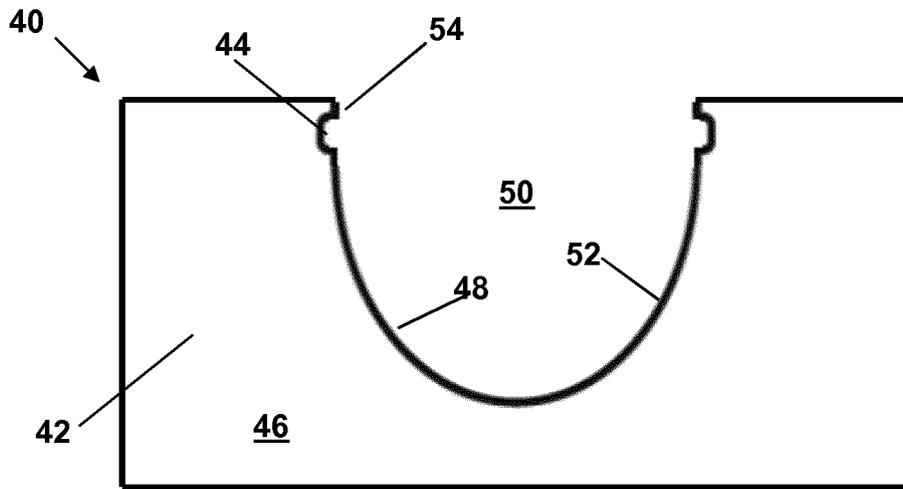


Figure 8a

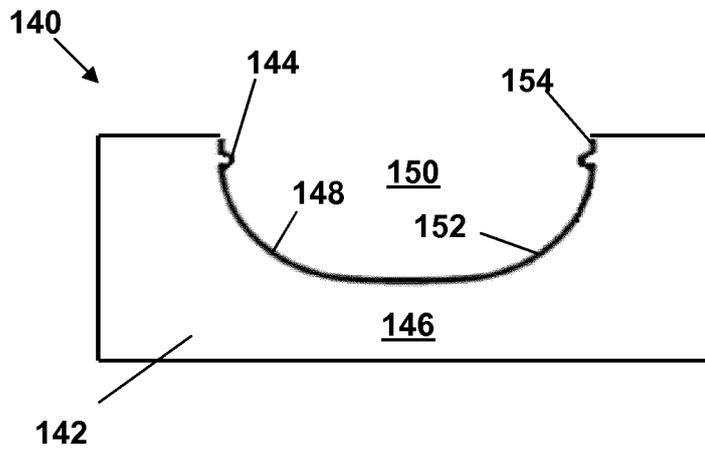


Figure 8b



EUROPEAN SEARCH REPORT

Application Number  
EP 19 16 7168

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			TECHNICAL FIELDS SEARCHED (IPC) A44C B22D
The present search report has been drawn up for all claims			
Place of search <b>The Hague</b>		Date of completion of the search <b>11 October 2019</b>	Examiner <b>Debard, Michel</b>
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The members are as contained in the European Patent Office EDP file on  
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11-10-2019

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KR 200183269 Y1	15-05-2000	NONE	

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82