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(54) Title: EMBEDDED GEM AND A METHOD FOR EMBEDDING A GEM

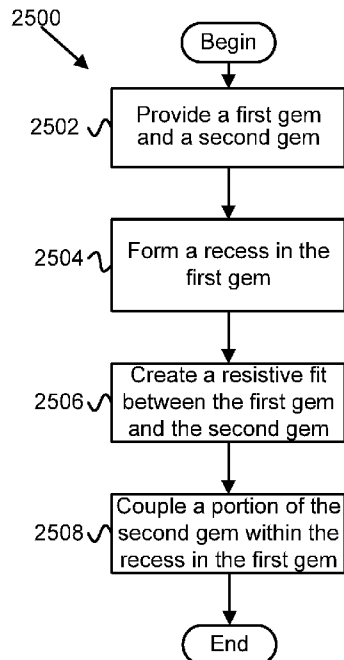


FIG. 25

(57) Abstract: An embedded gem and a method for embedding a gem are disclosed. An embedded gem includes a first gem 122 and a second gem 102. The first gem 122 includes a recess 202. The recess 202 has an opening at the location of the table 130. The first gem 122 has a first diameter. The second gem 102 is coupled to the first gem. The second gem 102 has a second diameter that is less than the first diameter of the first gem 122. The resistive fit within the recess 202 of the first gem 122 couples the first gem 122 to the second gem 102. At least a portion of the second gem 102 is within the recess 202.



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EMBEDDED GEM AND A METHOD FOR EMBEDDING A GEM

CROSS-REFERENCES TO RELATED APPLICATIONS

This application claims the benefit of United States Provisional Patent Application
5 Number 61/467,855 entitled “Embedded Gem and a Method for Embedding a Gem” and filed on
March 25, 2011 for Kerry E. W. Sorenson, which is incorporated herein by reference.

FIELD

This invention relates to jewelry including real or imitation gemstones and more
particularly relates to gems partially embedded in another gem for jewelry including designer
10 jewelry, imitation jewelry, costume jewelry, play jewelry, or any other type of ornamentation.

BACKGROUND

Diamonds are often valued based on a variety of factors including cut, color, clarity, and
carat-weight. A variety of different aspects of the natural stone can affect these values. For
example, rough diamonds often include impurities or inclusions which can discolor, cloud, or
15 otherwise hurt the clarity and color of a diamond. For example, large pieces of dark or
discolored material may significantly reduce the value of a diamond. This may require a large
stone being cut into a number of smaller stones to avoid the impurities of inclusions. This result
in a reduced value and a loss of money.

On the other hand, much of the value of a diamond results from what has been done by a
20 diamond cutter. For example, diamonds with precise and well designed cut styles can have
much more value than diamonds of the same size which have been poorly cut. Furthermore, new
styles and other changes can lead to more value than if the diamond is cut or set in a boring or
conventional manner. However, very little development or changes in relation to cut styles have
happened for many years.

SUMMARY

25 From the foregoing discussion, it should be apparent that a need exists for improving a
stones value based on removal of inclusions or other impurities and/or creating designs that are
new and customizable.

The present invention has been developed in response to the present state of the art, and
30 in particular, in response to the problems and needs in the art that have not yet been fully solved
by currently available cut styles or gemstone processing methods. Accordingly, the present
invention has been developed to provide an embedded gem and a method for embedding a gem
that may increase the value of the resulting jewelry when compared to other types of jewelry or

cut styles.

An embedded gem includes a first gem and a second gem. The first gem includes a recess. The recess has an opening at the location of the table. The first gem has a first diameter. The second gem is coupled to the first gem. The second gem has a second diameter that is less than the first diameter of the first gem. The resistive fit within the recess of the first gem couples the first gem to the second gem. At least a portion of the second gem is within the recess.

In one embodiment, the resistive fit includes a press fit where substantially no rotation is required for insertion or removal of the second gem. In a further embodiment, the resistive fit is between the first gem and the second gem. In yet another embodiment, the resistive fit is between a wall of the recess of the first gem and a girdle of the second gem.

In one embodiment, the embedded gem further includes a coupling mechanism. In a further embodiment, the resistive fit is between the coupling mechanism and first gem or the second gem. In yet another embodiment, the coupling mechanism includes a dowel. In one embodiment, the dowel provides the resistive fit coupling the first gem to the second gem. The resistive fit may be between the dowel and the first gem and the dowel and the second gem.

In one embodiment, the recess of the first gem includes faceting. In one embodiment, the second gem includes a pavilion within the recess of the first gem and the pavilion includes faceting. In a further embodiment, the recess of the first gem includes faceting symmetrical to the faceting of the pavilion of the second gem. In another embodiment, the recess of the first gem includes faceting non-symmetrical to the faceting of the pavilion of the second gem.

In one embodiment, either the first gem or second gem includes a natural gemstone, a synthetic gemstone, glass, crystal, plastic, or costume jewelry. In one embodiment, the embedded gem includes a light source within the recess of the first gem. In yet another embodiment, the second gem serves as a lens for an interior of the first gem. In one embodiment, the embedded gem includes one or more of an image, a hologram, and a sculpture located between the first gem and the second gem within the recess of the first gem. In one embodiment, the second gem serves as a lens to create an optical effect.

A method of the present invention is also presented for embedding a gem. In one embodiment, the method includes providing a first gem comprising a recess. The recess may include an opening at the location of the table. The first gem may have a first diameter. The method may include providing a second gem having a second diameter where the second diameter less than the first diameter of the first gem. The method may further include pressing the second gem into the recess of the first gem. A resistive fit within the recess of the first gem may result from the pressing step and may couple the first gem to the second gem.

In one embodiment, substantially no rotation is required during pressing the second gem into the first gem to create the resistive fit. In one embodiment, the method further includes the recess within the first gem. In a further embodiment, forming the recess within the first gem includes removing material from the first gem and the removed material includes an inclusion.

5 Reference throughout this specification to features, advantages, or similar language does not imply that all of the features and advantages that may be realized with the present invention should be or are in any single embodiment of the invention. Rather, language referring to the features and advantages is understood to mean that a specific feature, advantage, or characteristic described in connection with an embodiment is included in at least one embodiment of the
10 present invention. Thus, discussion of the features and advantages, and similar language, throughout this specification may, but do not necessarily, refer to the same embodiment.

 Furthermore, the described features, advantages, and characteristics of the invention may be combined in any suitable manner in one or more embodiments. One skilled in the relevant art will recognize that the invention may be practiced without one or more of the specific features or
15 advantages of a particular embodiment. In other instances, additional features and advantages may be recognized in certain embodiments that may not be present in all embodiments of the invention.

 These features and advantages of the present invention will become more fully apparent from the following description and appended claims, or may be learned by the practice of the
20 invention as set forth hereinafter.

BRIEF DESCRIPTION OF THE DRAWINGS

 In order that the advantages of the invention will be readily understood, a more particular description of the invention briefly described above will be rendered by reference to specific embodiments that are illustrated in the appended drawings. Understanding that these drawings
25 depict only some of the typical embodiments of the invention and are not therefore to be considered to be limiting of its scope, the invention will be described and explained with additional specificity and detail through the use of the accompanying drawings, in which:

 Figure 1 is a side view illustrating one embodiment of an insert gem and a host gem that may be used to create an embedded gem in accordance with the present invention;

30 Figure 2 is a side view illustrating one embodiment of an insert gem having a recess and a host gem having a recess that may be used to create an embedded gem in accordance with the present invention;

 Figure 3 is a side view illustrating one embodiment of an insert gem embedded in a host gem in accordance with the present invention;

Figure 4 is a bottom view of one embodiment of an insert gem illustrating the facets of a pavilion in accordance with the present invention;

Figure 5 is a top view of a host gem having a recess illustrating one embodiment of facets of a recess in accordance with the present invention;

5 Figure 6 is a top view of a host gem having a recess illustrating another embodiment of facets of a recess in accordance with the present invention;

Figure 7 is a top view of a host gem having a recess illustrating another embodiment of facets of a recess in accordance with the present invention;

10 Figures 8A is a side view of one embodiment of an insert gem and host gem with a recess having the faceting of Figure 7 in accordance with the present invention;

Figure 8B is a cut-away side view of one embodiment of the insert gem and host gem of Figure 8A with the insert gem received into the recess of the host gem in accordance with the present invention;

15 Figures 9A and 9B illustrate another embodiment of an insert gem and a host gem in accordance with the present invention;

Figures 10A and 10B illustrate another embodiment of an insert gem and a host gem in accordance with the present invention;

Figures 11A and 11B illustrate another embodiment of an insert gem and a host gem in accordance with the present invention;

20 Figure 12 is a cut-away side view illustrating one embodiment of a resistive fit between an insert gem and a host gem in accordance with the present invention;

Figures 13A-13F are a cut-away sides view illustrating various embodiments of resistive fits between a girdle of an insert gem and a wall of a recess of a host gem in accordance with the present invention;

25 Figures 14A-14C are top views of an insert gem and a host gem illustrating one embodiment of a resistive fit according to the present invention;

Figures 15A-15B are cut-away side views illustrating one embodiment of a resistive fit between an insert gem and a host gem that includes a dowel in accordance with the present invention;

30 Figures 16A-16B are cut-away side views illustrating one embodiment of a resistive fit between an insert gem and a host gem that includes a dowel in accordance with the present invention;

Figures 17A-17B are cut-away side views illustrating one embodiment of a resistive fit between an insert gem and a host gem that includes a dowel in accordance with the present

invention;

Figures 18A-18B are cut-away side views illustrating one embodiment of a resistive fit between an insert gem and a host gem where the host gem includes a dowel in accordance with the present invention;

5 Figures 19A-19B are cut-away side views illustrating one embodiment of a resistive fit between an insert gem and a host gem where the insert gem includes a dowel in accordance with the present invention;

10 Figures 20A-20B are cut-away side views illustrating one embodiment of an attachment mechanism for attaching an embedded gem to a jewelry base in accordance with the present invention;

Figures 21A-21B are cut-away side views illustrating one embodiment of an embedded gem including an insert gem acting as a lens in accordance with the present invention;

Figure 22 is a cut-away side view illustrating one embodiment of an embedded gem that creates a false image in accordance with the present invention;

15 Figure 23 is a cut-away side view illustrating another embodiment of an embedded gem that creates a false image in accordance with the present invention;

Figures 24A-24B are cut-away side views illustrating one embodiment of an embedded gem including a light source in accordance with the present invention;

20 Figure 25 is a schematic block diagram illustrating one embodiment of a method for creating an embedded gem in accordance with the present invention; and

Figure 26A-26B is a side view illustrating one embodiment of an insert gem and a host gem having an inclusion that may be used to create an embedded gem in accordance with the present invention.

DETAILED DESCRIPTION

25 Reference throughout this specification to “one embodiment,” “an embodiment,” or similar language means that a particular feature, structure, or characteristic described in connection with the embodiment is included in at least one embodiment of the present invention. Thus, appearances of the phrases “in one embodiment,” “in an embodiment,” and similar language throughout this specification may, but do not necessarily, all refer to the same
30 embodiment.

Furthermore, the described features, structures, or characteristics of the invention may be combined in any suitable manner in one or more embodiments. In the following description, numerous specific details are provided, such as examples of programming, software modules, user selections, network transactions, database queries, database structures, hardware modules,

hardware circuits, hardware chips, etc., to provide a thorough understanding of embodiments of the invention. One skilled in the relevant art will recognize, however, that the invention may be practiced without one or more of the specific details, or with other methods, components, materials, and so forth. In other instances, well-known structures, materials, or operations are not shown or described in detail to avoid obscuring aspects of the invention.

The schematic flow chart diagrams included herein are generally set forth as logical flow chart diagrams. As such, the depicted order and labeled steps are indicative of one embodiment of the presented method. Other steps and methods may be conceived that are equivalent in function, logic, or effect to one or more steps, or portions thereof, of the illustrated method. Additionally, the format and symbols employed are provided to explain the logical steps of the method and are understood not to limit the scope of the method. Although various arrow types and line types may be employed in the flow chart diagrams, they are understood not to limit the scope of the corresponding method. Indeed, some arrows or other connectors may be used to indicate only the logical flow of the method. For instance, an arrow may indicate a waiting or monitoring period of unspecified duration between enumerated steps of the depicted method. Additionally, the order in which a particular method occurs may or may not strictly adhere to the order of the corresponding steps shown.

Figure 1 depicts two gems, an insert gem 102 and a host gem 122, which may be used for creating an embedded gem, according to one embodiment. The two gems include an insert gem 102 and a host gem 122 and are depicted as embodying different sizes of a brilliant cut style gem. The insert gem 102, as depicted, includes a pavilion 104, a girdle 106, a crown 108, and a table 110. The host gem 122, as depicted, also includes a pavilion 124, a girdle 126, a crown 128, and a table 130. The insert gem 102 is depicted as being smaller than the host gem 122. In one embodiment, the insert gem 102 may be embedded within a recess of the host gem 122. In another embodiment, the host gem 122 may be embedded within the insert gem 122. One of skill in the art will recognize in light of the present disclosure that a large gem may be embedded in a smaller gem, in some embodiments.

The gems 102, 122 may be formed of a variety of different materials. As used herein the term “gem” is given to mean a natural, synthetic, or imitation material, whether natural or man-made, formed in the shape of a gem and thus is not limited by material. Thus, the gems 102, 122 may be formed from natural diamond, ruby, sapphire, emerald, or any other naturally occurring material or gemstone. The gems 102, 22 may also be formed of any artificial material such as artificial diamonds, rubies, cubic zirconium, crystals, or any other man made material. The gems 102, 122 may also be formed of materials that are not natural or artificial gemstones. For

example, the gems 102, 122 may be formed of glass, plastic, resin, or any other material. Due to the broad meaning of the term gem as used herein, the present disclosure is directed towards all material types and is thus not restricted to natural gemstones but may also apply to imitation gems or gemstones that may be used in costume jewelry, imitation jewelry, play jewelry, and/or toy jewels or jewelry.

Although the gems 102, 122 are depicted in a brilliant cut style, this is exemplary only. Gems of all different materials and styles may be used in accordance with the present invention. Additionally, although the smaller and host gems 102, 122 are depicted as having the same or similar cut style, different styled gems may be used in combination. In fact, later figures will illustrate exemplary embedded gems having variations in style as well as mixing of styles between insert and host gems. One of skill in the art will recognize great freedom in the types and cuts of gems which may be used to create an embedded gem due to the attachment mechanisms and other teaching herein.

Figure 2 illustrates the insert and host gems 102, 122 of Figure 1 and depicts one embodiment of a recess 202 in the host gem 122. The recess 202 is depicted with thin dotted lines to distinguish it from the outer facets of the host gem 122. The recess 202 is depicted as having a shape corresponding to the pavilion 104 of the insert gem 102.

The recess 202 as depicted is formed at the location of the table 130 of Figure 1. According to one embodiment, the opening of the recess 202 takes the place of the whole surface of a table of a gem. According to another embodiment, the opening of the recess 202 takes up only a portion of the surface of the table of a gem. For example, the edges of the recess may be set inward from the crown to allow for greater strength of the recess 202 walls at its opening. According to one embodiment, an inclusion is removed from the host gem during a forming of the recess 202.

The recess 202 may have a variety of shapes and configurations. According to one embodiment, the recess 202 may have a conical shape, spherical shape, pyramid, or any other shape. According to another embodiment, the recess 202 may include faceting or one or more facets. The term facet as used herein is given to mean a surface on a gem for reflecting light in a desired direction. Generally, facets are substantially planar and are set at angles to direct light towards a desired location. For example, in a brilliant cut style gem light is directed towards the table and/or crown to provide a brilliant appearance. According to one embodiment, the pavilion and/or crown of a gem includes a plurality of facets which define the shape of the pavilion or crown.

In embodiments where the recess 202 includes facets, the facets may be symmetrical or

non-symmetrical to a pavilion of an insert gem 102. For example, if the facets of the recess 202 are symmetrical to the pavilion 104, they may be formed having a substantially inverse shape of the pavilion 104 and the facets may be substantially aligned with corresponding facets of the pavilion 104 of the insert gem 102. Faceting of the recess 202 and the faceting of the pavilion 104 of the insert gem 102 will be discussed in greater detail in relation to Figures 4-7.

The recess 202 may be formed in the host gem 122 in a variety of manners. According to varying embodiments, laser cutting, drilling, filing, milling, planing, and/or use of computer numerical control (CNC) machine tools may be used to form a recess. According to some embodiments, the way the recess 202 is formed is dependent on the material type from which the host gem 122 is formed and/or the hardness of the material. For example, softer materials and/or materials with lower melting points may be formed with the use of molds or thermal fusion. Another example may include the formation using hot or cold casting methods to create different shapes. Harder materials and/or materials with higher melting points may be formed using a mill, chisels, saws, a laser, CNC machine tools, files, diamond tipped tools, etc.

Turning now to Figure 3, one embodiment of an embedded gem 300 is shown. As used herein the term embedded gem is given to mean an insert gem having a portion embedded within a recess of a host gem. According to one embodiment, the embedded gem 300 includes the insert gem 102 of Figures 1 and 2 inserted into the recess 202 of the host gem 122 of Figures 1 and 2. According to one embodiment, the pavilion 104 and the girdle 106 of the insert gem 102 has been received in to the recess 202.

The embedded gem 300 of Figure 3 may provide a greater number of facets than would otherwise be possible with a gem of similar size. For example, the extra facets of the crown of the insert gem 102 may increase total facets by one-third in some embodiments. Additional facets may also be obtained through faceting of a recess and the faceting of the pavilion of an insert gem. This may result in providing twice as many or more facets than with a similarly cut (or styled) gem having a weight similar to the insert gem 102 and the host gem 122 in combination. Facets within an embedded gem may create a glowing effect from within the gem, creating an appearance and beauty not otherwise obtainable. Additionally, interior faceting may create additional surface area and allow for greater reflections and/or refractions.

Additionally, the ability to embed gems may provide variation that may otherwise not be possible. Mixing and matching of gems, styles, colors, and or materials may allow for more interesting gems than is possible with a single gem. Additionally, various connections mechanisms may allow for secure reattachment of gems to allow for swapping and customizing jewelry for different occasions. According to one embodiment, each gem is modular so that it

may be swapped with one or more other gems to create custom configurations. For example, a plurality of gems having the same girdle, pavilion, or recess size may be swapped out for each other to create new and customizable variations. In one embodiment, the gems 102, 122 may be swappable by an end user. In another embodiment, special tools and/or training may be required for swapping.

Additional value may also be able to be obtained from gems having inclusions or other imperfections. Exemplary inclusions may include bubbles, cracks, mineral deposits, or any other type of inclusion. For example, a recess may be formed to remove an inclusion. The removing of an inclusion from a host gem, increasing the overall weight of a gem by inserting an insert gem, increasing facets, and/or increasing possible variety in configurations may help provide more value to the same set of gems than may be possible using traditional methods and practices.

Turning now to Figures 4-7, exemplary symmetrical and non-symmetrical faceting between the pavilion 104 of the insert gem 102 and the recess 202 of the host gem will be discussed.

Figure 4 depicts a bottom view of the insert gem 102 taken upward along the line 204 of Figure 2. Figure 4 depicts exemplary faceting of the pavilion 104 of the insert gem 102. It will be understood by one skilled in the art and in light of the present disclosure that the faceting of the pavilion 104 is exemplary only and may vary considerably. However, for the sake of simplicity and clarity, the alignment and symmetry between the specific faceting of the pavilion 104 and the faceting of the recess 202 will be discussed in relation to Figure 4 and Figures 5-7.

Figures 5-7 illustrate exemplary top views of the crown 228 and recess 202 taken downward along the line 204 of Figure 2, according to varying embodiments. Figure 5 illustrates a top view of the host gem 122 where the recess 202 includes faceting that is substantially symmetrical to the faceting of the pavilion 104 of the insert gem 102. The faceting of the recess 202 is substantially the inverse of the faceting of the pavilion 104 of the insert gem 102. According to one embodiment, the faceting of the recess 202 is substantially the inverse of the girdle 106 and the pavilion 104 of the insert gem 102. In other words, the concave recess 202 includes faceting substantially corresponding to the convex pavilion 104 of the insert gem 102.

According to one embodiment, the insert gem 102 may be inserted into the recess 202 such that the facets align. According to another embodiment, the insert gem 102 may be inserted such that the facets are off set. For example, the insert gem 102 may be rotated from its depicted position in Figure 4 such that the facets are symmetrically out of phase with the facets of the recess 202. This may be accomplished, for example, by rotating the insert gem 102 by $1/32^{\text{nd}}$ of

a rotation in relation to the host gem 122 because the pattern of the facets repeats every $1/16^{\text{th}}$ of a rotation. According to one embodiment, the gems 102, 122 are rotated with respect to each other prior to embedding the insert gem 102 within the host gem 122. In one embodiment, the gems 102, 122 are rotated with respect to each other following embedding the insert gem 102 within the host gem 122.

Figure 6 illustrates a top view of the host gem 122, according to another embodiment. In the depicted embodiment of Figure 6 the recess 202 includes faceting that is non-symmetrical to the faceting of the pavilion 104 of the insert gem 102, as depicted in Figure 4. Specifically, the faceting of the recess 202 of Figure 6 is a substantially different configuration from that of the pavilion 104 of Figure 4.

Figure 7 illustrates a top view of the host gem 122, according to yet another embodiment. In the depicted embodiment of Figure 7 the recess 202 includes faceting that is non-symmetrical to the faceting of the pavilion 104 of the insert gem 102, as depicted in Figure 4. More specifically, the recess 202 includes faceting to create a spherical shape.

Figures 8A and 8B illustrate an insert gem 102 and a host gem 122 having a recess 802 with the spherical faceting depicted in the top view of Figure 7. In Figure 8A the recess 802 is depicted with thin dotted lines to distinguish it from the outer facets of the host gem 122. The recess 802 is depicted as having a circular shape.

Although the Figures 5-7 illustrate recesses 202 having internal faceting a variety of shapes may also be created without faceting. For example, a smooth spherical, smooth pyramid, or any other shape of a recess may be created, according to different embodiments. Additionally, the insert gem 102 that is inserted within a host gem 122 need not be round or substantially round. For example, girdles 126 having corners, oblong shapes, or non-symmetrical shapes may be used in some embodiments. For example, gems having such shapes may be inserted by pressing the gem into a recess of another gem. Further discussion of mounting mechanisms and methods is included in relation to later figures.

Figure 8B is a cutaway side view of an embedded gem 800 that includes the insert gem 102 and the host gem 122 of Figure 8A. A portion of the host gem 122 is depicted as cut away to more clearly show the non-symmetrical faceting between the recess 802 of the host gem 122 and the pavilion 104 of the insert gem 102.

In the depicted embodiment of an embedded gem 800, a gap is shown between the surface of the recess 802 and the surface of the pavilion of the insert gem 102. According to at least one embodiment, there may be little or no gap between the insert gem 102 and the host gem 122. For example, the shapes of the pavilion 104 of an insert gem 102 and a recess 802 of a host

gem may be formed having such tight tolerances that substantially no gap exists between the two gems 102, 122. In another embodiment, a gap of varying sizes may be created between the two gems 102, 122. According to one embodiment, a gap may be filled with air or a gas or any other medium. According to one embodiment, a gap may be filled with an optical glue or other material. For example, a flowing material may be added to the gap which may then harden in the gap.

According to one embodiment, the material in the gap may have a refractive index similar to one or both of the insert gem 102 and the host gem 122. The refractive index of the material corresponds to the velocity of light through a vacuum divided by the velocity of light through the material and can be used to describe how light will act a boundary between different materials. A gap filled with a material may be desirable, for example, if it is desired that the gap or gaps between the recess 802 and the insert gem 102 not be visible. For example, if the material within the gap has substantially the same refractive index as both of the gems 102, 122, the gap or even the boundary between the gems 102, 122 may not be visible. It may also be desirable to control the way light bounces between the glue or optical material in the gap and a surface of the host gem 122 and/or the insert gem 102. According to one embodiment, the gap may be filled with a material having a refractive index different from the insert and host gems 102, 122. For example, an air or a filler material may have a different refractive index and may lead to more optical bending and reflection of light. Other optical properties of a medium, such as color, may be desirable in some embodiments.

Figures 9A-11B illustrate exemplary embodiments of embedded gems that includes gems of different cut styles than those depicted in the previous figures. Figure 9A includes an insert gem 902 and a host gem 922. The insert gem 902 is depicted having a simple sphere cut style (based on Simple Sphere cut style by Greg Glenn) and the host gem 922 is depicted as having Portuguese Cut (based on The Portuguese Cut by Bob Keller). The host gem 922 has a spherical recess 802 similar to the recess 802 of Figure 8. Figure 9B depicts the insert gem 922 and the host gem 922 of Figure 9A coupled to form one embodiment of an embedded gem 900.

Figure 10A is a top view of an insert gem 1002 and a host gem 1022 that includes a recess 202. The insert gem 1002 and host gem 1022 are both depicted having a marquise cut style (based on a marquise cut style registered with the United States Faceters Guild). The host gem 1022 has a recess 202 that corresponds to the shape of the pavilion of the insert gem. Figure 10B is a side view of the insert gem 1002 and the host gem 1022. Dotted lines indicate a shape of the recess 202 that corresponds to the insert gem 1002.

In the embodiment of Figures 10A 10B the insert gem 1002 and recess 202 are not round

or substantially round shapes. According to one embodiment, mounting methods that require a rotation of the insert gem 1002 with respect to the host gem may not function with non-round shapes. For example, the illustrated marquise cut style is oblong and could not be rotated within the recess 202. Methods for mounting non-round gems will be discussed below.

5 Figure 11A is a top view of an insert gem 1002 and a host gem 1022 that form an embedded gem 1100. Figure 11B is a side view of the embedded gem of Figure 11A. The insert gem 1102 is depicted having a simple sphere cut style (based on Simple Sphere cut style by Greg Glenn) and the host gem 1122 is depicted as having a pear cut style (based on a pear cut style registered with the United States Faceters Guild). The insert gem 1102 is shown mounted within
10 a recess of the host gem 1122

Figures 1-11B are exemplary only and depict only exemplary embodiments of embedded gems. Considerable variation and additional features are possible. For example, the types of gems used in the exemplary embodiments of Figures 1-11 could vary widely. According to one embodiment, an insert gem 102 and a host gem 122 are formed of the same type of material.
15 According to another embodiment, the insert gem 102 is formed of a different material than the host gem. One or both of the insert gem 102 and the host gem 122 may be formed of natural materials, artificial materials, and/or synthetic materials. Exemplary materials may include gemstone such diamond, ruby, sapphire, or any other gemstone. Other exemplary materials may include synthetic or artificial diamond, ruby, or other synthetic materials such as cubic
20 zirconium. The gems may also comprise imitation jewelry or costume jewelry materials such as glass, plastic, crystal, or any other natural or synthetic materials.

According to one embodiment, coatings may be applied to one or more surfaces of one or both of the insert gems and the host gems. According to one embodiment, a reflective coating is applied to the interior surface of a recess. For example, a coating may be placed on interior
25 facets within a recess. According to one embodiment, a reflective coating is applied to a portion of an insert gem that is received into a recess. For example, the pavilion 104 of the insert gem 102 of Figures 2 and 3 and/or the recess 202 of the host gem 122 of Figure 2 may be coated with a reflective coating. A reflective coating may be desirable to limit the amount of light transferred between the insert gem 102 and the host gem 122. This may be desirable, for
30 example, if the insert gem 102 and the host gem 122 are different colors. A reflective coating may help maintain a difference in color between the two gems. Exemplary reflective coatings may include a silvering or other coating that reflects light rather than lets it pass through the coated surface. According to one embodiment, a black coating may also be used to limit light transfer between gems. Coatings may be applied to one or more surfaces of the insert and/or

host gems using a variety of methods. For example, plating, leafing, sputtering, vapor deposition, painting, or any other method may be utilized to coat a surface with a desired coating material. Other coatings having other special optical properties are also possible and may be desirable in some embodiments. Such optical properties may include polarizing of light and/or providing a tint to a gem. Additionally, coatings may have an opaque, transparent, or semi-transparent appearance.

According to one embodiment, a coating may be applied to one or more surfaces to provide and/or change a color of a gem. For example, a red, blue, or any other color coating may be applied to a pavilion or recess surface to make an embedded gem appear to be different than its true color. Additionally, a coating may be used to apply a tint, such as a darker or lighter tint, to a surface of a gem.

The insert gems 102, 1002 and host gems 122, 1022 may be permanently, semi-permanently, or removably attached. According to one embodiment, the gems, and any other gems may be modular such that one gem may be interchanged with another gem. According to one embodiment, the insert gems 102, 1002 are permanently attached within the host gems 122, 1022 and are not removable without damaging one or both of the gems. According to another embodiment, the gems are semi-permanently attached and can only be safely removed with special skills, tools, and/or methods. According to yet another embodiment, the insert gems 102, 1002 may be removably attached to the host gems 122, 1022 such that the gems may be removed, and swapped by an end user, such as a consumer, to create custom jewelry. For example, a user may have a number of different gems and may be able to interchange and swap them to create new looks to match different outfits, etc.

Turning now to Figures 12-20B a number of mechanisms for coupling a host gem 122 to an insert gem 102 will be discussed. According to one embodiment, the attachment mechanism comprises a resistive fit to couple the two gems 102, 122 together. As used herein the term resistive fit is given to mean a fit between two components that provides mechanical resistance to coupling and/or removal. For example, friction, retaining bumps or features, or other configurations may be used to provide mechanical resistance to retain an insert gem 102 within a host gem 122. According to one embodiment, a resistive fit requires no, or substantially no, rotation. For example, an insert gem 102 may be mounted within a host gem 122 by providing force to press the insert gem 102 into the host gem 122. According to another embodiment, the attachment mechanism comprises an adhesive. According to yet another embodiment, the attachment mechanism comprises both a resistive fit and an adhesive. According to another embodiment, the attachment mechanism comprises lugs and corresponding groves. According to

another embodiment, the attachment mechanism comprises threading, similar to threading on nuts and bolts or other threaded mechanical fasteners.

Figure 12 illustrates a cross sectional side view of an embedded gem 1200 that includes an insert gem 102 and a host gem 122, according to one embodiment. A resistive fit is depicted between the insert gem 102 and host gem 122. More specifically a resistive fit between the girdle of the insert gem 102 and a wall of a recess of the host gem 122 is illustrated in box 1202. Exemplary embodiments of resistive fits between the girdle and wall will be discussed in relation to Figures 13A-13F.

A gap 1204 within the recess between the insert gem 102 and 122 is also depicted. The gap 1204 may vary greatly in size. For example, see the gap between the insert gem 102 and large gem 122 of Figure 8B. According to one embodiment, the gap 1204 is extremely small or nonexistent. This may be the case, for example, in the case of a precision fit between the insert gem 102 and the host gem 122. According to one embodiment, the gap 1204, if present, may be empty. For example, the gap may include only air or a vacuum. According to one embodiment, the gap 1204 may include an optical filling such as a glue, plastic, epoxy, rubber, or any other filling. An optical filling may have any of the optical properties previously discussed.

According to one embodiment, the gap 1204 may be filled with a optical filling that has desirable optical properties, such as being transparent, having a color/tint matching one or both of the gems 102, 122, and/or having a refractive index approximately matching one or both of the gems 102, 122. A refractive index is a number indicating the speed of light in a material. More specifically it is a ratio of the velocity of light in a vacuum divided by the velocity of light through a reference material. The refractive index may be used to calculate the way light will refract (bend) or reflect (bounce) at a boundary between materials. According to one embodiment, the gap may be filled with a non-toulene diisocyanate (non-TDI) urethane having a same refraction coefficient (refractive index) as a gem. Other materials may be used having other optical properties not explicitly mentioned herein.

Turning now to Figures 13A-13F exemplary configuration of the resistive fit between the girdle 106 of the insert gem 102 and a wall 1302 of the recess of the host gem 122. The Figures are shown from an enlarged view depicted by the box 1202 of Figure 12.

Figure 13A depicts a vertical wall 1302 which engages a girdle 106 of the insert gem 102. According to one embodiment, friction between the wall 1302 and the girdle 106 may help retain the insert gem 102 within a recess of the host gem 122. According to one embodiment, a tight fit between the girdle 106 and the wall 1302 provides pressure which increases friction and creates a secure coupling of the insert gem 102 to the large gem.

According to one embodiment, the orientation of the crystal lattice of one or both of the gems 102, 122 may be evaluated to determine a desired orientation of an insert gem 102 within a host gem. For example, some materials, such as diamond, quartz, amethyst, sapphire, ruby, or other materials, may have a lattice structure that is stronger in one direction but weaker in another direction. Additionally some materials, such as diamond, may expand or contract with changes in temperature to a greater or lesser extent in one direction than in another direction. It may be desirable to orient the lattices of one or both of the insert gem 102 and the host gem 122 to reduce breakage of one of the gems 102, 122 and or to provide a tight fit between the gems 102, 122.

According to one embodiment, both the insert gem 102 and the host gem 122 are formed of diamond. If the lattice orientations of an insert gem 102 and a host gem are not matched, the insert gem may vary in size with temperature to a greater extent, in at least one direction, than the host gem 122. This may cause the insert gem 102 to expand and break the host gem 122. The same orientation may also result in the insert gem 102 shrinking such that it falls out of the host gem 122. In other embodiments, it may be desirable to purposely not match the lattice orientations. For example, unmatched lattice orientations may result in a tighter fit between the gems 102, 122 in some embodiments. It will be understood in light of the present disclosure by one skilled in the art that different materials may have different lattice structures, grains, and/or expansion coefficients.

The width (or height) of the girdle 106 and the wall 1302 is exemplary only. The girdle 106 and wall 1302 may vary in width, according to different embodiments. For example, the width of the girdle 106 and/or wall 1302 may be increased to increase the surface area engaged between the insert gem 102 and the host gem 122. Increased surface area may result in greater friction and/or strength in the couple between the insert gem 102 and the host gem 122. The width of the girdle 106 and/or wall 1302 may also be varied to vary the size of a recess and/or vary the impact that the girdle and/or wall 1302 have on the way light bounces within an embedded gem 200.

Figure 13B depicts a wall 1302 having a small bump or ridge past which the girdle 106 must slide or snap to engage the large gem 122 provide a resistive fit in a recess. The bump or ridge on the wall 1302 may vary in size. For example, with harder materials a smaller bump or ridge may be sufficient to retain the insert gem 102 within the host gem 122. Additionally, it may not be possible to insert an insert gem 102 into a host gem if the ridge is too big. With softer materials, a larger bump or ridge may allow the insert gem 102 to be inserted and may be needed to securely retain the insert gem 102 within a recess.

Figure 13C depicts a wall 1302 that angles inward such the insert gem 102 is retained in the recess. According to one embodiment, the angle of the wall 1302 is only slightly angled inward to encourage the insert gem 102 to remain within the recess.

Figures 13D-13F depict resistive fits similar to the resistive fits of Figures 13A-13C. However, the distance between the wall 1302 and the crown is greater. For example, the walls 1302 of Figures 13A-13C terminates very close to the slope of a crown of the host gem 122. In Figures 13D-13F the walls 1302 terminate some distance from the slope of a crown. This may be done, for example, by creating a recess having a diameter smaller than a diameter of a table of the host gem 122. This may provide more strength and may reduce likelihood of cracking or breakage of the host gem and may increase the amount of pressure that can be created between the girdle 106 and the wall 1302. This may, in turn, provide a more secure couple between gems.

The insert gem 102 may be inserted into the recess of the host gem 122 in a variety of manners. According to one embodiment, the insert gem 102 is forced into the host gem 122. For example, pressure may be applied to the crown of the insert gem 102 and to the pavilion of the host gem 122, such as by using a clamp or press, to force the girdle 106 to engage the wall 1302. According to one embodiment, the girdle 106 is forced to slide or snap into the recess and engage the wall 1302. In one embodiment, no rotation or substantially no rotation is required to slide, press, or snap the insert gem 102 into the host gem 122.

According to one embodiment, the temperature of one or both of the insert gem 102 and the host gem 122 are changed to alter the size of the gems 102, 122. For example, the host gem 122 may be heated such that it expands while the insert gem 102 is cooled such that it shrinks in size. The insert gem 102 may then be placed within the host gem 122. According to one embodiment, this may still require some amount of force to press the insert gem 102 within the host gem 122. As the gems 102, 122 then approach the same or similar temperature, they may then contract or expand such that movement of the insert gem 102 out of the recess is resisted. According to one embodiment, an adhesive is used to retain the insert gem 102 within the host gem. For example, a glue, a heat activated adhesive, or any other adhesive is applied to help maintain the insert gem 102 within the host gem 122.

The cross-sectional shapes of Figure 12 and 13A-13F are exemplary only. Any gem cut style may be used according to varying embodiments. For example, ball cut style, marquise cut style, pear cut style, or any other cut style may also be used. According to one embodiment, the widest portion of a ball cut style gem may act as a girdle, similar to the girdles 106 of Figures 16A and 13A-13F.

According to one embodiment, the surface of the girdle 106 around the diameter of the insert gem 102 engages the wall 106 around the diameter of the recess of the host gem 122. For example, the girdle 106 and the wall 1302 may have a uniform diameter. According to another embodiment, only a portion of the diameter of the girdle 106 engages the wall 1302.

5 Turning now to Figures 14A-14C one exemplary embodiment of an attachment mechanism between an insert gem 102 and a host gem 122 is shown. According to the depicted embodiment, an insert gem 102 may be coupled in a host gem 122 by inserting the insert gem 102 and rotating the insert gem 102 in relation to the host gem 122.

Figure 14A depicts a top view of a host gem 122 and an insert gem 102. For simplicity, 10 faceting of the gems 102, 122 is not shown. With regards to the host gem 122 the outer circumference or girdle, the wall 1302 of a recess 202, and three ridges 1402 are shown. With regards to the insert gem 102 the girdle 106 and three protrusions 1404 are shown. According to other embodiments there may be fewer or a greater number of ridges 1402 and protrusions 1404.

Figure 14B depicts a top view of the insert gem 102 which has been inserted into the host 15 gem 122. The insert gem 102 is depicted with its protrusions 1404 offset from the ridges 1402 of the host gem 122.

Figure 14C depicts a top view of the insert gem 102 which has been inserted into the host gem 122 and has been rotated in relation to the host gem 122 such that the ridges 1402 and the protrusions 1404 engage. According to one embodiment, friction between the protrusions 1404 20 of the insert gem and the ridges 1402 and wall 1302 of the host gem 122 resists movement of the insert gem 102 from the recess 202.

The ridges 1402 and protrusions 1404 are exemplary only. According to one embodiment, the ridges 1402 may include grooves and the protrusions 1404 may include lugs. The grooves may be formed to receive the lugs to retain the insert gem 102 at least partially 25 within the recess of the host gem 122. Other embodiments may include threading, similar to threading used on nuts and bolts. According to yet other embodiments, the insert gem 102 may have ridges 1402 while the host gem 122 has protrusions 1404.

Figures 15A and 15B depict an embedded gem 1500 having a resistive fit between an insert gem 102 and a host gem 122 provided by a dowel 1502. Figure 15A depicts unassembled 30 components 102, 122, and 1502 of an embedded gem 1500. The components 102, 122, 1502 are depicted from a cross sectional cut-away view. The components include an insert gem 102, a host gem 122 and a dowel 1502. The host gem 122 includes a recess 202 for receiving the insert gem 102. The recess 202 and the pavilion of the insert gem 102 include channels 1504 for receiving the dowel 1502. The channels 1504 are depicted as only going partially into each of

the insert gem 102 and the host gem 122.

According to one embodiment, the dowel 1502 is made of the same type material as the insert gem 102 and/or the host gem 122. This may allow the dowel 1502 to be substantially invisible to an observer of an assembled embedded gem 1500. According to one embodiment, the dowel 1502 may also vary in length and diameter. For example, a thicker diameter may result in a stronger coupling of the insert gem 102 to the host gem 122. A smaller diameter may result in a more invisible dowel 1502.

[0100] Additionally, the dowel 1502 may be faceted. This may create additional reflections and refractions of light and may lead to a more brilliant looking embedded gem 150. According to one embodiment, a surface of the dowel 1502 and/or channel may be coated with a reflective or colored coating, or coatings having other optical properties as previously discussed.

Figure 15B depicts the components 102, 122, and 1502 in an assembled configuration. The dowel 1502 has been received by the channels 1504 in the insert gem 102 and the host gem. According to one embodiment, the dowel 1502 has a friction fit with both the insert gem 102 and the host gem 122. The dowel 1502 may provide significant strength in retaining the gems 102, 122 together. The dowel 1502 may vary considerably in configuration such as in diameter, length, faceting, material, or in other properties.

The embedded gem 1500 may be assembled in a similar manner mentioned in relation to Figures 12-14B. For example, the different components 102, 122, 1502 may be pressed together using a clamp, press, or other mechanism. In one embodiment, one or more of the different components 102, 122, 1502 of the embedded gem 1500 may be heated and/or cooled prior to assembly. This may allow for a more secure friction fit. Additionally, glue or any other adhesive may also be used. Similarly to the insertion discussed in relation to Figures 12-14B it may be desirable or necessary to evaluate the crystalline structure of the insert gem 102, the host gem 122, and/or the dowel 1502 to provide a secure resistive fit and/or reduce breakage.

According to one embodiment a ring may be placed around the dowel 1502 and insert gem 102 and/or between the dowel 1502 and the host gem 122. For example, one or more small rings may be placed on the dowel 1502 prior to insertion into the channel 1504. According to one embodiment, a ring may be formed of a metal, elastomer, rubber, plastic, or any other material. According to one embodiment, the ring between the dowel 1502 and the channel 1504 provides a friction fit or a resistive fit to retain the dowel 1502 within the channel 1504.

According to one embodiment, the dowel 1502 and or the channel 1504 may include one or more grooves corresponding to a desired placement of a ring. For example, a ring placed in a groove on the dowel 1502 may resist movement away from the groove of dowel 1502 and a ring

placed in a groove in the channel 1504 may resist movement away the groove of the channel 1504. Thus, if a ring and dowel 1502 are placed within the channels 1504, the movement of the gems 102, 122 may be resisted in relation to the dowel 1502.

Figures 16A and 16B another embodiment of an embedded gem 1600 having a resistive fit provided by a dowel 1602 is shown. Figure 16A depicts unassembled components 102, 122, and 1602 of an embedded gem 1600. The components 102, 122, 1602 are depicted from a cross sectional cut-away view. The components include an insert gem 102, a host gem 122 and a dowel 1602 having prongs. The host gem 122 includes a recess 202 for receiving the insert gem 102. The recess 202 includes a channel 1604 for receiving the dowel 1602. The insert gem 102, rather than having a channel as depicted in relation to Figures 15A and 15B includes detents 1606 or a hidden crown for engaging the prongs of the dowel 1602.

According to one embodiment, the dowel 1602 may be formed of two or more materials. According to one embodiment the shaft of the dowel 1602 may be formed of gemstone, glass, plastic, or any other material and the prongs of the dowel 1602 formed of metal.

Figure 16B depicts the components 102, 122, and 1602 assembled. The dowel 1602 may provide a resistive fit between itself and the host gem 122 through friction between the walls of the dowel 1602 and the walls of the channel 1604. The dowel 1602 may also provide a resistive fit between itself and the insert gem 102 through the prongs of the dowel 1602 and detents 1606, the crown of the insert gem 102, or a hidden crown. In one embodiment, the prongs of the dowel 1602 are longer and extend to the crown of the insert gem 102.

According to one embodiment, the dowel may be first attached to the insert gem 102 through use of the prongs of the dowel 1602 and the insert gem 102 and then inserted into the channel 1604 of the host gem 122. According to another embodiment, the dowel 1602 is first inserted into the channel 1604 of the host gem 122 followed by which the insert gem 102 is inserted into the recess 202 and attached to the prongs of the dowel 1602

Figures 17A and 17B depict another embodiment of an embedded gem 1700 having a resistive fit provided by a dowel 1704. Figure 17A depicts unassembled components 102, 122, 1702, and 1704 of an embedded gem 1700. The components 102, 122, 1702, and 1704 are depicted from a cross sectional cut-away view. The components include an insert gem 102, a host gem 122, a third gem 1702, and a dowel 1704. The host gem 122 includes a recess 202 for receiving the middle gem 1702. The third gem 1702 also includes a recess for receiving the insert gem 102. The recess 202 of the host gem 122, the pavilion of the insert gem 102, and the middle gem 1702 all include channels 1706 for receiving the dowel 1704.

Figure 17B depicts the components 102, 122, 1702, and 1704 assembled to create an

assembled embedded gem 1700. According to the depicted embodiment, the dowel 1704 may provide a resistive fit between itself and the host gem 122, insert gem 102, and/or the middle gem 1702 through friction between the walls of the dowel 1704 and the walls of the channels 1706. A resistive fit between the dowel 1704 and insert gem 102 and between the dowel 1704 and host gem 122 may help securely couple the host gem 122 and the insert gem 102 together, with the middle gem 1702 between.

Although the dowels 1502, 1602, and 1704 are described in relation to a friction fit other types of fits are also possible. For example, threading may be used on the dowels and/or channels in one embodiment. In other embodiments, a lug and corresponding groove may be used. According to yet another embodiment an adhesive may be used to secure the dowel and gems.

According to one embodiment, a reflective coating may be applied to portions of one or more of the insert gem 102, the third gem 1702, the dowel 1704, and the host gem 122. This may be desirable, for example, to limit the amount of light that passes from one component of the embedded gem 1700 to another component. For example, according to one embodiment, the insert gem 102, the host gem 122 and the dowel 1704 may be formed of the same type of material and have a similar color while the middle gem 1702 is formed of a different material and/or has a different color. In such an embodiment, it may be desirable to provide a reflective, or semi-reflective, coating between the middle gem 1702 and the other components 102, 122, and 1704. This may allow the appearance middle gem 1702 to not be affected by different colored components and vice versa.

According to one embodiment, the dowel 1704 may act as a waveguide between two or all of the host gem 122, the insert gem 102, and the middle gem 1702. This may be desirable, for example, to provide additional illumination between gems or between different layers of gems. For example, if the insert gem 102 and host gem 122 are the same color but the middle gem 1702 is a different color a reflective coating between the middle gem 1702 and other components may be used. However, if a portion of the dowel 1704 that is in contact with the host gem 122 and a portion of the dowel 1704 that is in contact with the insert gem 102 is not coated, light may be allowed to pass between the insert gem 102 and the host gem 122 through the dowel 1704. According to one embodiment, this may allow different layers of the dowel 1704 to be alternately transparent or opaque. This may allow different gems to have different levels of illumination. According to one embodiment, the colors of one gem may not be allowed to bleed into another gem. According to another embodiment, coatings may allow for incidental illumination control over each gem.

As will be understood in light of the present disclosure by one skilled in the art, the attachment mechanisms comprising a dowel, such as dowels 1502, 1602, and 1704, are exemplary only. Considerable variation as well as combination with additional features is possible. For example, the diameter of the dowels 1704, 1602, and 1502 are exemplary only.

5 Variation on the length, diameter, and/or shape of the dowels may be present in different embodiments. Additionally, any of the features, methods, or mechanisms discussed in relation to other figures may also be incorporated in the embodiments of Figures 15A-17B, or any other embodiment.

Turning now to Figures 18A, 18B, 19A, and 19B exemplary dowels that are formed as part of one of the insert gem 102 and host gem 122 are depicted. Figure 18A depicts exemplary components of an embedded gem 1800. Specifically, an insert gem 102 having a channel 1802 and a host gem 122 having a dowel 1804 in a recess 202 are shown.

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According to one embodiment, the dowel 1804 is configured to have a resistive fit within the channel 1802. According to one embodiment, the fit between the channel 1802 and the dowel 1804 is so tight that the gems 102, 122 may be permanently or semi-permanently affixed.

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This may help limit the insert gem 102 falling out of the recess 202 of the host gem 122 and being lost.

According to one embodiment, the fit between the channel 1802 and the dowel 1804 is tight enough to securely attach the insert gem 102 within the recess 202 of the host gem 122 yet still allow the insert gem 102 to be removed. For example, the insert gem 102 may snap onto the dowel 1804 of the host gem similar to the way Lego ® bricks, or the like, snap together and can be removed.

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According to one embodiment, various portions of an embedded gem may be shaped complicated shapes to form 3-dimensional puzzle pieces. For example, 3 or more pieces, such as an insert gem 102, host gem 122 and one or more other pieces, may fit together to form a gem.

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The shapes of the pieces may be formed such that it is not clear how they fit together, thus forming a puzzle that a user would need to assemble.

According to one embodiment, a reattachable nature of the connection mechanism between the insert gem 102 and the host gem 122 may allow for ease in swapping gems and creating new looks. For example, a set of modular plastic play jewelry for children may be provided where different gems can be swapped and attached in a variety of ways.

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Figure 18B depicts the insert gem 102 and the host gem 122 in an attached configuration to form an embedded gem 1800.

Figures 19A and 19B are similar to Figures 18A and 18B, according to one embodiment.

However, the insert gem 102 includes a dowel and the host gem 122 includes a channel. Figure 19A depicts exemplary components of an embedded gem 1900. Specifically, an insert gem 102 having a protruding dowel 1902 and a host gem 122 having a channel 1904 in a recess 202 are shown. Figure 19B depicts the insert gem 102 and the host gem 122 attached to form an embedded gem 1900.

Figures 20A and 20B illustrate one embodiment of using a pin 2002 for embedding a gem. Figure 20A illustrates exemplary unassembled components of an embedded gem 2000. The components include an insert gem 102, a host gem 122, and a pin 2002. The pin includes prongs 204 and grooves 2006. The prongs 2004 may be configured to engage detents 2008 of the insert gem 102. The grooves 2006 may be provided for attaching to a jewelry base. Figure 20B depicts the components of Figure 20A in an assembled configuration to form an embedded gem 2000. The insert gem 102 is shown attached to the prongs 2004 of the pin 2002. The attached pin 2002 and insert gem 102 are shown inserted into the host gem 122. The pin 2002 extends through a channel 2010. The grooves 206 of the pin 2002 extend past the host gem 122. According to one embodiment, a jewelry base may receive a portion of the pin 2002 and engages the grooves 2006 to retain the pin 2002, insert gem 102, and the host gem 122 on the jewelry base.

The embodiments of Figures 12-20B are exemplary only. Although various embodiments have been discussed in relation to a permanent, semi-permanent, or removable attachment each embodiment may be used according to any method. For example, the embodiment of Figures 20A and 20B may be used to permanently attach the embedded gem 2000 to a ring. Alternatively, the embodiment of Figures 20A and 20B may be used to removable attach to a jewelry base and allow for swapping of gems 102, 122 with other gems. Similarly the embodiment of Figures 12-19B may be used to permanently attach insert gems 102 to host gems 122. Alternatively, the embodiment of Figures 12-19B may be used to removable attach to insert gems 102 to host gems 122 and allow for swapping of gems 102, 122 with other gems.

According to one embodiment, a variety of gems may be modular. For example, an insert gem may be swappable with another insert gem. A host gem may be swappable with another gem, and a middle gem may also be swappable with another middle gem. A modular configuration of various gems may allow for easy customization of an embedded gem by a jeweler and/or a consumer, in some embodiments.

As will be understood in light of the present disclosure by one of skill in the art, the features, shapes and configurations discussed in the various embodiments may be used in any

embodiment. For example, the rings discussed in relation to Figures 15A-15B may be used on any embodiment that includes a dowel. Additionally, a resistive fit between a girdle of an insert gem and a wall of the recess of a host gem may be used in conjunction with a dowel.

Turning now to Figures 21A-23, exemplary embodiments of insert gems 102 acting as a lens are depicted. Figures 21A and 21B illustrate one embodiment of an embedded gem 2100 that includes an image 2102. Figure 21A depicts the components of the embedded gem 2100 which include an insert gem 102, a host gem 122, and an image 2102. The host gem 122 includes a recess 202 for receiving the insert gem 102. The recess 202 of the host gem includes a floor 2104 for receiving the image 2102. The insert gem 102 includes a cullet 2106.

The image 2102 is depicted having a substantially flat disc shape and having a likeness of a flower. According to one embodiment, the likeness of the flower is printed, etched, or engraved on the image 102. Other likenesses may be included in other embodiments. According to one embodiment, the image 2102 is a piece of material having a picture and/or symbol printed or engraved thereon. According to the depicted embodiment, the image 2102 is depicted as including a piece of material separate from the host gem 122 and the insert gem 102. According to one embodiment, the image 2102 may include another object such as a sculpture, memento, or other object. For example, the image 2102 may be replaced by a baby tooth, a tiny sculpture of a flower, a lock of hair, etc. According to one embodiment, the image may comprise an adhesive for adhering to one or both of the floor 2104 and the cullet 2106. According to one embodiment, an image 2102 is painted, printed, or otherwise placed on the floor 2104 and/or cullet 2106.

Figure 21B depicts the components 102, 122, and 2102 of the embedded gem 2100 in assembled form. The image 2102 is shown between the cullet 2106 of the insert gem 102 and the floor 2104 of the recess 202 of the host gem 122. According to one embodiment, the likeness included on the image 2102 is visible through the table when viewed in the direction indicated by arrow 2108.

According to one embodiment, the cullet 2106 and/or table of the insert gem 102 may act as a lens through which to view the image 2102, when the components 102, 122, and 2102 are in assembled form. According to one embodiment, the cullet 2106 and/or table may include curvature and/or a Fresnel lens for making the image 2102 appear larger or smaller when viewed through the table of the insert gem 102. For example, a convex (curved outward from the center of the insert gem 102) curvature on the cullet 2106 may make the image 2102 appear larger when the embedded gem 2100 is viewed from the direction indicated by arrow 2108. Additionally or alternatively, the table of the insert gem 102 may include a convex curvature such that the image 2102, when viewed through the table in the direction indicated by arrow

2108, appears larger. According to one embodiment, one or both of the cullet 2106 and the table of the insert gem 102 have a concave (curved inward toward the center of the insert gem 102) curvature. According to one embodiment, a Fresnel type lens may be created by engraving ridges on one or both of the cullet 2106 and table of the insert gem 102. According to varying
5 embodiments, the table and/or cullet may include one or a combination of concave, convex, or Fresnel type lenses.

According to one embodiment, the image 2102 is magnified such that it appears to fill the table of the insert gem 102. According to another embodiment, the image 2102 is magnified such that it appears to fill the table and the crown of the insert gem 102.

10 In one embodiment, the image 2102 may not be visible until a drop of water is placed on the table of the insert gem 102. According to one embodiment, the table of the insert gem 102 has a concave curvature that makes the image 2102 hard to see by making it appear very small. For example, the concave curvature of the table of the insert gem 102 may make it so that when the embedded gem 2100 is viewed in the direction indicated by arrow 1208, the image 2102 is
15 not visible. According to one embodiment, when a drop of water is placed on the concave table of the insert gem 102, the image 2102 is magnified and becomes visible.

According to the depicted embodiment, the insert gem 102 is coupled to the host gem 122 by a resistive fit between the girdle of the insert gem 102 and a wall of the recess 202 of the host gem 122. According to another embodiment, the insert gem 102 may be coupled to the host gem
20 122 with a dowel. For example, the image 2102 may be placed between an end of the dowel and one of the insert gem 102 and the host gem 122.

Figure 22 depicts an embedded gem 2200 that creates a false image 2204 that appears to float outside of an embedded gem 2200. The embedded gem 2200 includes an insert gem 102, a host gem 122, and an image 2102. The host gem 122 includes a recess 202 having a curved
25 surface. For simplicity of explanation, the insert gem 102 is depicted as formed in the shape of a concave-convex lens. According to another embodiment, the insert gem 102 may have a more traditional gem cut style with a curvature and/or Fresnel lens on a cullet and/or a curvature and/or Fresnel lens on a table to create a desired false image.

According to one embodiment, the image 2102 is held in place against a surface of the
30 insert gem 102 such that the likeness faces towards the interior of the host gem 122. According to one embodiment, the image 2102 is embedded in the insert gem 102 or the host gem. In the depicted embodiment, the image 2102 is depicted as centered on the lower surface of the insert gem 102. In some embodiments, the image 2102 may be set off to one side and/or embedded within the insert gem 102.

According to one embodiment, the image 2102 is held in place by the use of an adhesive. According to another embodiment, a likeness is painted, printed, etched, or engraved on a surface of the insert gem 102 and/or the host gem 122. According to one embodiment, a small sculpture may replace the image 2102. Use of such a 3-dimensional object, such as a sculptor, may allow
5 for the creation of a hologram. For example, the false image 2204 may appear as a 3-dimensional object that appears to float above the embedded gem 2200. According to one embodiment, a 3-dimensional object may be created by engraving dimples on or in one or both of the insert gem 102 and the host gem 122. In one embodiment, the image 2102 itself may be a hologram recorded on a holographic medium.

10 According to one embodiment, when viewed in the direction indicated by the arrow 2202 a false image 2204 of the image 2102 is visible. According to one embodiment, the false image 2204 appears to float above the embedded gem 2200. The lines 2206 indicate exemplary paths for rays bouncing off the image 2102, host gem 122 and insert gem 102 to create a floating false image 2204.

15 It should be understood that the configuration depicted in Figure 22 is exemplary only. The shape of the recess 202, insert gem 102, and host gem 122 are subject to considerable variation. For example, the recess 202 may include a larger or smaller, concave or convex, curved surface. The insert gem 102 may have a more traditional cut style and the false image 2204 may be projected through a culet and table of an insert gem 102. According to one
20 embodiment, the recess 202 may be filled with air. According to another embodiment, the recess 202 may be filled with an optical element such as a plastic, glue, or other material. An optical element may be desirable for example, if the refractive index of air does not provide the right amount of bending that may be possible with another optical material. For example, the paths for rays, as indicated by lines 2206, may be varied by the use of an optical material in the recess
25 202.

According to one embodiment, one or more surfaces of the embedded gem 2200 may be coated to obtain desirable bounces or bends for rays. According to one embodiment, a reflective coating may be applied to a surface of the recess 202 to provide maximum reflection of rays. According to one embodiment, an anti reflective coating may be applied to a surface of the insert
30 gem 102 to provide for minimum reflection. Such coatings may allow for a false image 2204 to appear brighter and/or sharper.

Objects other than the image 2102 may also be used to create the false image 2204. For example, an object, such as a baby's tooth, a lock of hair, or a miniature sculpture may be placed within the recess 202 to create a projected false image 2204. According to another embodiment,

a holographic master may be used to create a 3-dimensional image at the place of the false image 2204. According to another embodiment, a holographic master may be created on a table of an insert gem 102 or in the recess 202.

Figure 23 depicts another embodiment of an embedded gem 2300 that includes an insert
5 gem 102 that acts as a lens. According to the depicted embodiment, the embedded gem 2300 creates a false image 2304 that is visible from the direction indicated by the arrow 2302, similar to the embedded gem 2200 of Figure 22. However, the insert gem 102 is shown having a cut style that looks like a more traditional gem. According to some embodiments, the embedded gem 2300 of Figure 23 may be more pleasing to look at than the embedded gem 2200 of Figure
10 22. One of skill in the art will recognize in light of the present disclosure that the projection of a false image 2304 is possible with an insert gem 102 having a variety of shapes and styles.

Figures 24A and 24B illustrate an embedded gem 2400 with a light source 2402 within the embedded gem 2402, according to one embodiment. Figure 24A illustrates unassembled components of the embedded gem 2400 including an insert gem 102, a host gem 122, and light
15 source 2402. The light source 2402 includes wires 2404 and the host gem 122 includes a channel 2010 through which the wires 2404 may be routed to a power supply or control module. For example, a power supply or control module external to the embedded gem 2400 or on a jewelry base (such as a ring, necklace, pin base, or any other base) may provide electrical energy to power the light source 2402. In one embodiment, the light source is a light emitting diode
20 (LED) or any other type of light source.

Figure 24B illustrates the embedded gem 2400 in an assembled configuration. The light source 2404 is shown within the recess 202 of the host gem 122 and the insert gem 102 is shown mounted within the recess 202 as well. The wires 2404 extend from the light source 2402 and out the embedded gem 2400 through the channel 2010. According to one embodiment, the
25 embedded gem 2400 may be mounted on a ring, ear ring, necklace, or any other ornament or jewelry. The light source 2402 may be lit to illuminate the embedded gem 2400. A power source or control module on the jewelry may provide electricity to the light source.

Figure 25 illustrates one embodiment of a method 2500 for embedding a gem. The steps 2502-2508 of the method 2500 may be performed by a human or by a machine. For example, a
30 human may manually perform one or more of the steps and/or a partially automated or fully automated machine may perform one or more of the steps. The human or automated machine may perform one or more of the steps using a variety of tools such as a mill, press, saw, laser, chisel, CNC router, diamond tip tools, or any other tool known in the art.

The method 2500 begins and a first gem and a second gem are provided 2502. The first

gem may have a diameter larger than the second gem. The first gem may include a larger gem such as the host gems 122 illustrated in any of the accompanying figures. The second gem may include a smaller gem such as the insert gems 102 illustrated in any of the accompanying figures.

5 A recess is formed 2504 in the first gem. The recess is formed 2504 large enough such that a portion of the second gem may be received into the recess. According to one embodiment, the first gem includes a girdle and the recess is large enough to receive a portion of the first gem that includes the girdle. According to one embodiment, the first gem includes a girdle and a pavilion and the recess is large enough to receive a portion of the first gem that includes the pavilion and the girdle. According to varying embodiments, the recess and or the portion of the
10 second gem received into the recess may or may not include faceting.

According to one embodiment, the recess may be formed 2504 such that an inclusion is removed from the first gem.

A resistive fit is created 2506 between the first gem and the second gem. The resistive fit may include a tight fit between a girdle of the second gem and a wall of the recess of the recess
15 formed 2504 in the first gem. See for example, Figures 12-14B. Alternatively or additionally, the resistive fit may include a dowel having a tight fit between itself and the first gem and the second gem. In one embodiment, the resistive fit may include a straight-in press fit where no rotation is required. For example, the gems may be pressed together such that they slide or snap into a seated position.

20 A portion of the second gem is coupled 2508 within the recess of the first gem. The second gem may be coupled 2508 within the recess of the first gem using the resistive fit. According to one embodiment, an adhesive may be used to couple 2508 a portion of the second gem within the recess of the first gem. Adhesives may include a tape, a glue, an optical glue, a cement, an epoxy, a rubber, a plastic, a heat activated adhesive, or any other adhesive known in
25 the art. According to one embodiment, only a weak adhesive may be needed if used in conjunction with a resistive fit between the first gem and the second gem.

Figures 26A and 26B depict one embodiment of forming an embedded gem 2600 from gems that include a host gem 122 having an inclusion 2602. Figure 26A illustrates an insert gem 102 and a host gem 122. The host gem 122 includes an inclusion 2602. The inclusion 2602 may
30 include dirt, a carbon speck, a graphite speck, a crack, a bubble, a split, an imperfection in the host gem 122, a mineral deposit, or any other possible inclusion known in the art. According to one embodiment, the inclusion 2602 may include one or more grains of material that differs from the majority of the rest of the host gem 122.

According to one embodiment, the host gem 122 and the insert gem 102 may be used as a

first gem and a second gem, respectively, in the method 2500 of Figure 25. According to one embodiment, the step of forming 2504 a recess in the first gem includes forming a recess in the host gem 122 such that the inclusion 2602 is removed.

5 In order to form 2504 the recess it may be necessary to plan for the removal of the inclusion. According to one embodiment, the crystalline or lattice structure of the host gem 122 is examined. The location of the inclusion may also be determined. A recess having a location, a shape, and a connection mechanism that would result in the removal of the inclusion 2602 may be determined.

10 Figure 26B depicts the insert gem 102 embedded within the host gem 122. The embedded gem 2600 now includes an insert gem 102 received into a recess of the host gem 122. According to the depicted embodiment, the inclusion 2602 of Figure 26A has been removed. According to one embodiment, the embedded gem 2600 of Figure 26B may have a greater value than the total value of the insert gem 102 and the host gem 122 of Figure 26A. This may be because the removal of the inclusion 2602, the increase weight of the embedded gem, and/or
15 additional facets may result in a higher value to purchasers.

The present invention may be embodied in other specific forms without departing from its spirit or essential characteristics. The described embodiments are to be considered in all respects only as illustrative and not restrictive. The scope of the invention is, therefore, indicated by the appended claims rather than by the foregoing description. All changes which come within
20 the meaning and range of equivalency of the claims are to be embraced within their scope.

CLAIMS

1. An embedded gem comprising:
a first gem comprising a recess, the recess comprising an opening at the location of the
table, the first gem comprising a first diameter; and
5 a second gem coupled to the first gem, the second gem having a second diameter less
than the first diameter of the first gem, wherein a resistive fit within the recess of
the first gem couples the first gem to the second gem, at least a portion of the
second gem disposed within the recess.
2. The embedded gem of claim 1, wherein the resistive fit comprises a press fit where
10 substantially no rotation is required for insertion or removal of the second gem.
3. The embedded gem of claim 1, wherein the resistive fit is between the first gem and the
second gem.
4. The embedded gem of claim 3, wherein the resistive fit is between a wall of the recess of
the first gem and a girdle of the second gem.
- 15 5. The embedded gem of claim 1, further comprising a coupling mechanism, wherein the
resistive fit is between the coupling mechanism and one of the first gem and the second
gem.
6. The embedded gem of claim 5, wherein the coupling mechanism comprises a dowel.
7. The embedded gem of claim 6, wherein the dowel provides the resistive fit coupling the
20 first gem to the second gem and wherein the resistive fit is between the dowel and the
first gem and the dowel and the second gem.
8. The embedded gem of claim 1, wherein the recess of the first gem comprises faceting.
9. The embedded gem of claim 1, wherein the second gem comprises a pavilion within the
recess of the first gem, the pavilion comprising faceting.
- 25 10. The embedded gem of claim 9, wherein the recess of the first gem comprises faceting
symmetrical to the faceting of the pavilion of the second gem.

11. The embedded gem of claim 9, wherein the recess of the first gem comprises faceting non-symmetrical to the faceting of the pavilion of the second gem.
12. The embedded gem of claim 1, wherein one or both of the first gem and the second gem comprise:
 - 5 a natural gemstone;
 - a synthetic gemstone;
 - glass;
 - crystal;
 - plastic; and
 - 10 costume jewelry
13. The embedded gem of claim 1, further comprising a light source within the recess of the first gem.
14. The embedded gem of claim 1, wherein the second gem serves as a lens for an interior of the first gem.
- 15 15. The embedded gem of claim 14, further comprising one of an image, a hologram, and a sculpture located between the first gem and the second gem within the recess of the first gem, wherein the second gem serving as a lens creates an optical effect.
16. A method for embedding a gem, the method comprising:
 - 20 providing a first gem comprising a recess, the recess comprising an opening at the location of the table, the first gem comprising a first diameter;
 - providing a second gem having a second diameter, the second diameter less than the first diameter of the first gem; and
 - pressing the second gem into the recess of the first gem, wherein a resistive fit within the recess of the first gem coupling the first gem to the second gem is created.
- 25 17. The method of claim 16, wherein substantially no rotation is required during pressing the second gem into the first gem to create the resistive fit.
18. The method of claim 16, further comprising forming the recess within the first gem.

19. The method of claim 18, wherein forming the recess within the first gem comprises removing material from the first gem, wherein the material removed comprises an inclusion.

20. An embedded gem comprising:

5 a first gem comprising a first diameter, the first gem further comprising an opening at the location of the table, the recess comprising faceting; and
a second gem coupled to the first gem, the second gem having a second diameter less than the first diameter of the first gem, the second gem comprising a girdle and a pavilion, and wherein the pavilion comprises faceting, wherein a resistive fit
10 between the first gem and the second gem within the recess of the first gem couples the first gem to the second gem, the pavilion and girdle of the second gem within the recess, wherein the resistive fit is between a wall of the recess of the first gem and the girdle of the second gem, and wherein the resistive fit comprises
15 a press fit where substantially no rotation is required for insertion or removal of the second gem.

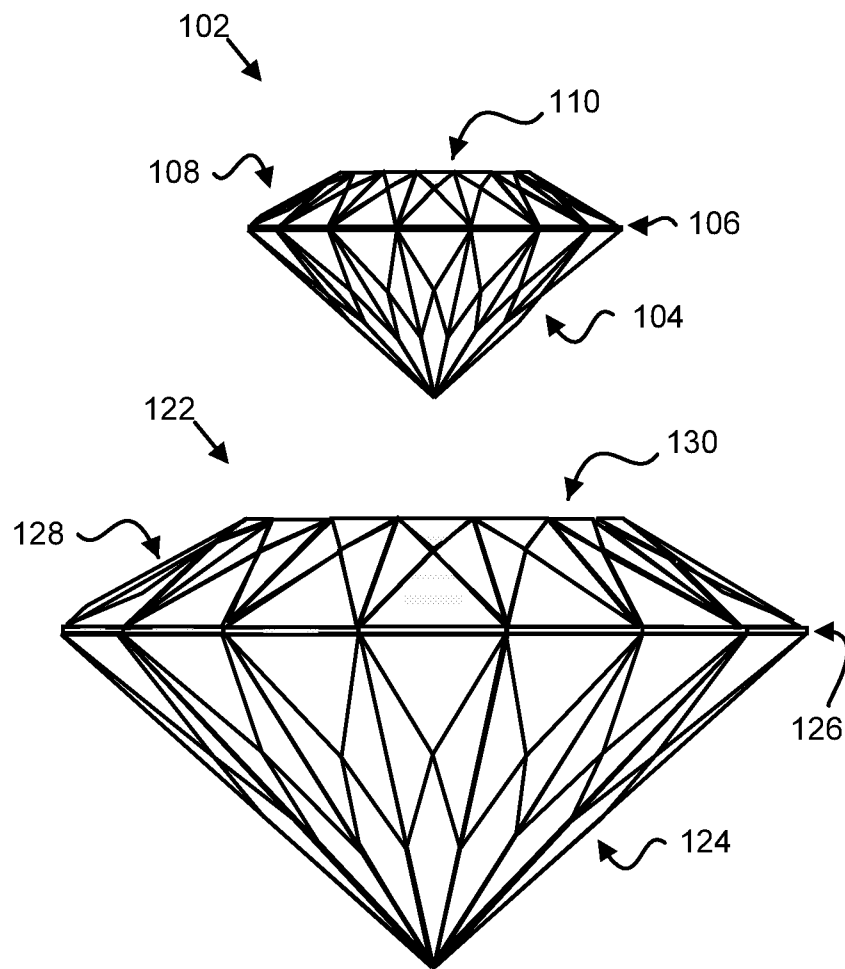
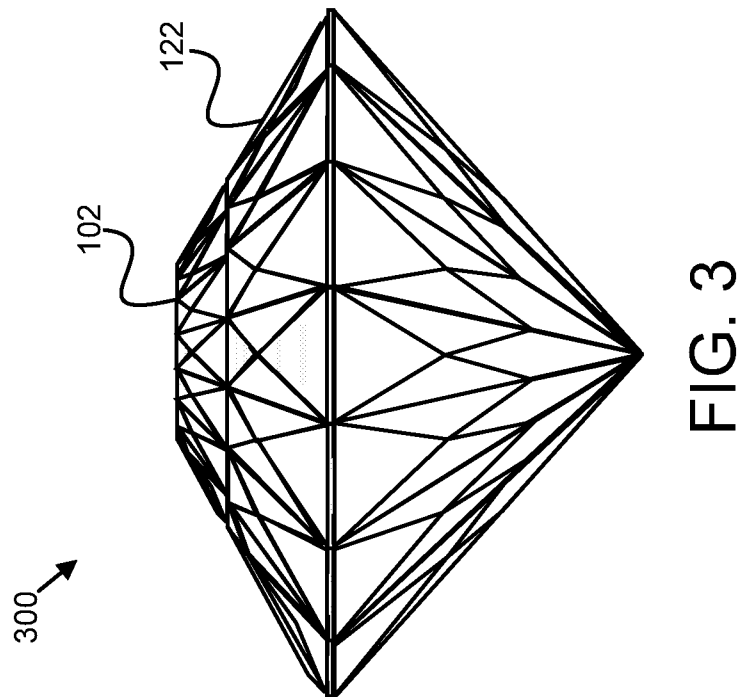
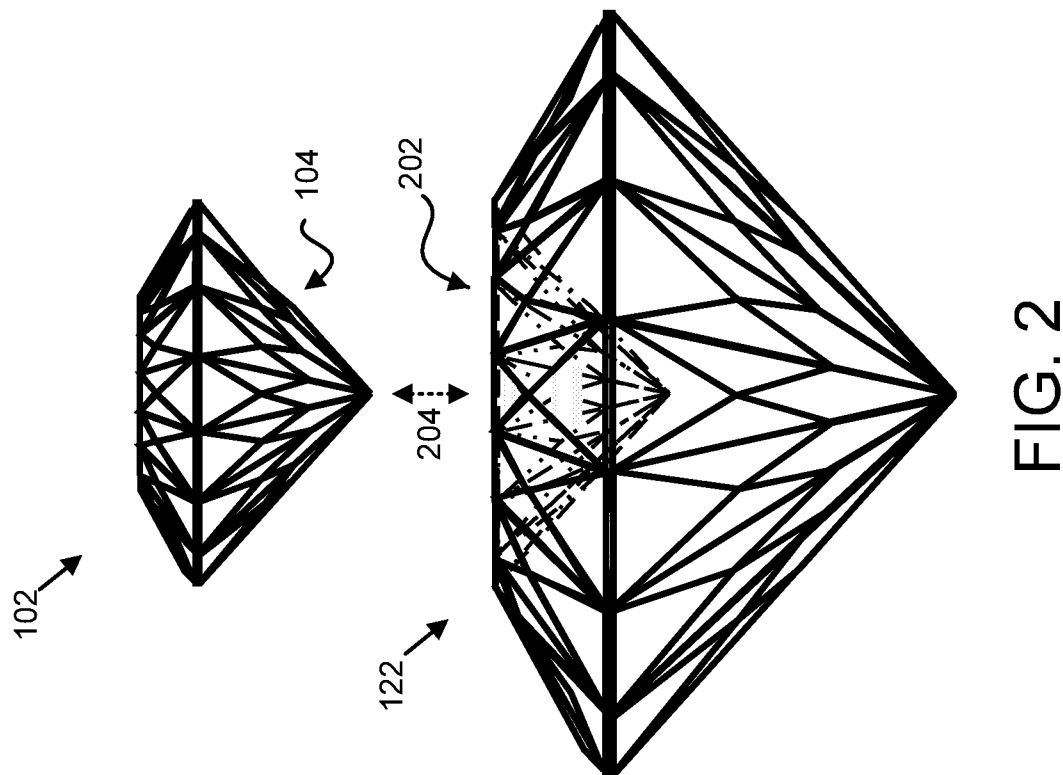


FIG. 1



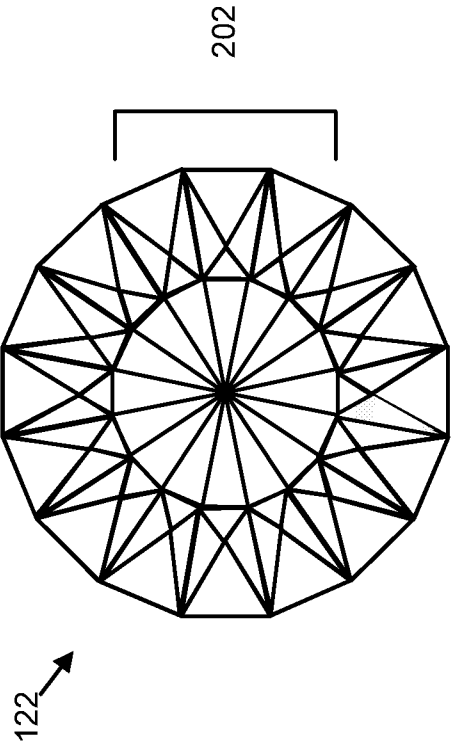


FIG. 4

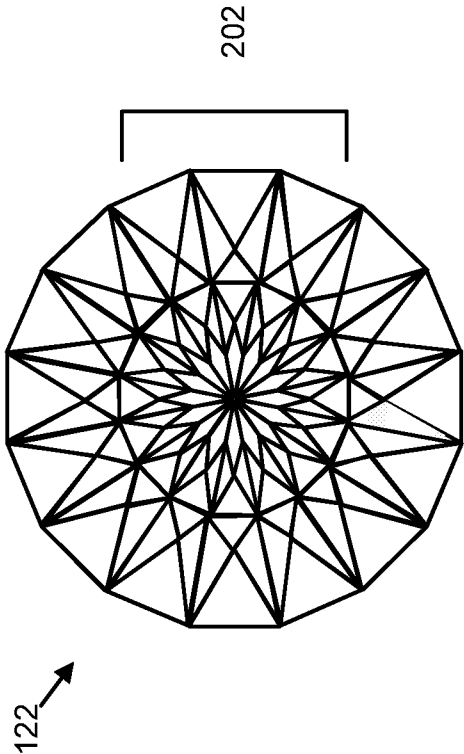


FIG. 5

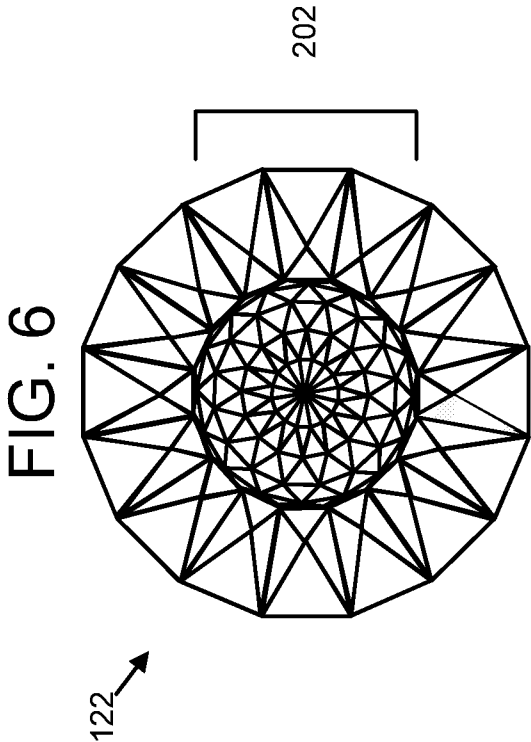


FIG. 6

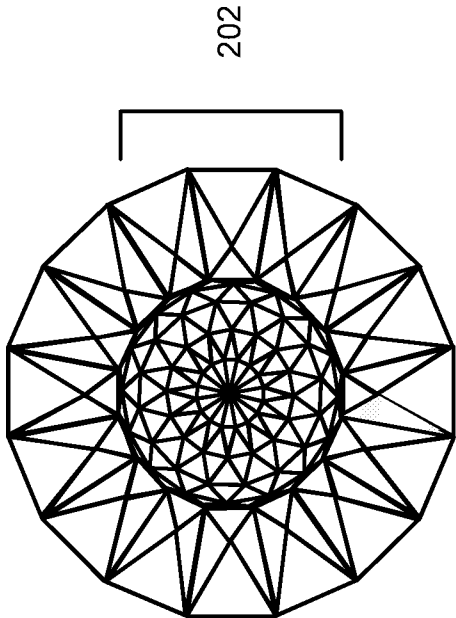


FIG. 7

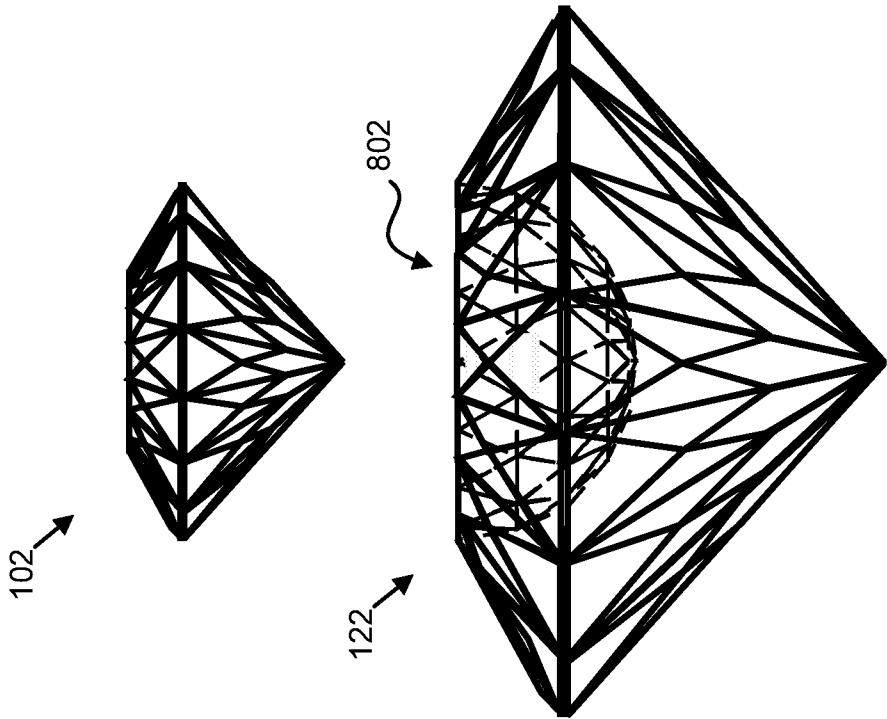


FIG. 8A

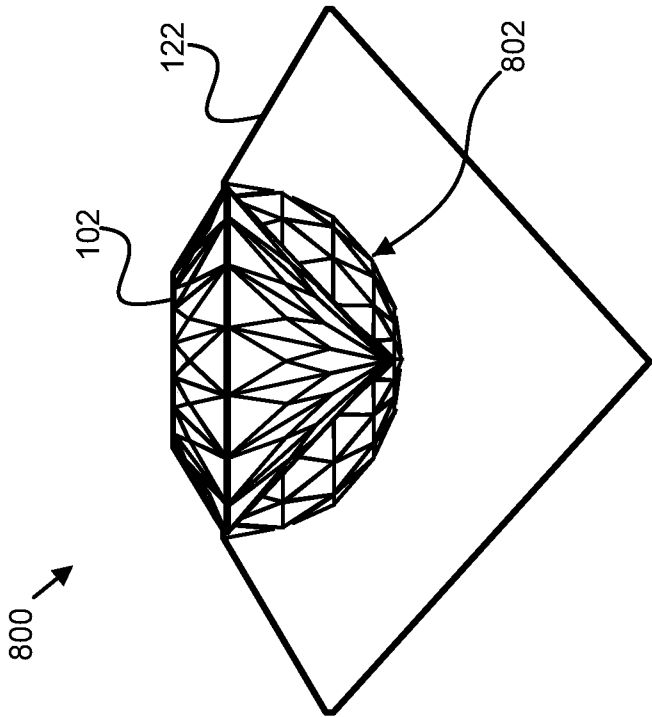


FIG. 8B

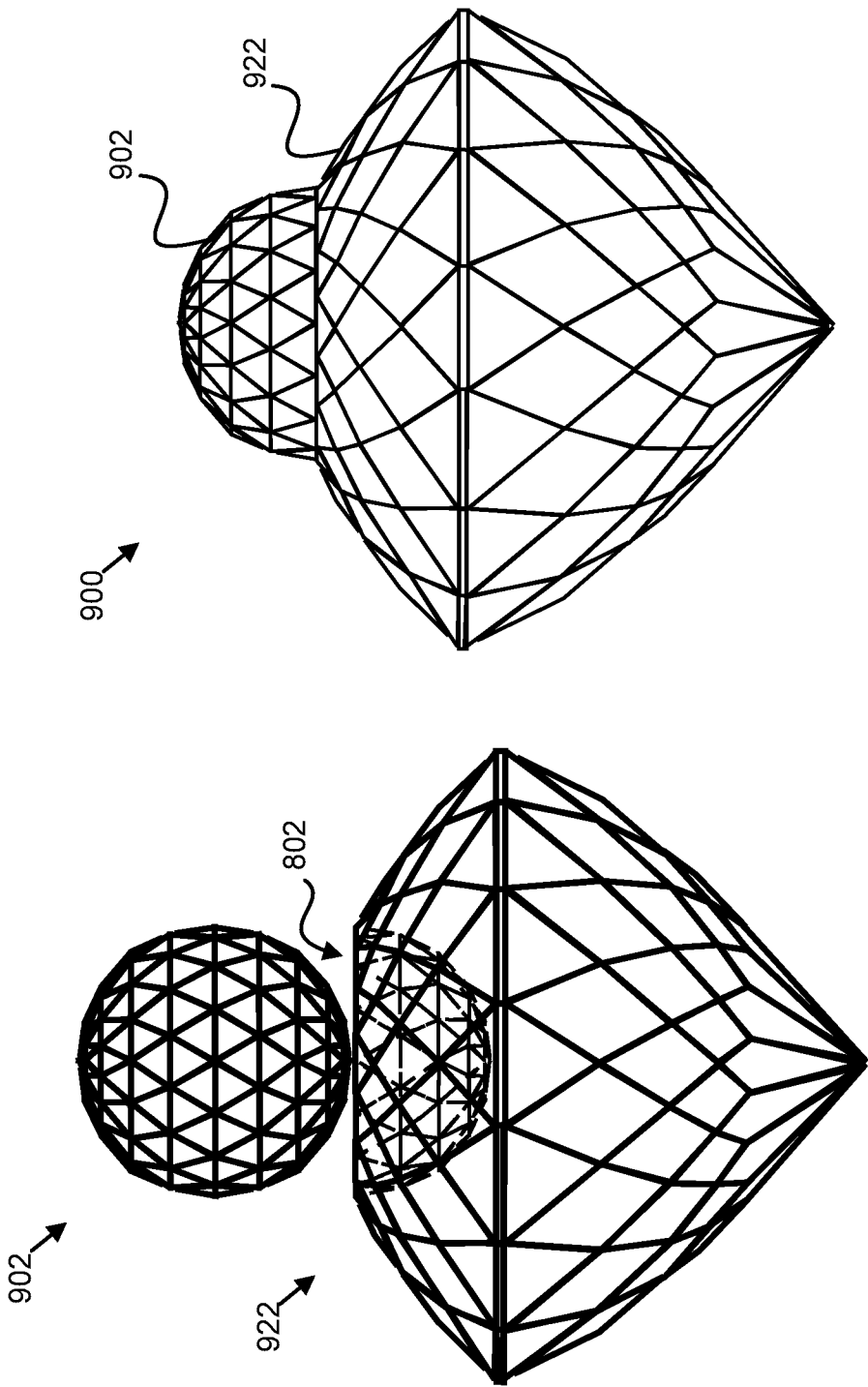


FIG. 9B

FIG. 9A

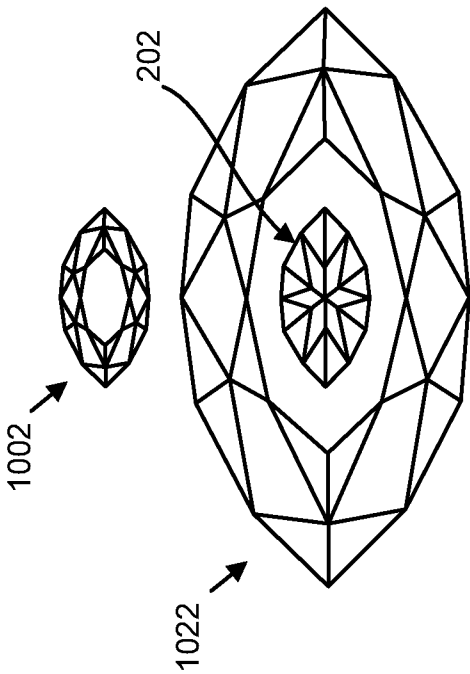


FIG. 10A

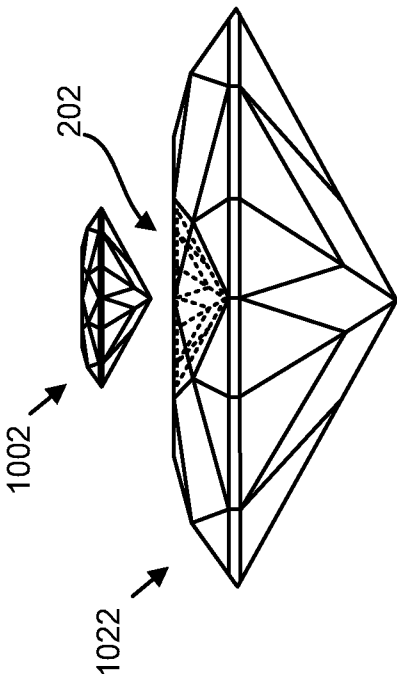


FIG. 10B

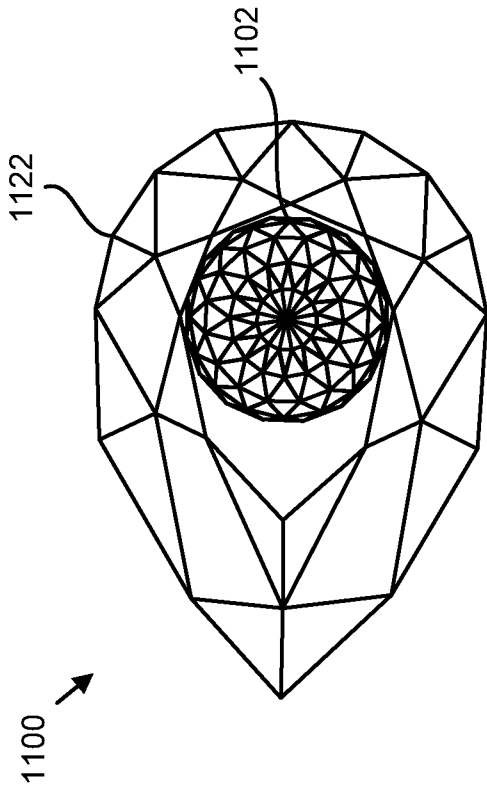


FIG. 11A

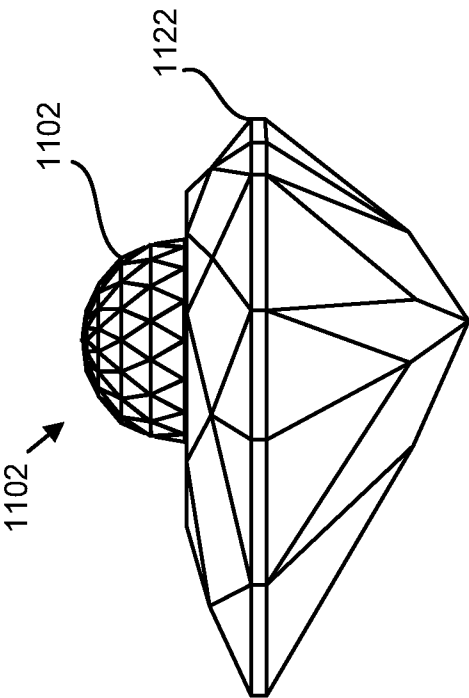


FIG. 11B

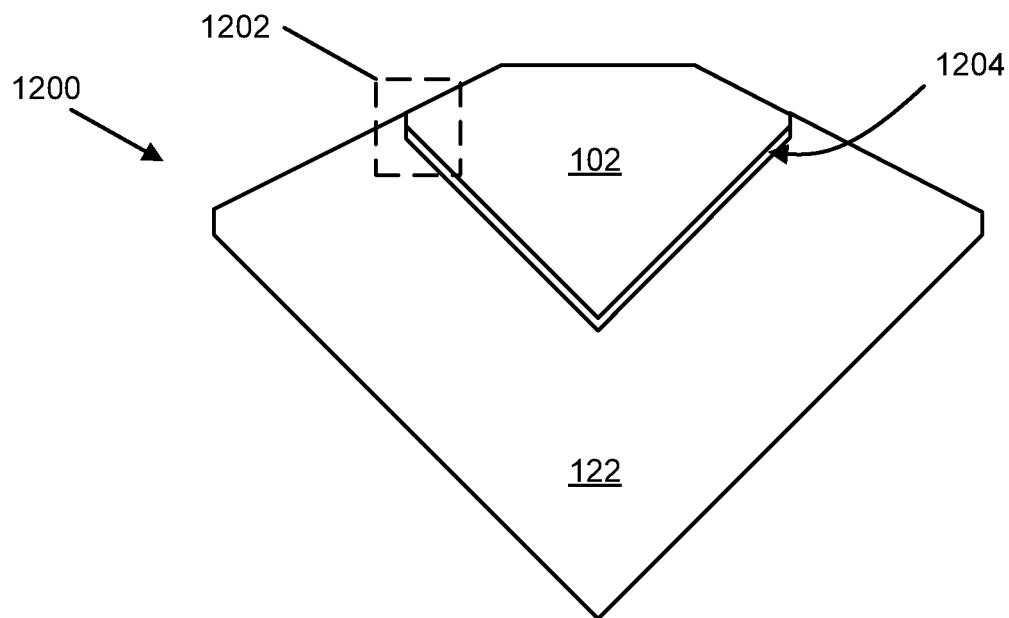


FIG. 12

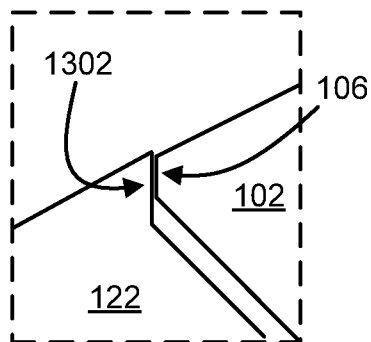


Fig. 13A

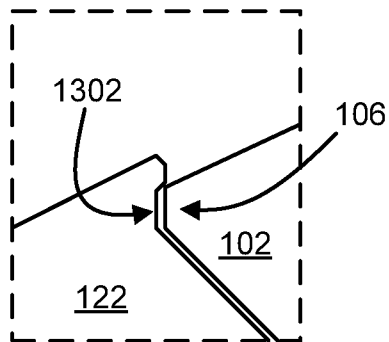


Fig. 13B

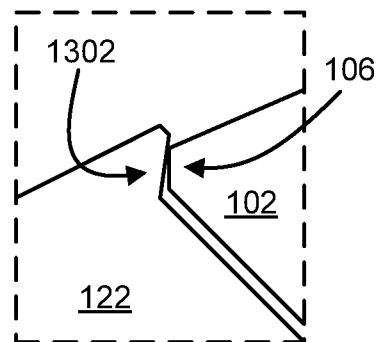


Fig. 13C

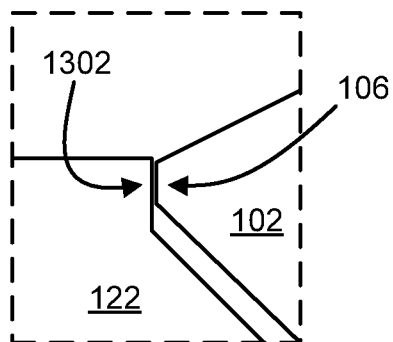


Fig. 13D

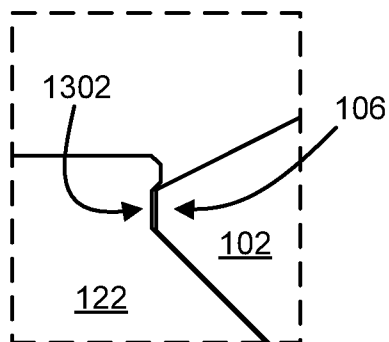


Fig. 13E

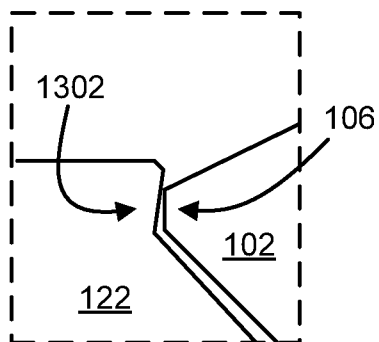


Fig. 13F

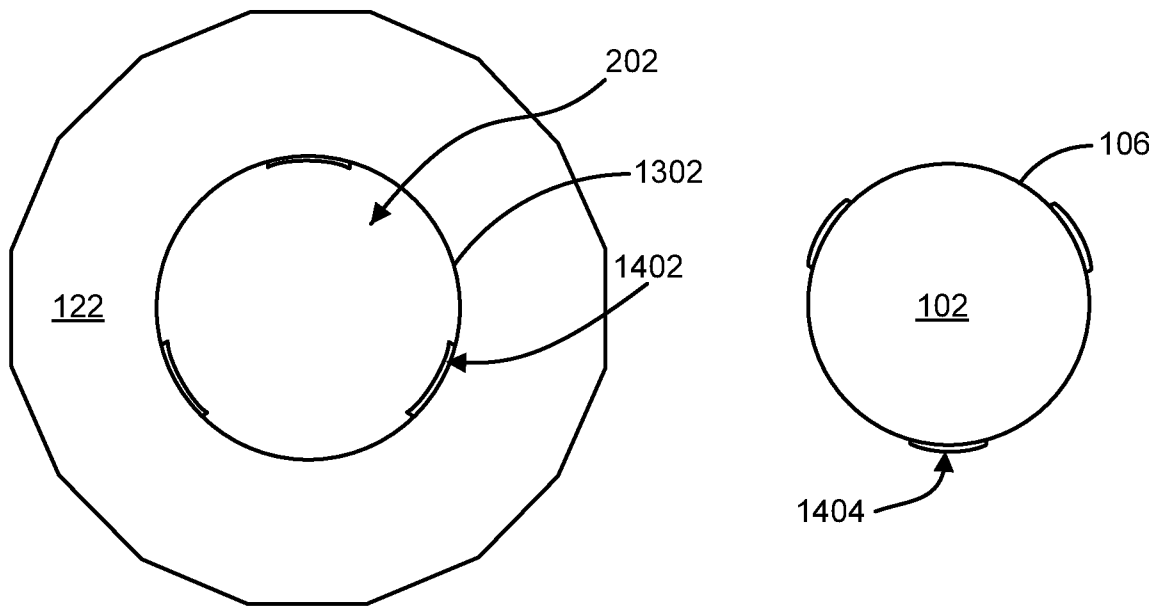


FIG. 14A

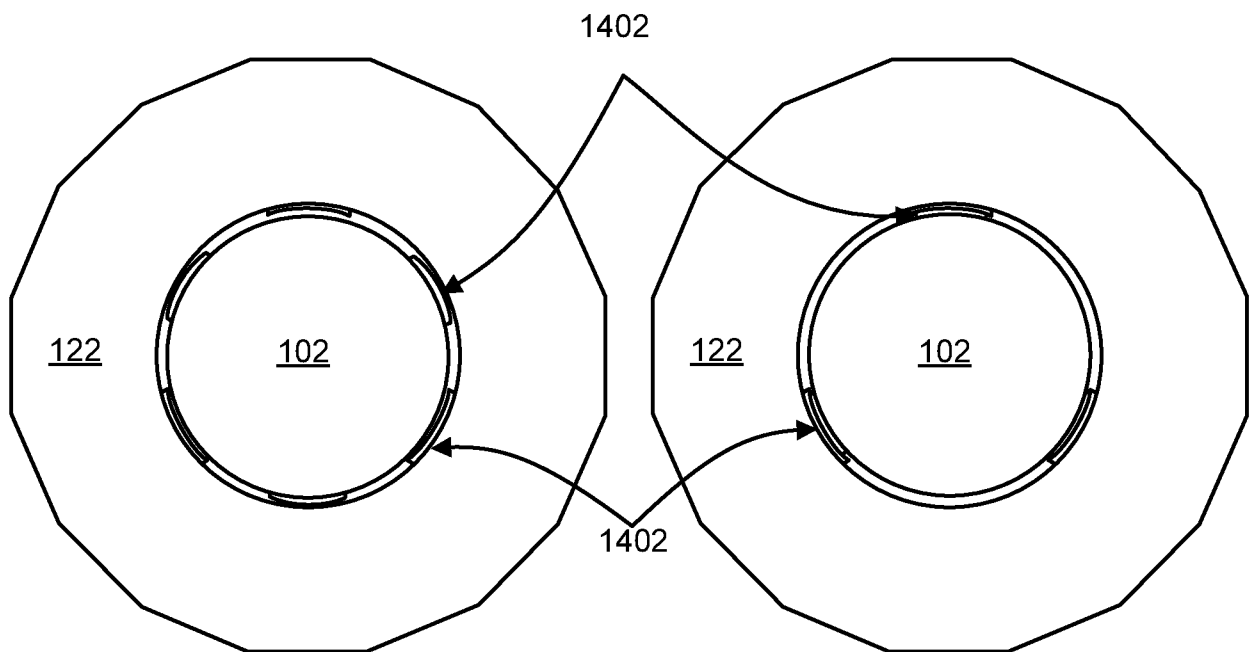


FIG. 14B

FIG. 14C

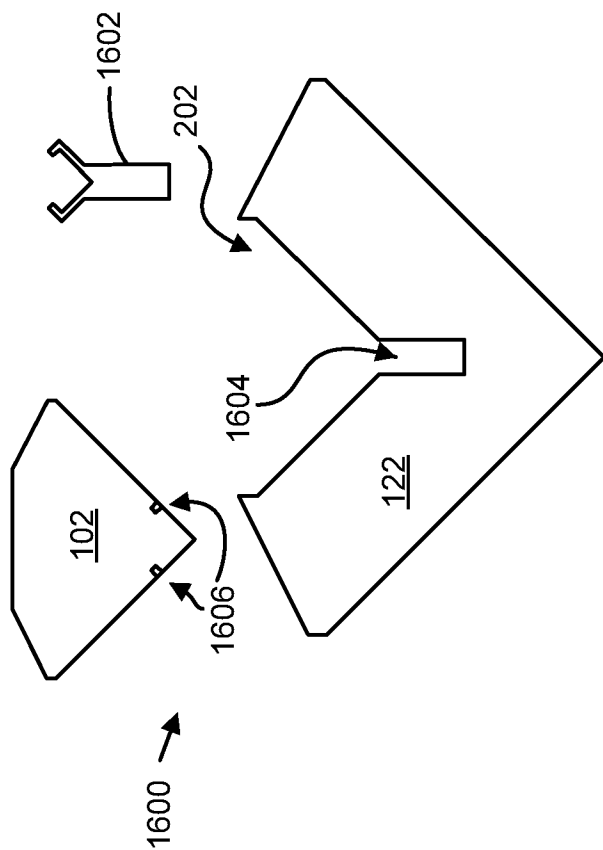


FIG. 16A

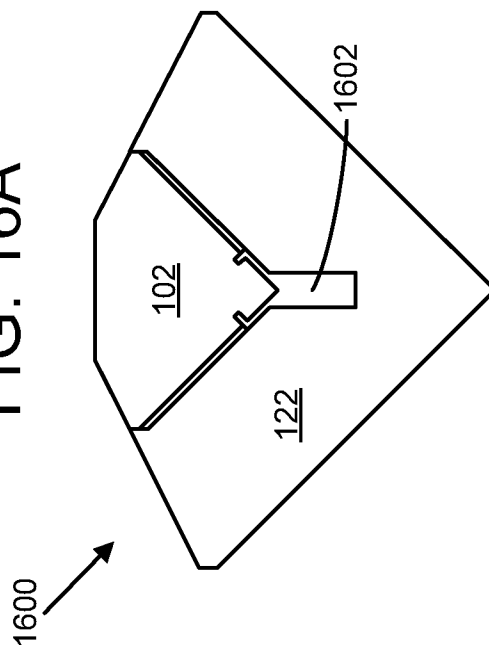


FIG. 16B

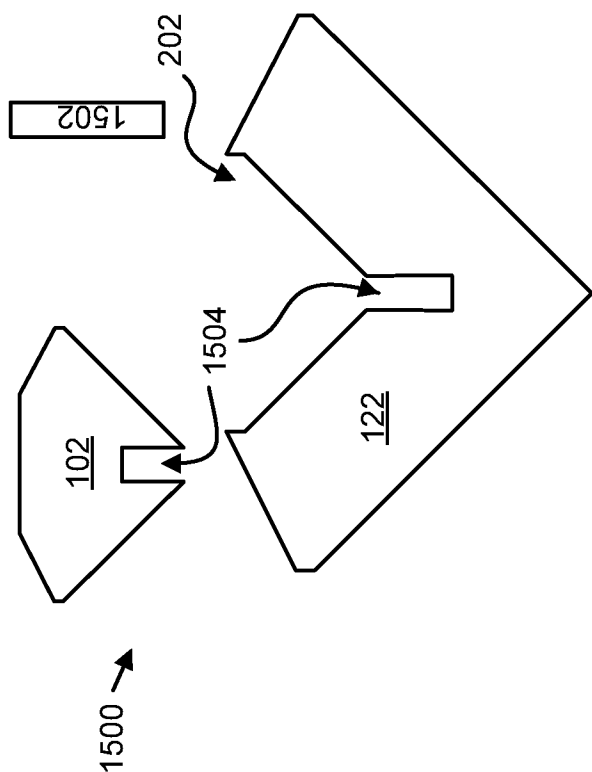


FIG. 15A

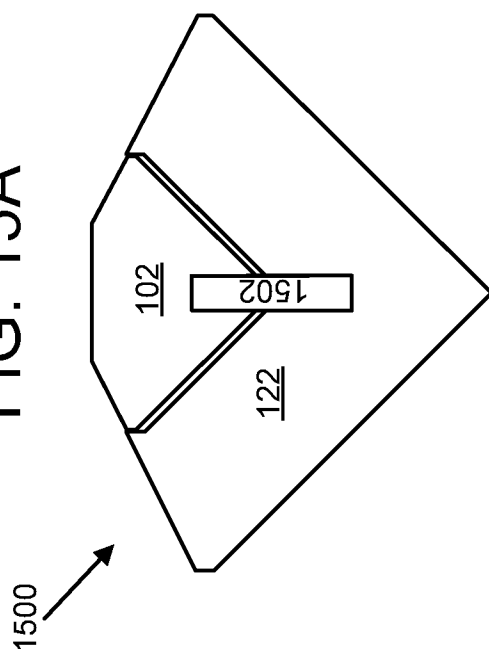


FIG. 15B

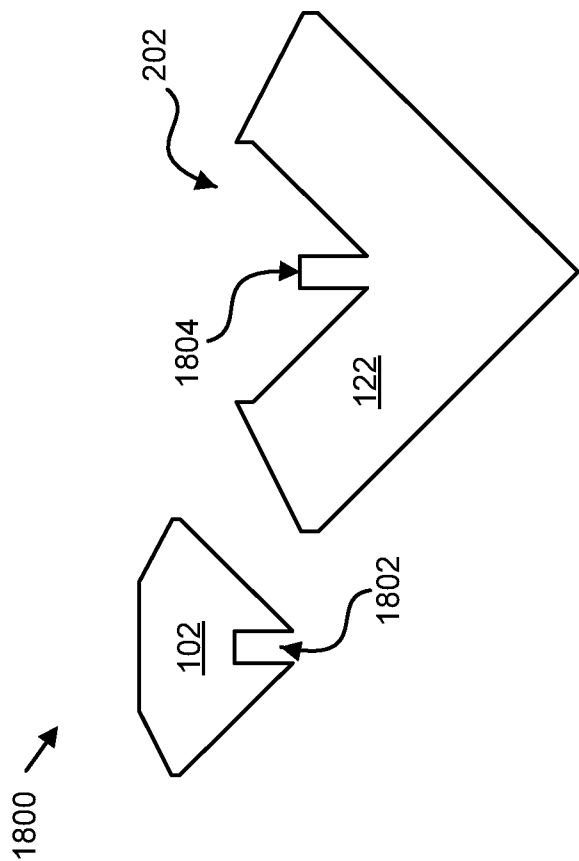


FIG. 18A

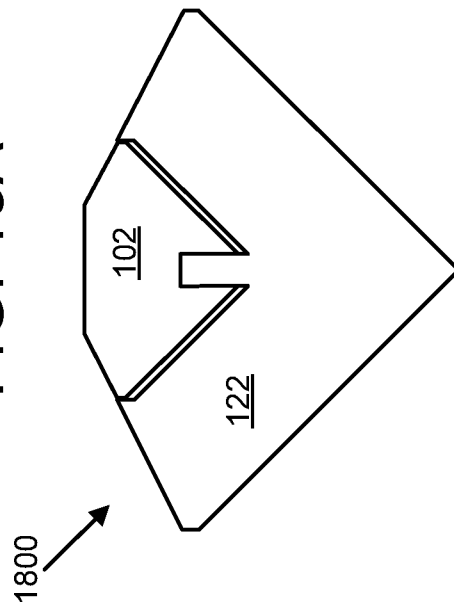


FIG. 18B

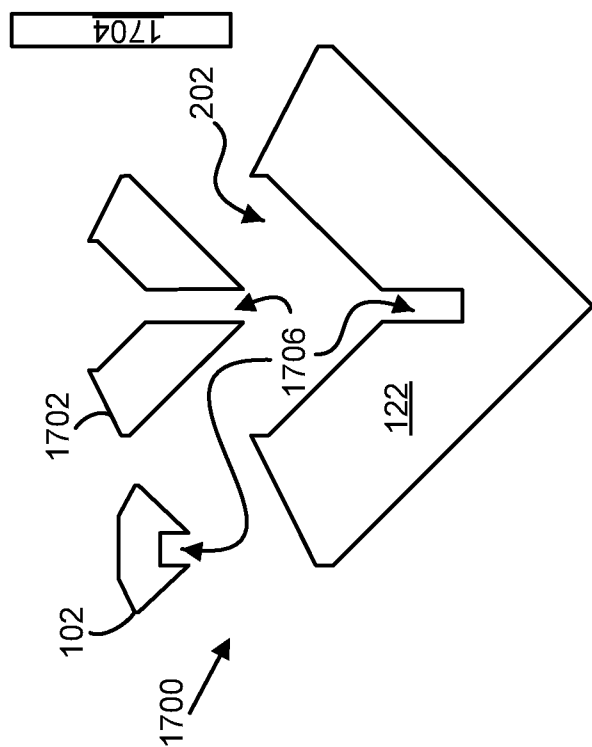


FIG. 17A

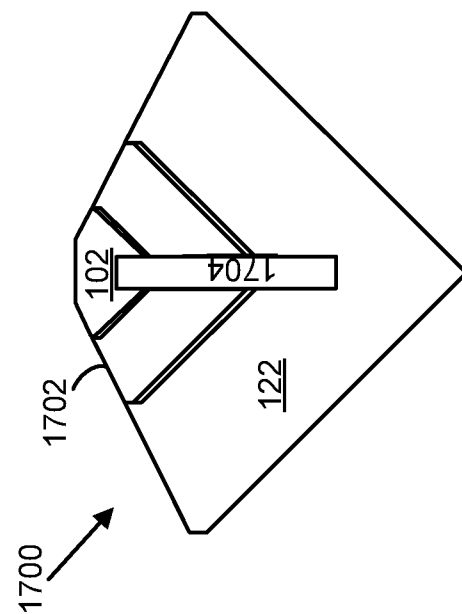


FIG. 17B

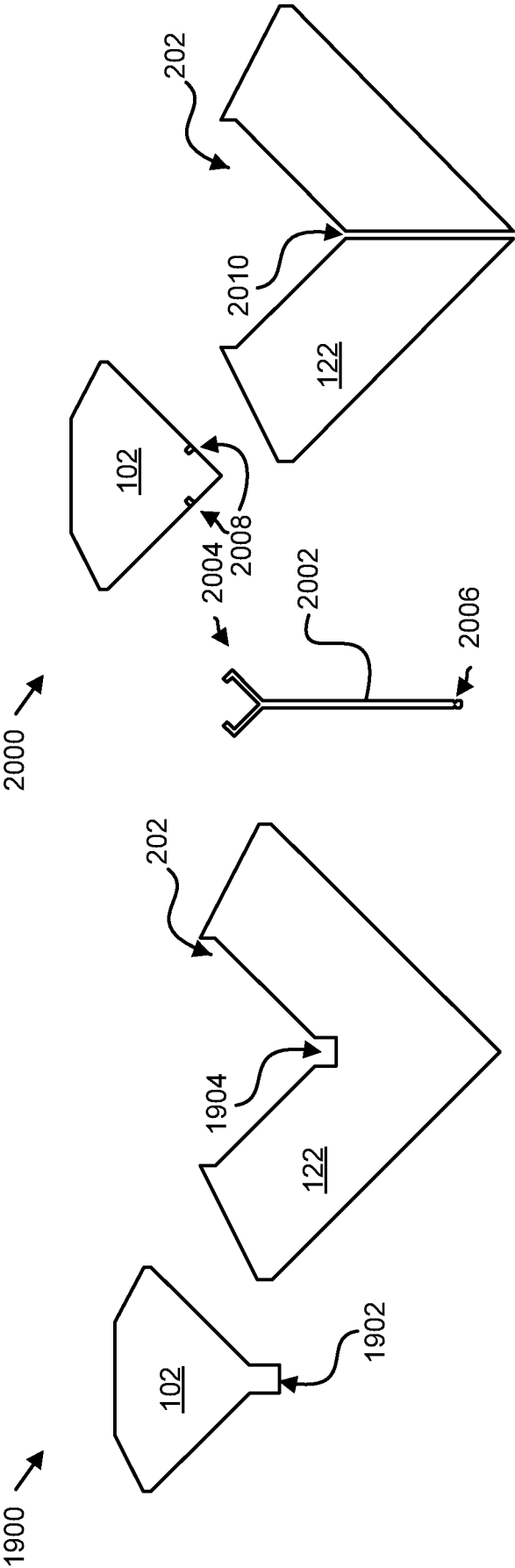


FIG. 20A

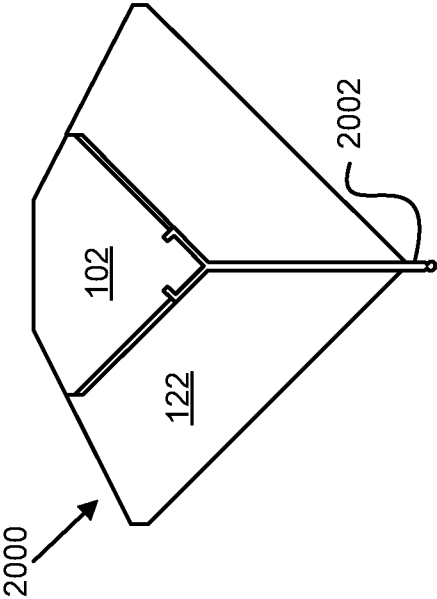


FIG. 20B

FIG. 19A

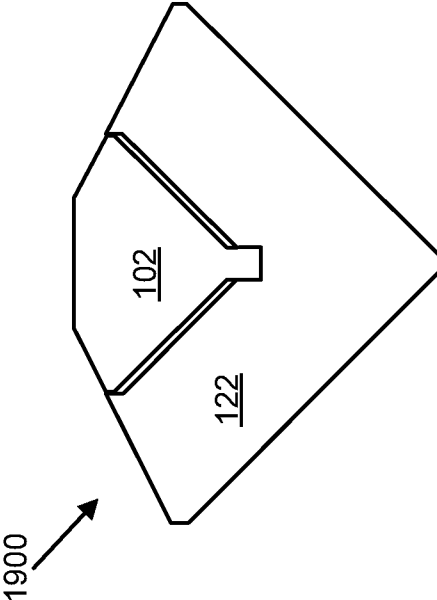


FIG. 19B

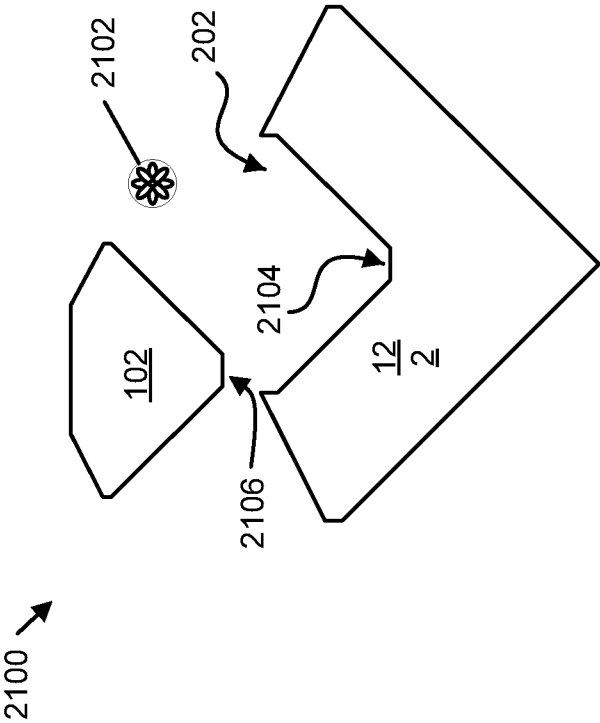


FIG. 21A

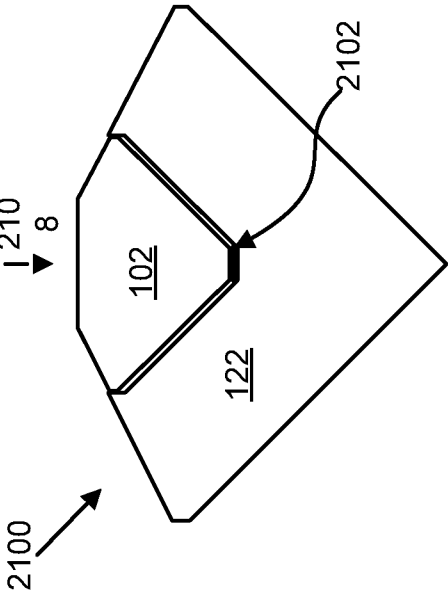


FIG. 21B

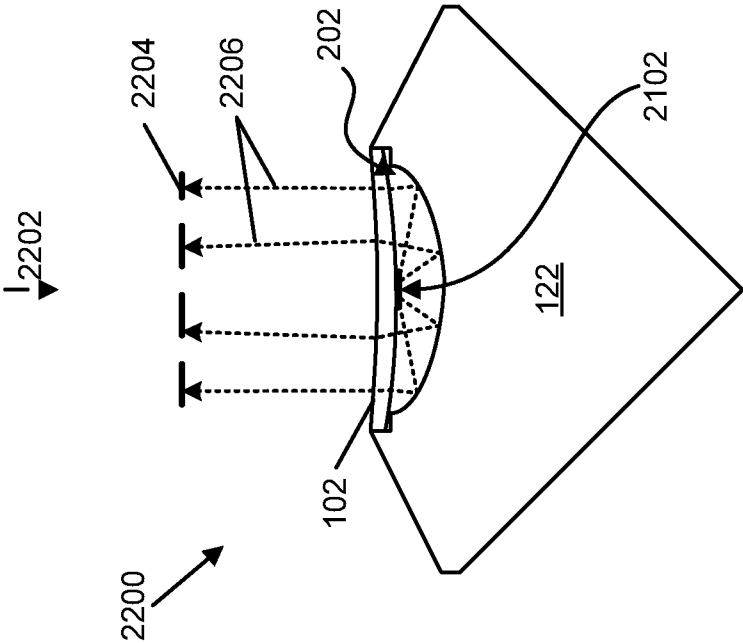


FIG. 22

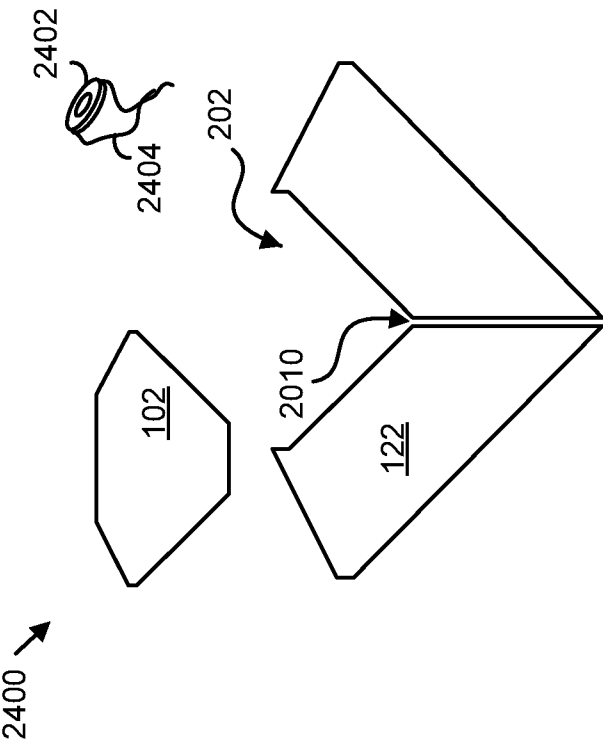


FIG. 24A

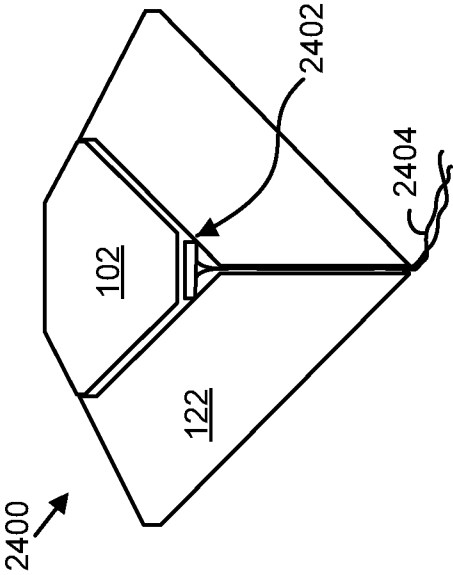


FIG. 24B

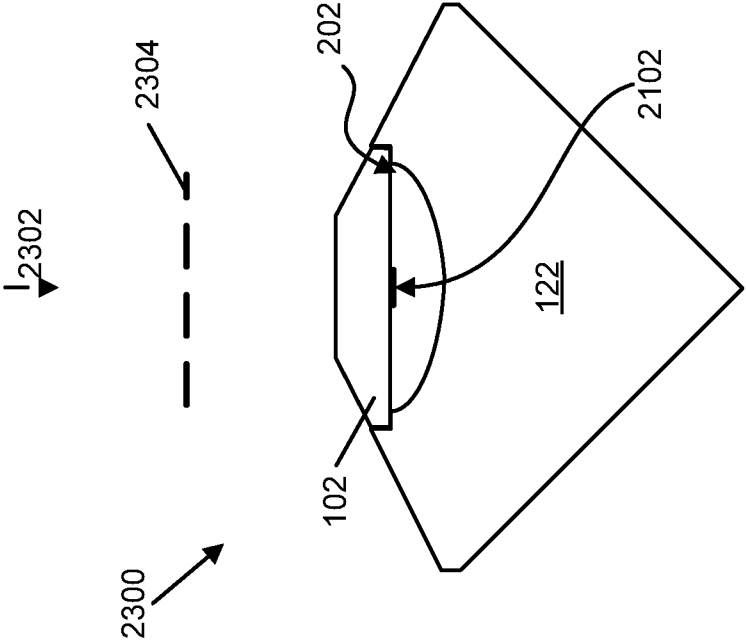


FIG. 23

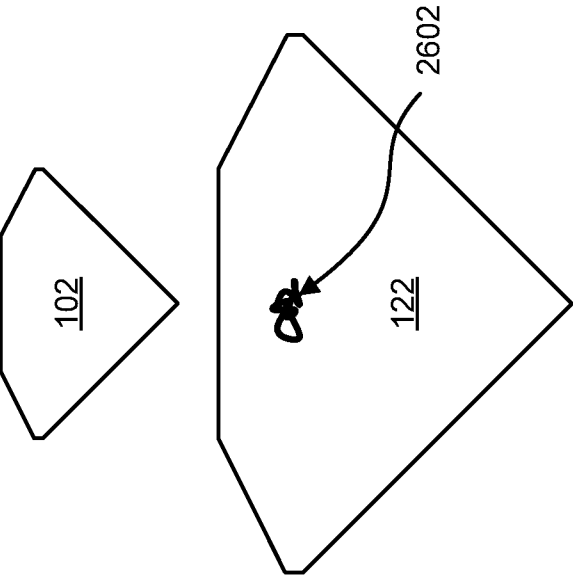


FIG. 26A

2600

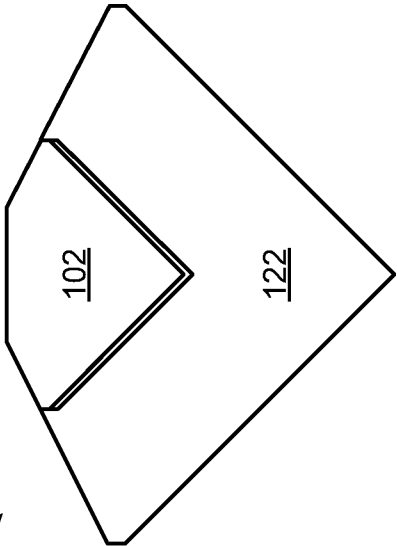


FIG. 26B

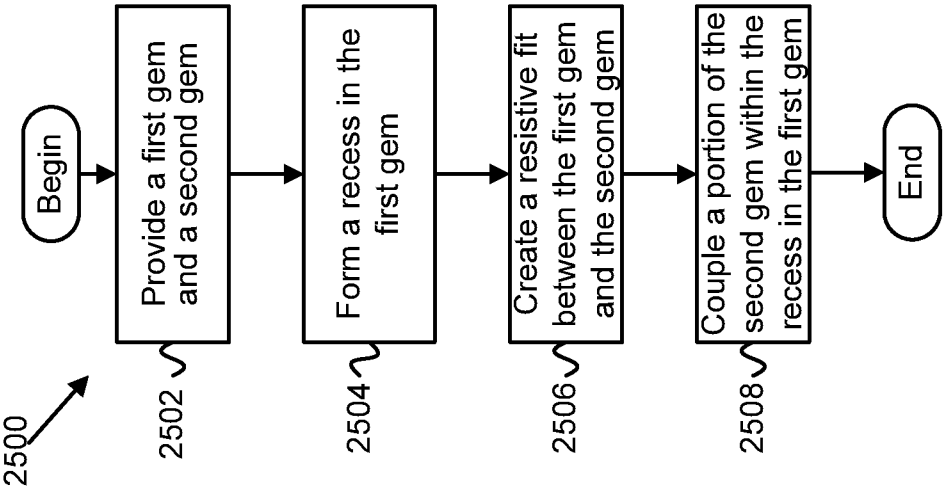


FIG. 25