US 20090120018A1

(19) **United States**

(12) **Patent Application Publication**

Trpkovski

(10) **Pub. No.: US 2009/0120018 A1**

(43) **Pub. Date: May 14, 2009**

(54) **SEALED UNIT AND SPACER WITH STABILIZED ELONGATE STRIP**

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(21) Appl. No.: **12/270,362**

(22) Filed: **Nov. 13, 2008**

Related U.S. Application Data

(60) Provisional application No. 60/987,681, filed on Nov. 13, 2007, provisional application No. 61/049,593, filed on May 1, 2008, provisional application No. 61/049,599, filed on May 1, 2008, provisional application No. 61/038,803, filed on Mar. 24, 2008.

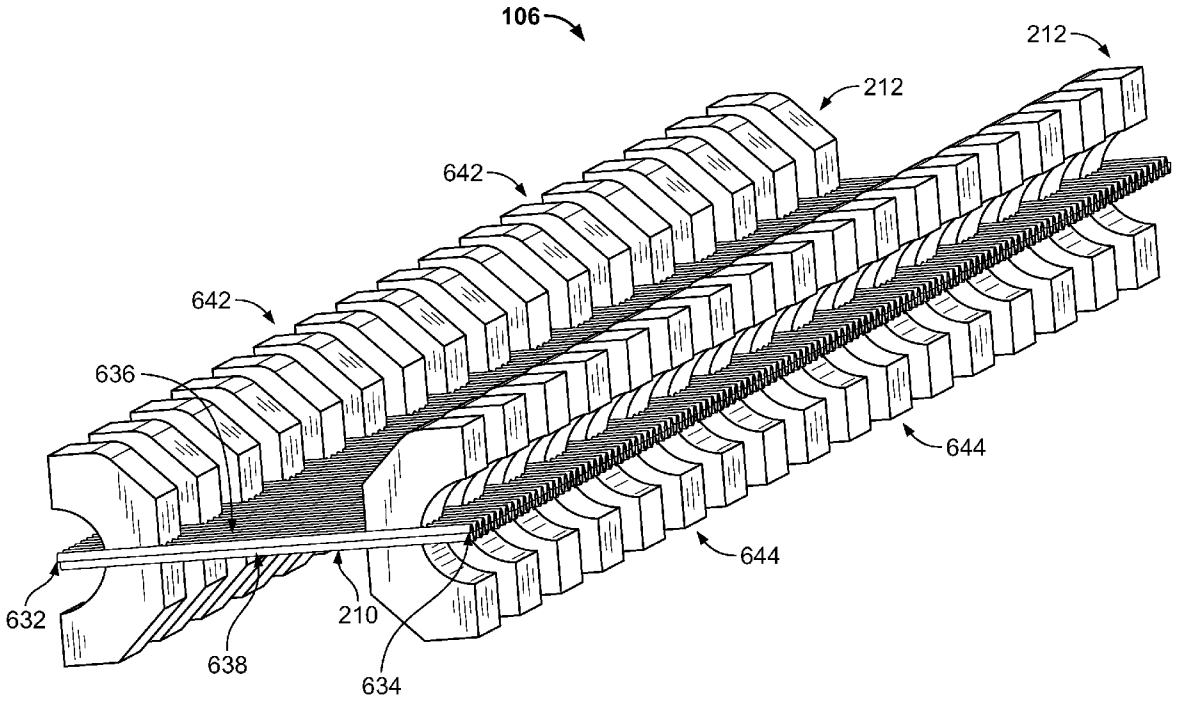
Publication Classification

(51) **Int. Cl.**
E06B 7/23 (2006.01)

(52) **U.S. Cl.** **52/204.593**; 52/745.19; 52/786.13; 52/309.1

(57) **ABSTRACT**

A sealed unit includes at least two sheets of material separated by a spacer. In one example, a spacer includes an elongate strip having a first longitudinal edge and a second longitudinal edge and defines a plane extending between at least portions of the first and second longitudinal edges. The spacer also includes at least a first stabilizer connected to the elongate strip adjacent the first longitudinal edge. The first stabilizer has a first surface arranged substantially perpendicular to the plane. The first surface is adapted to support the elongate strip against a first sheet of material. Some embodiments include a second stabilizer adapted to support the elongate strip against the second sheet of material.



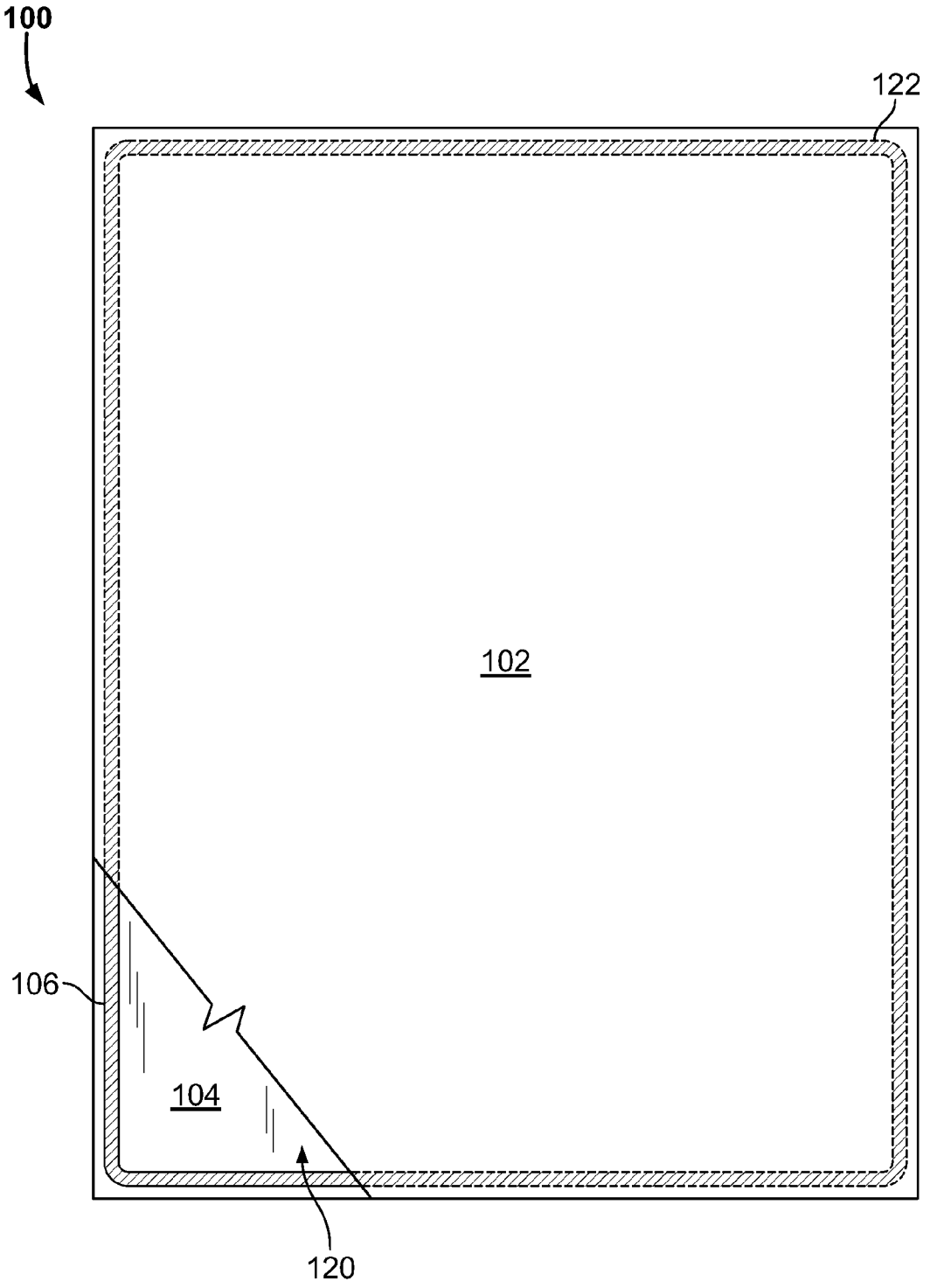


FIG. 1

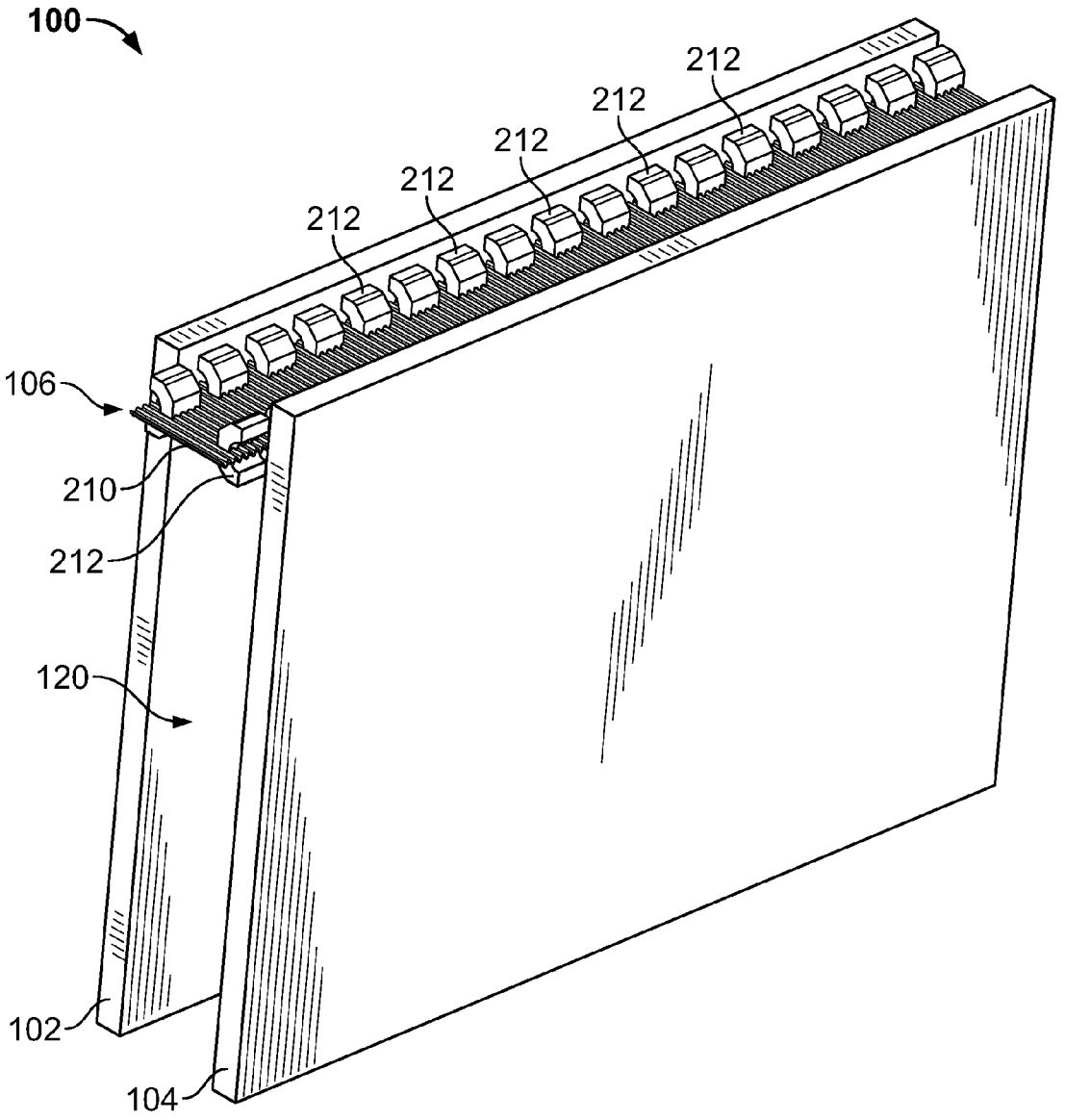


FIG. 2

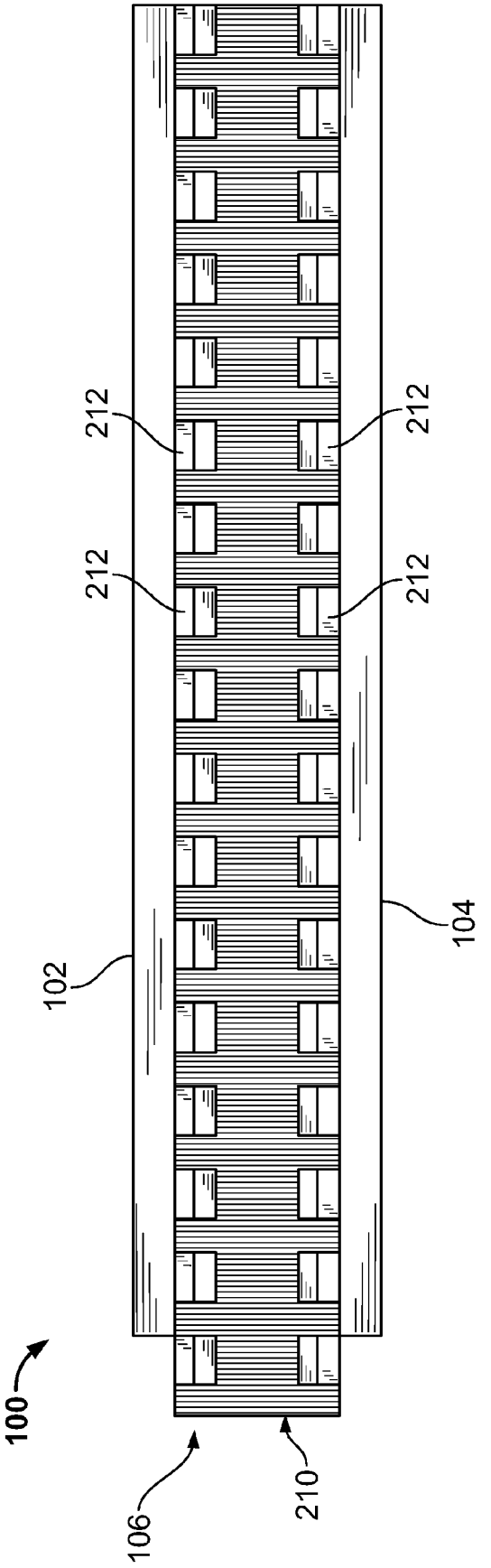


FIG. 3

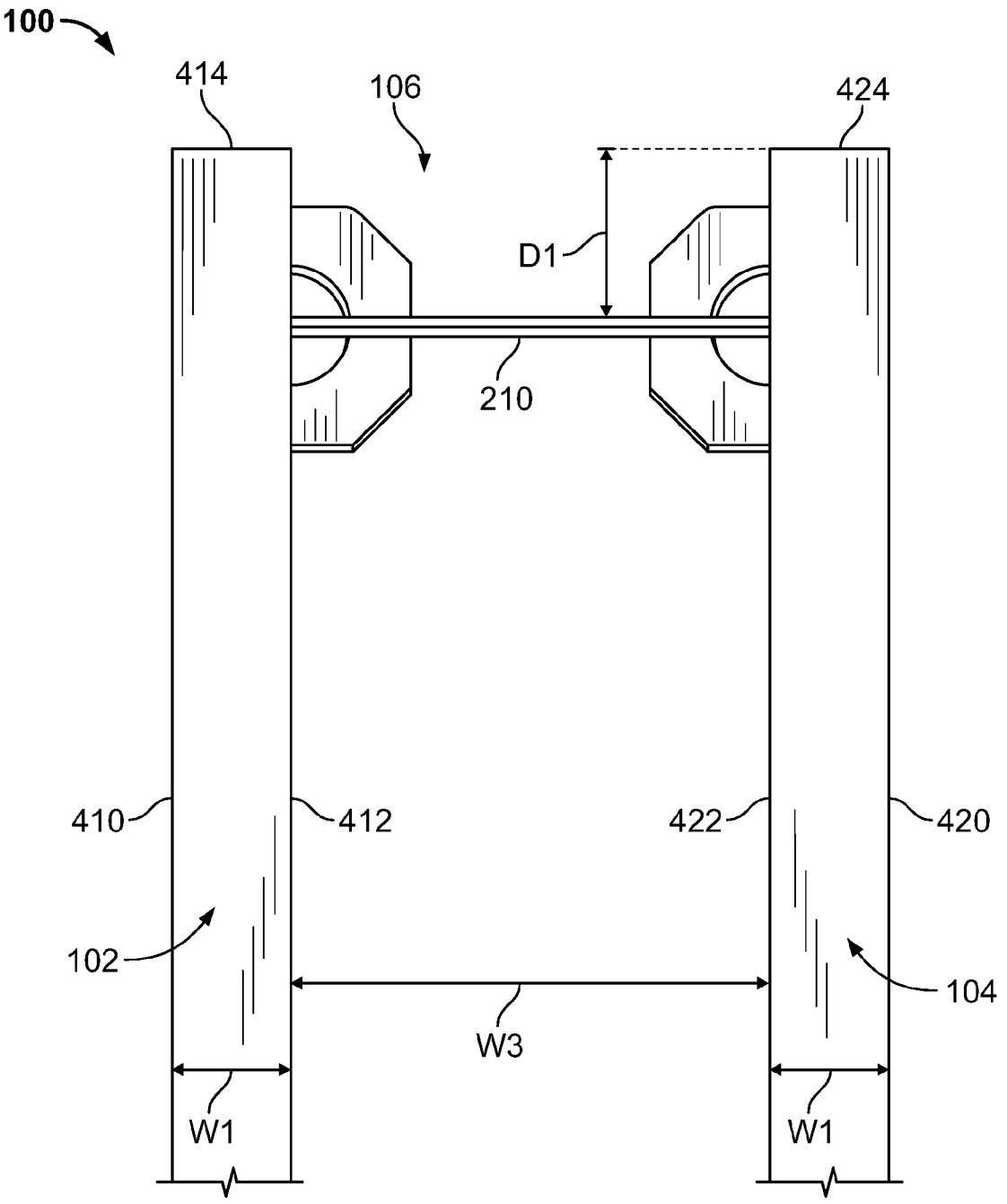


FIG. 4

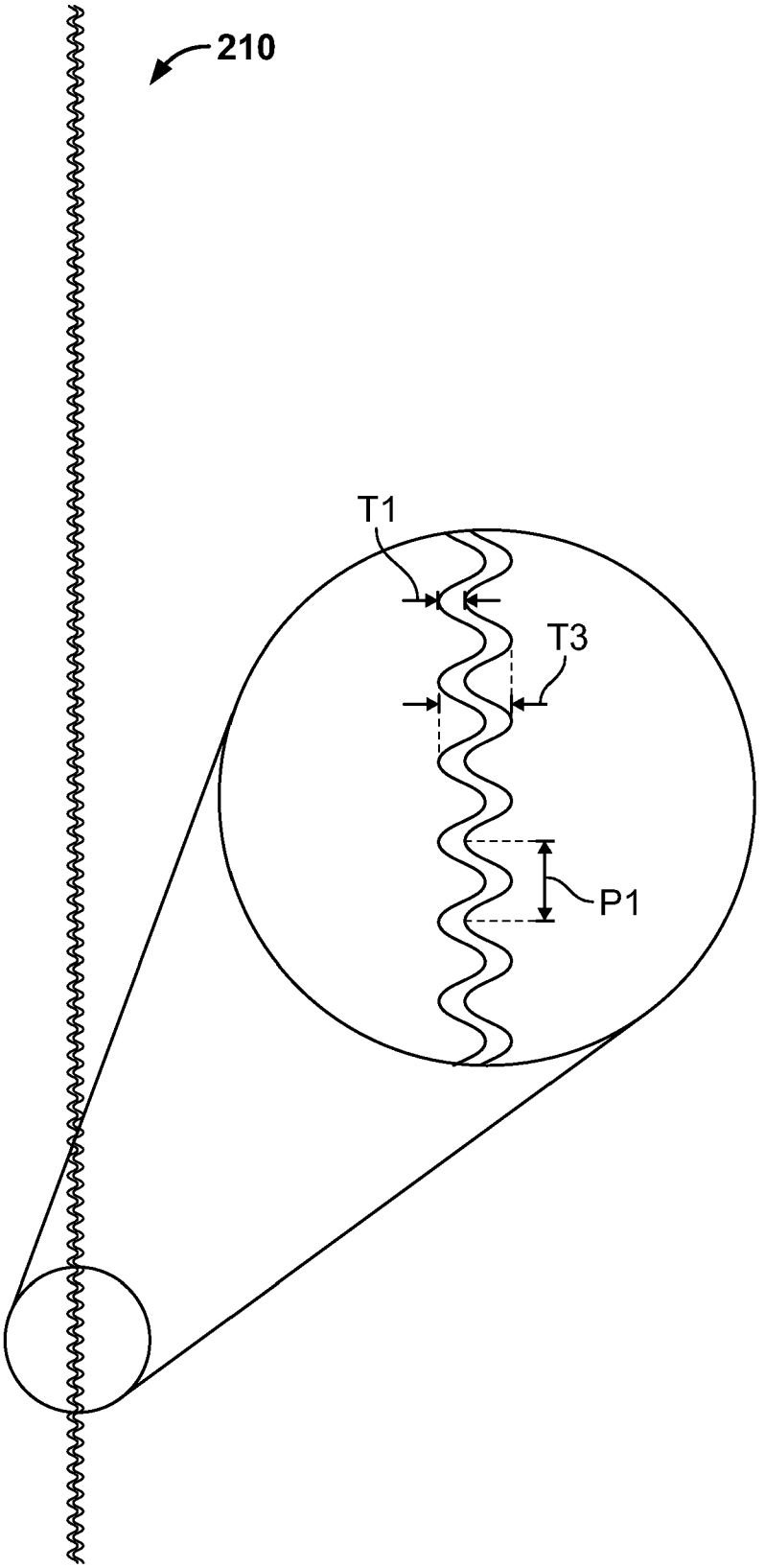


FIG. 5

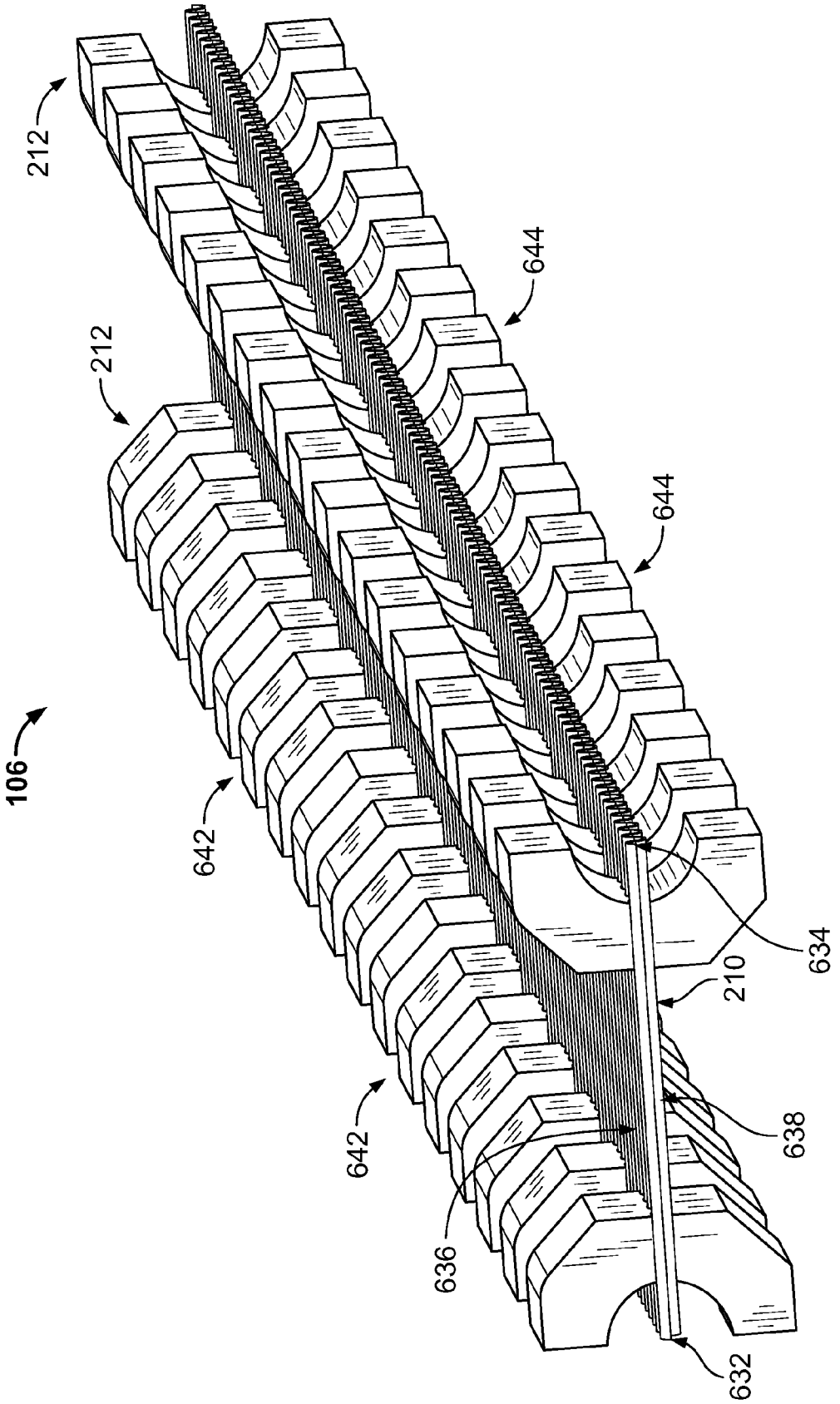


FIG. 6

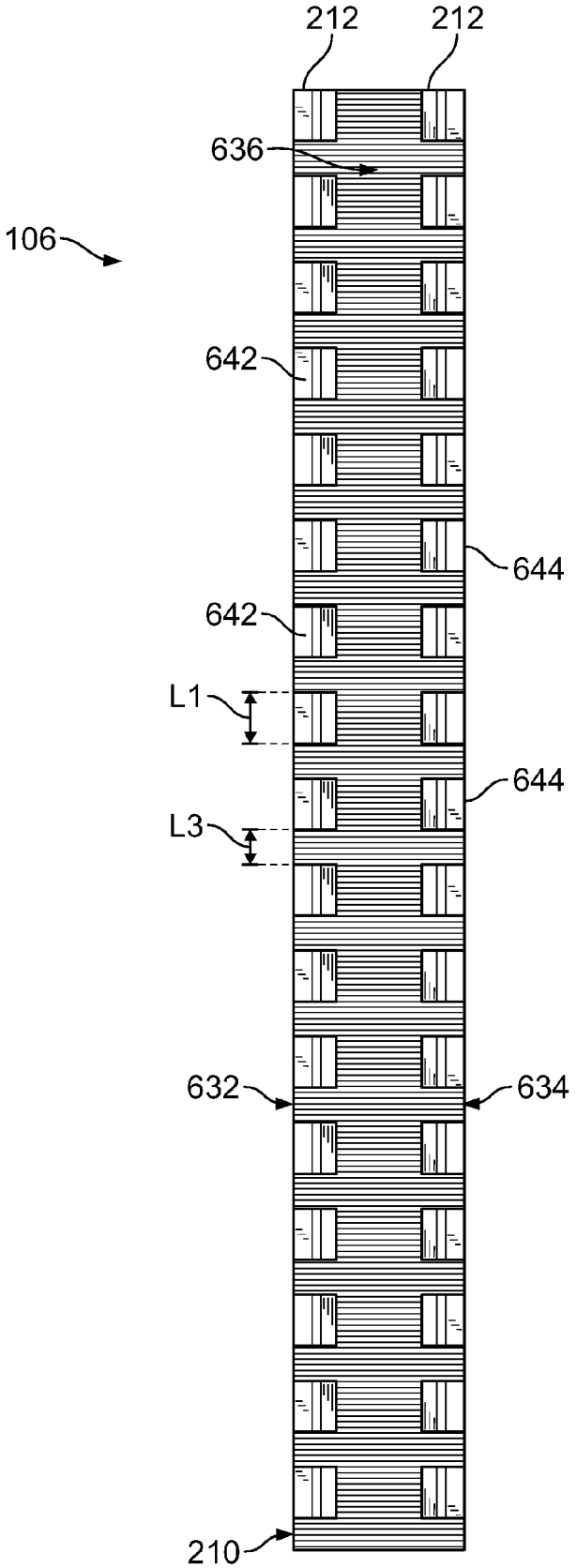


FIG. 7

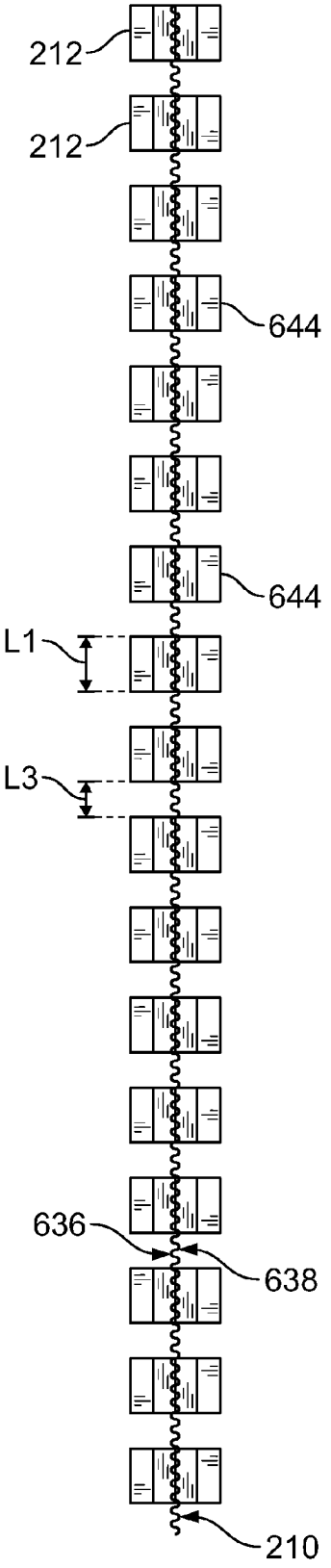


FIG. 8

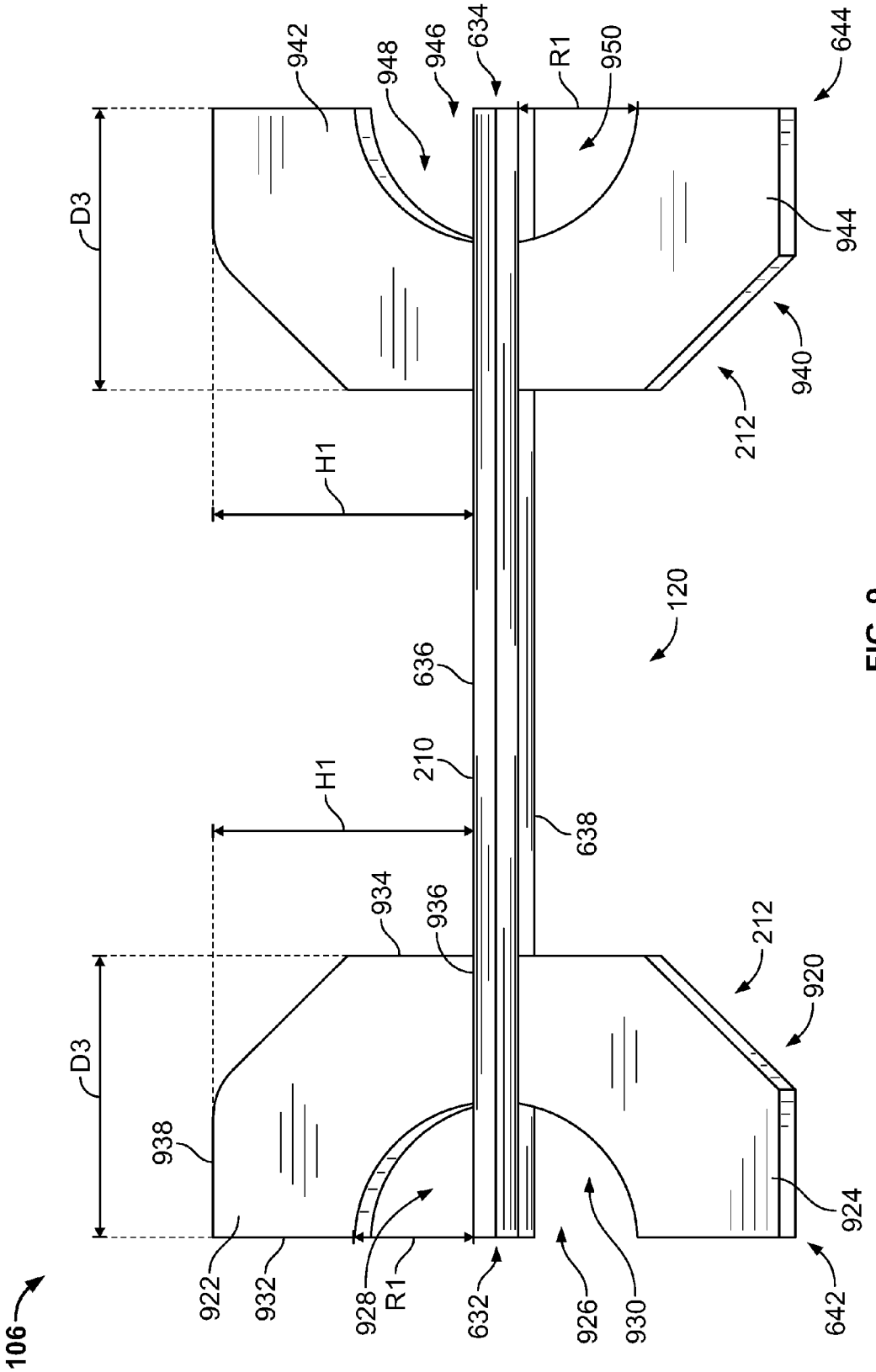

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FIG. 9

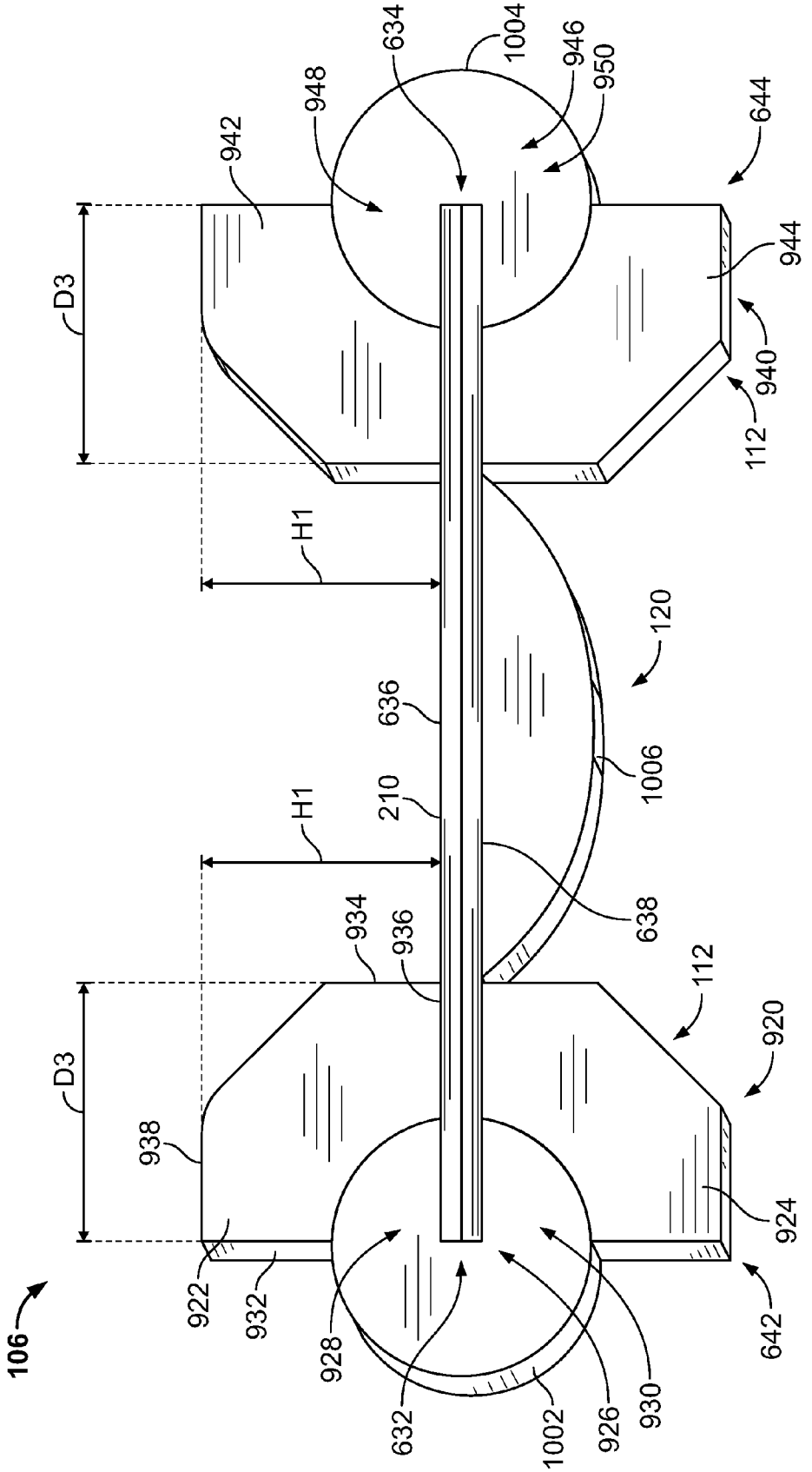
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FIG. 10

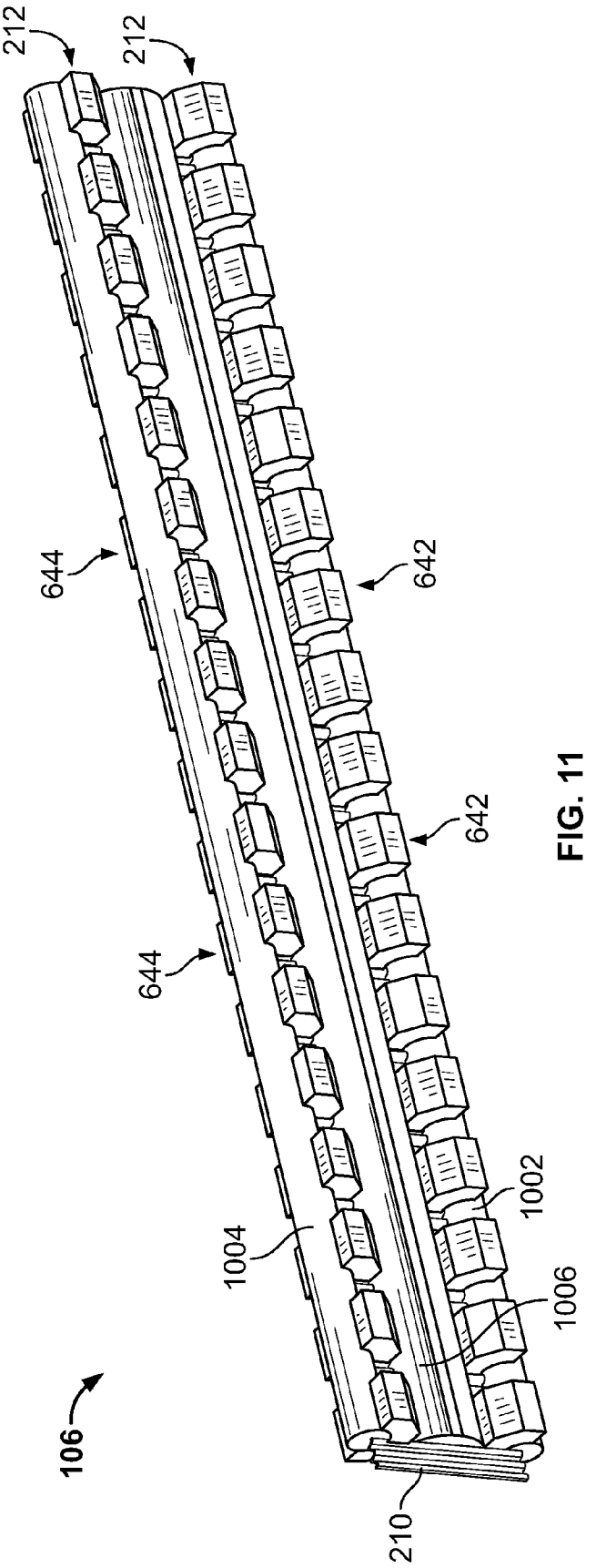

FIG. 11

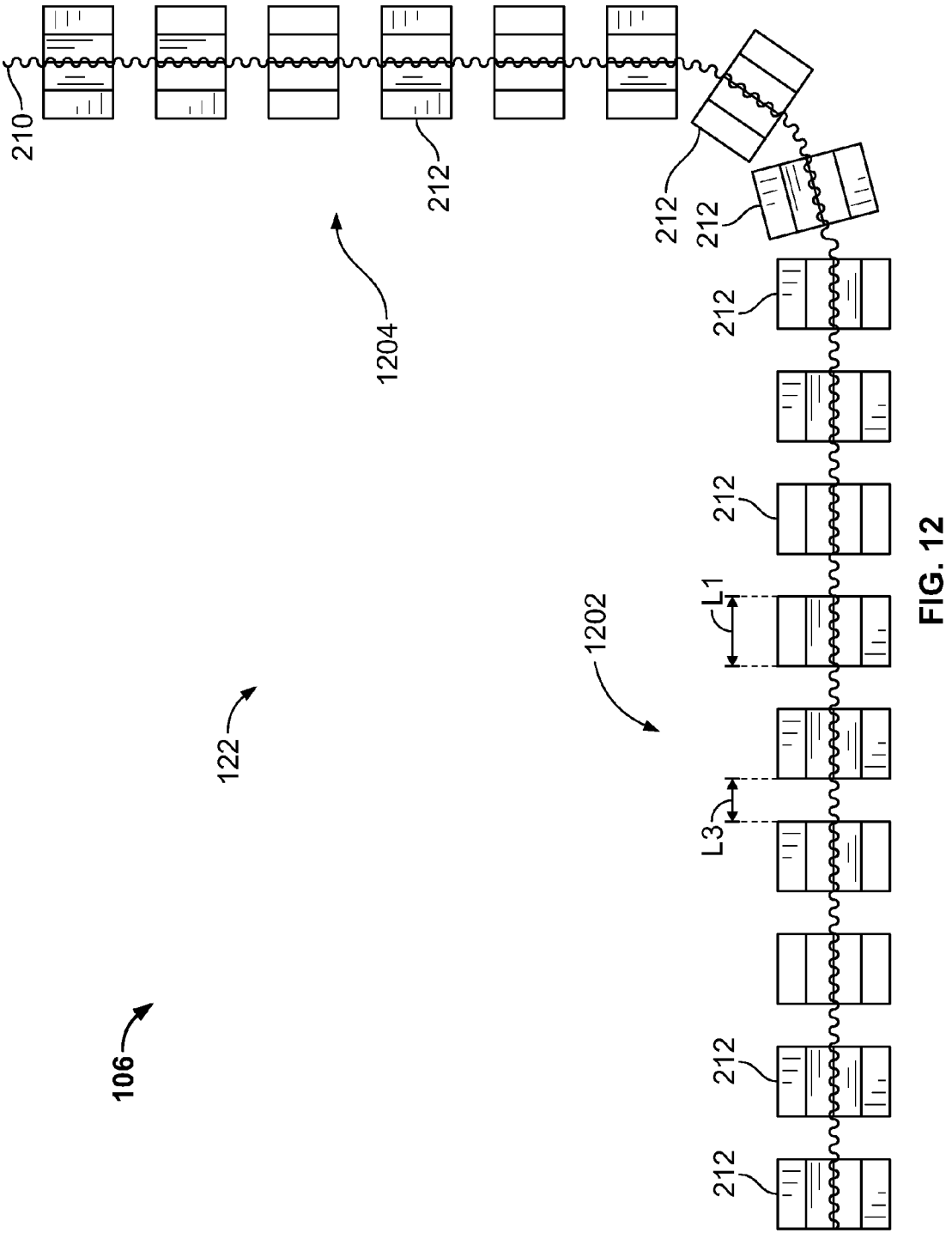

FIG. 12

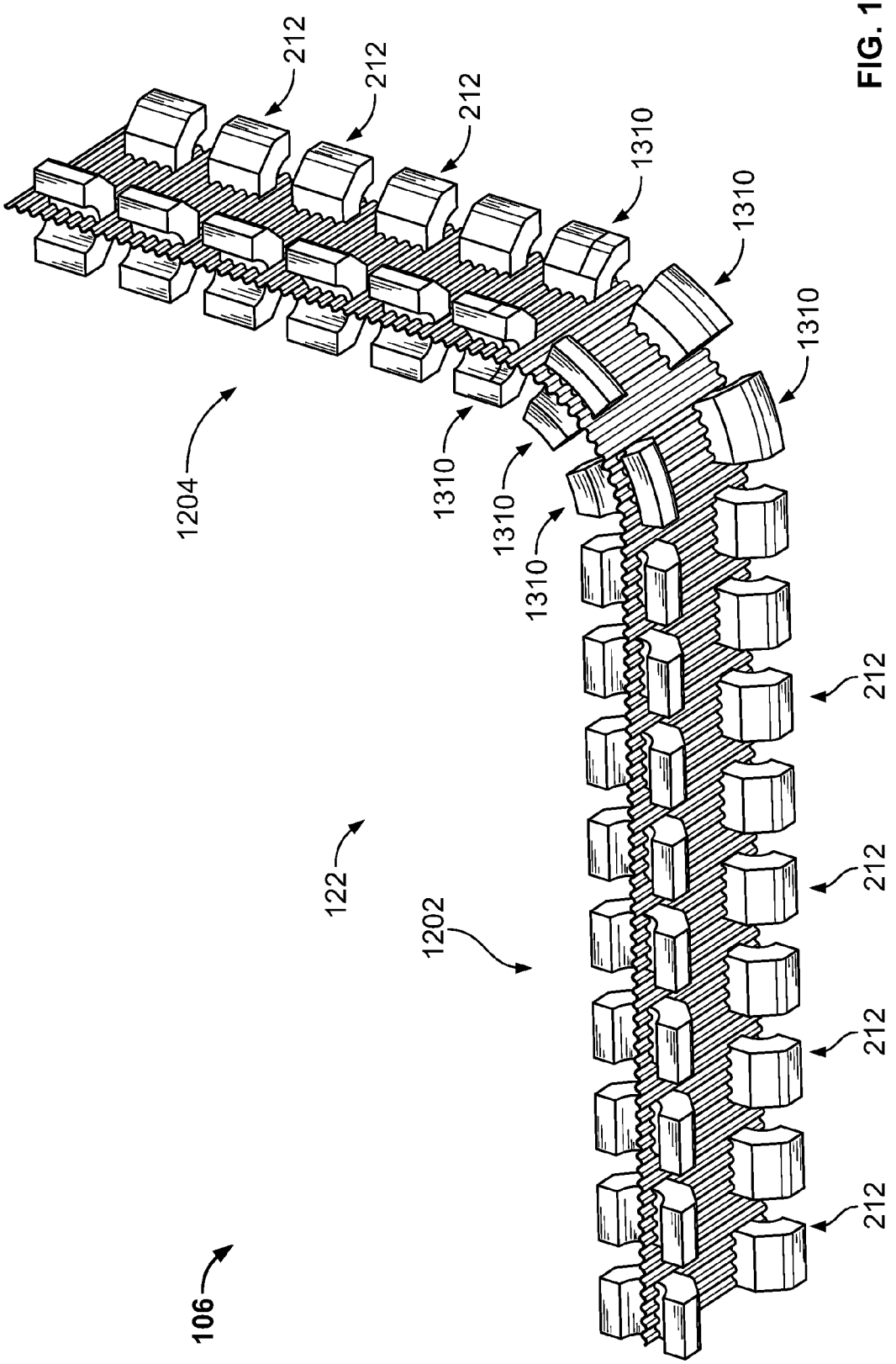
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FIG. 13

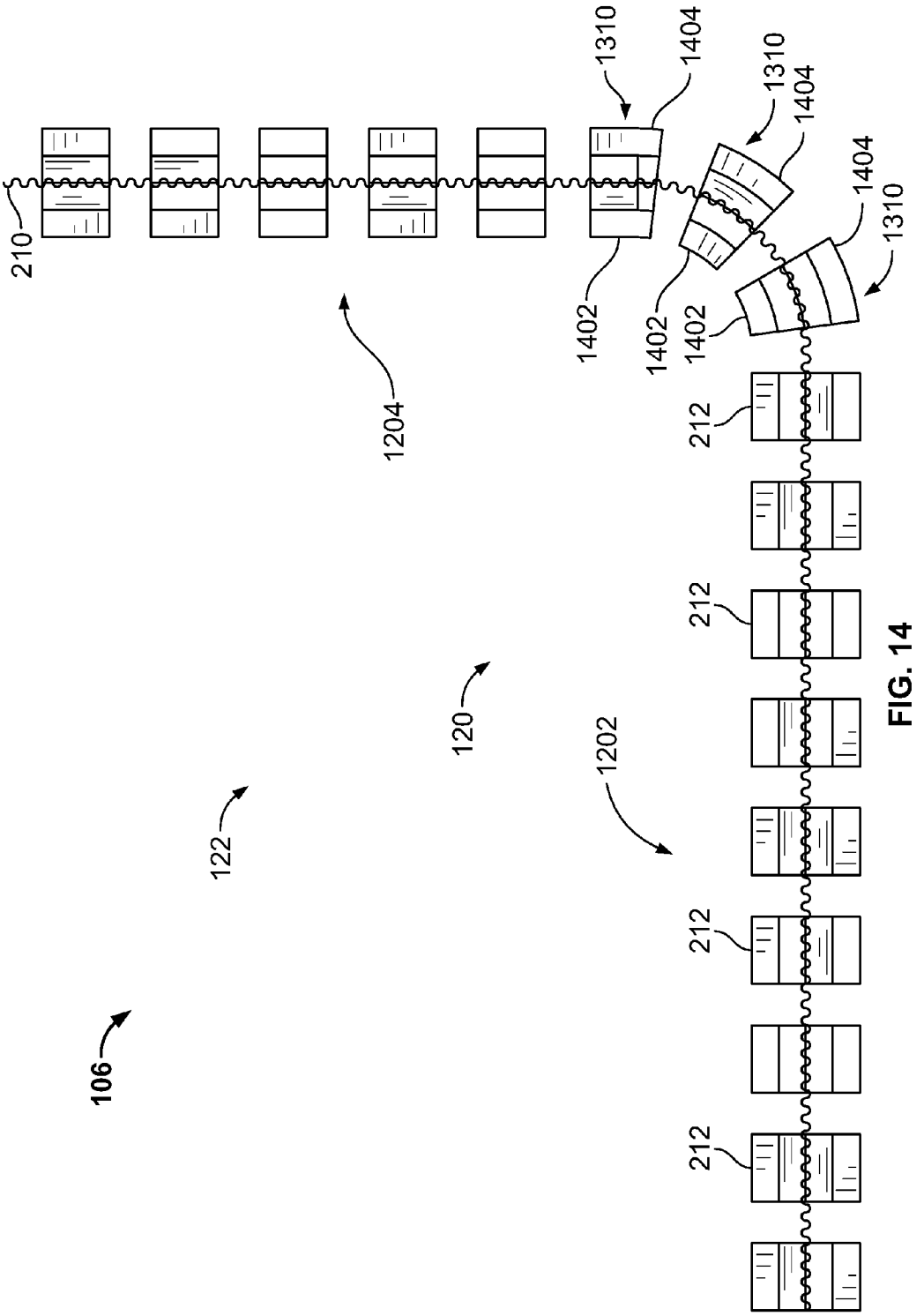
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FIG. 14

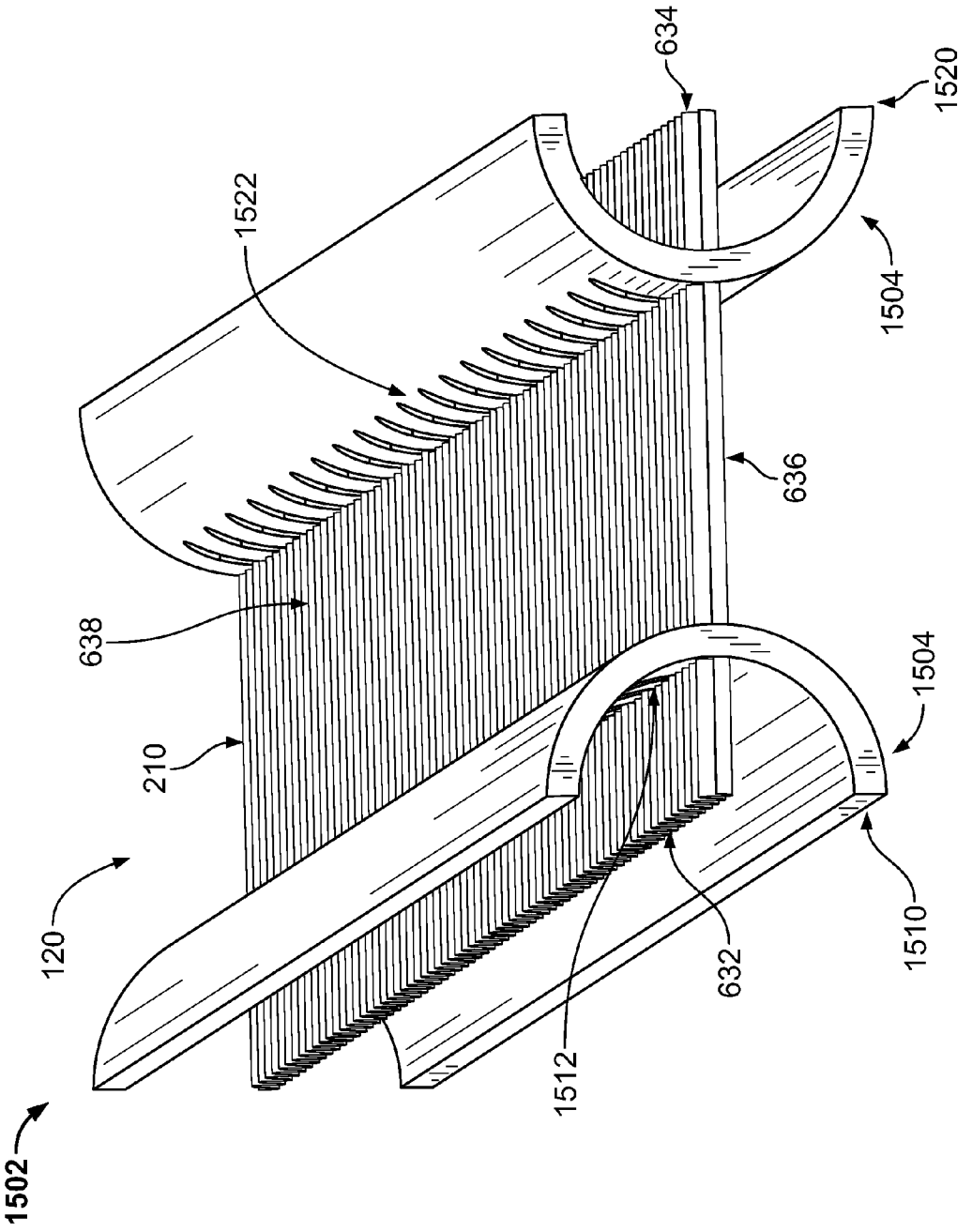

FIG. 15

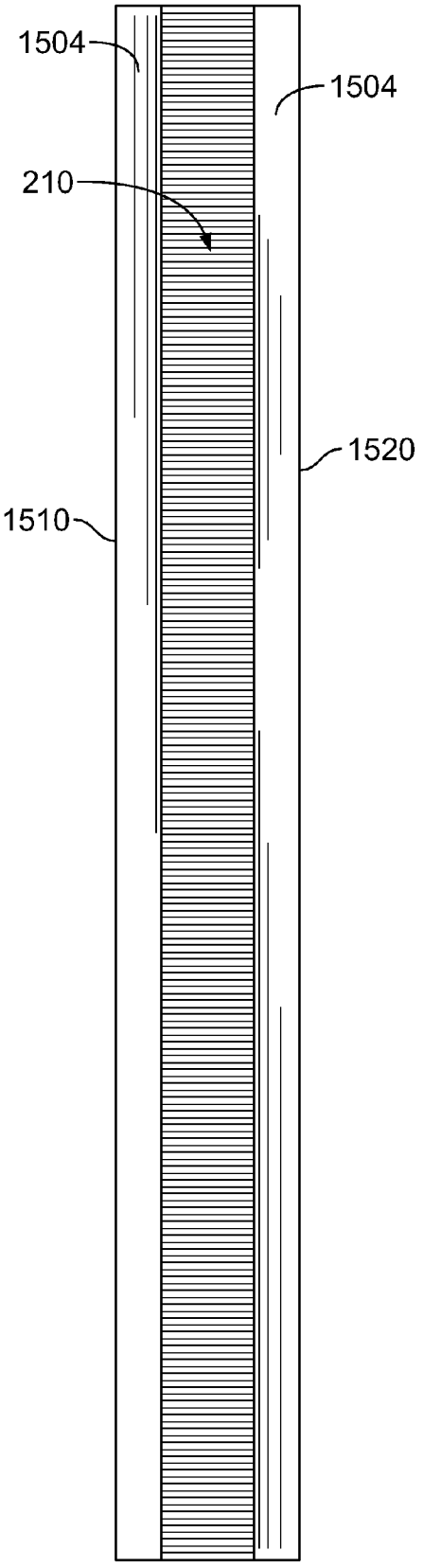

FIG. 16

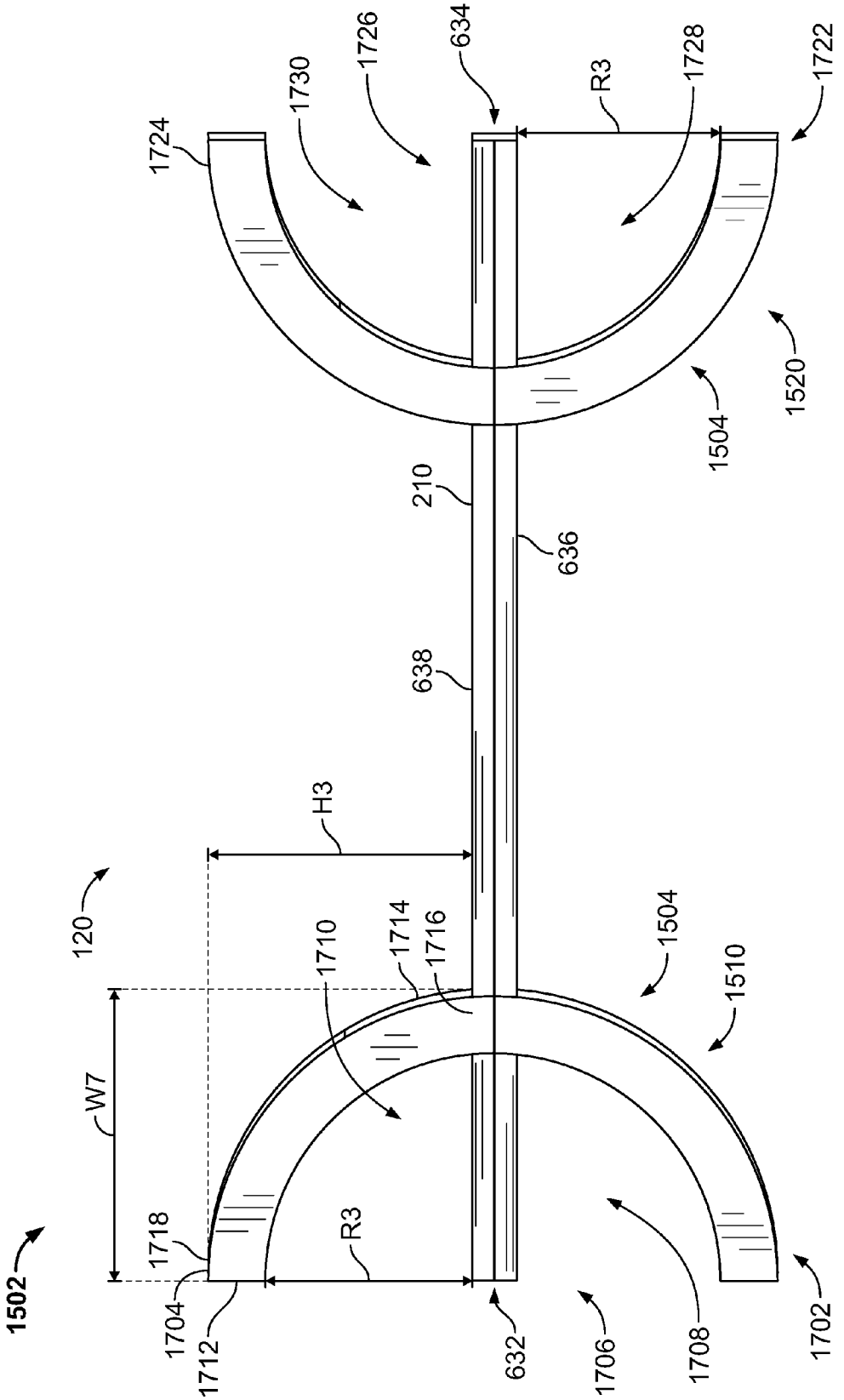
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FIG. 17

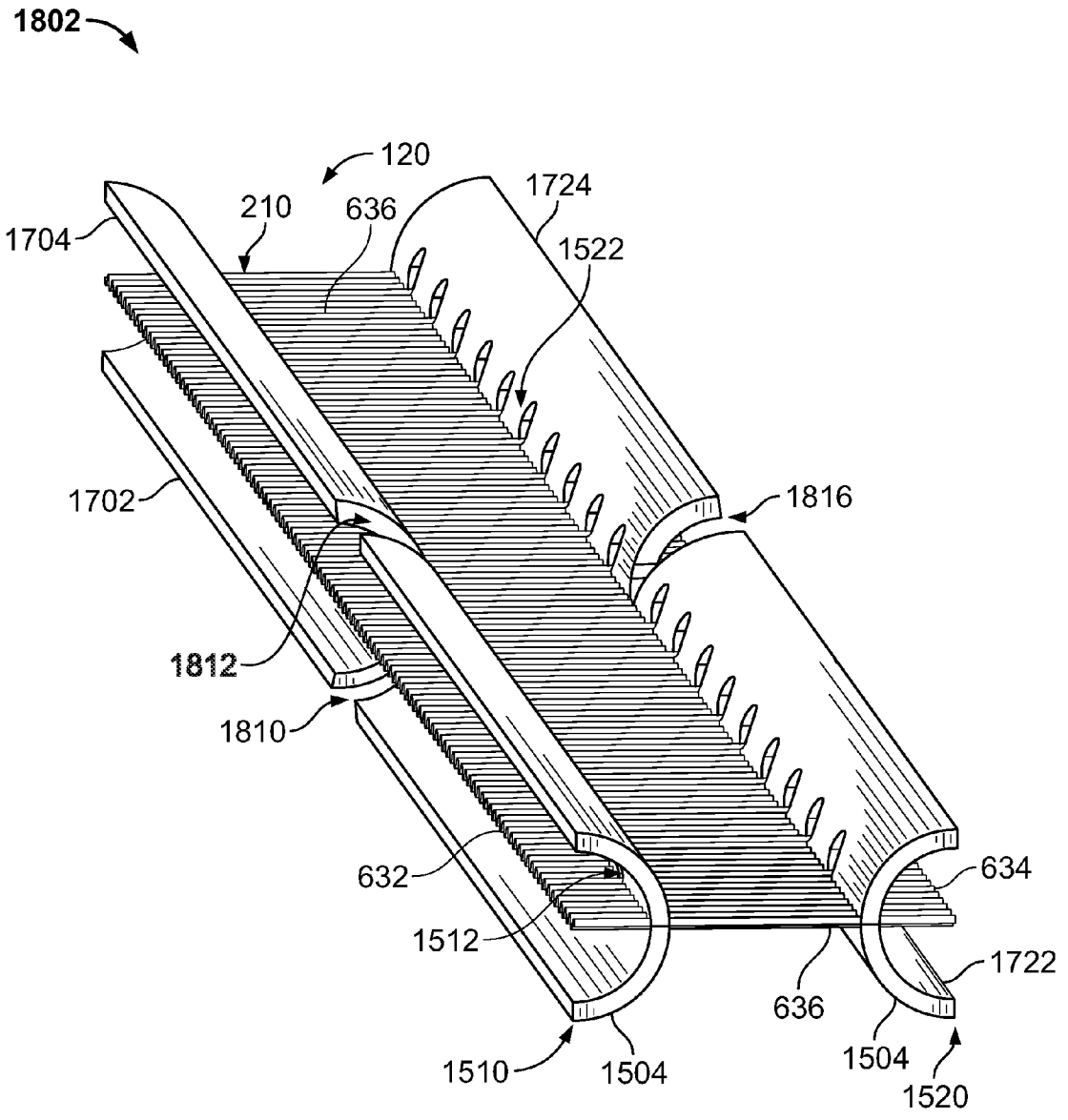
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FIG. 18

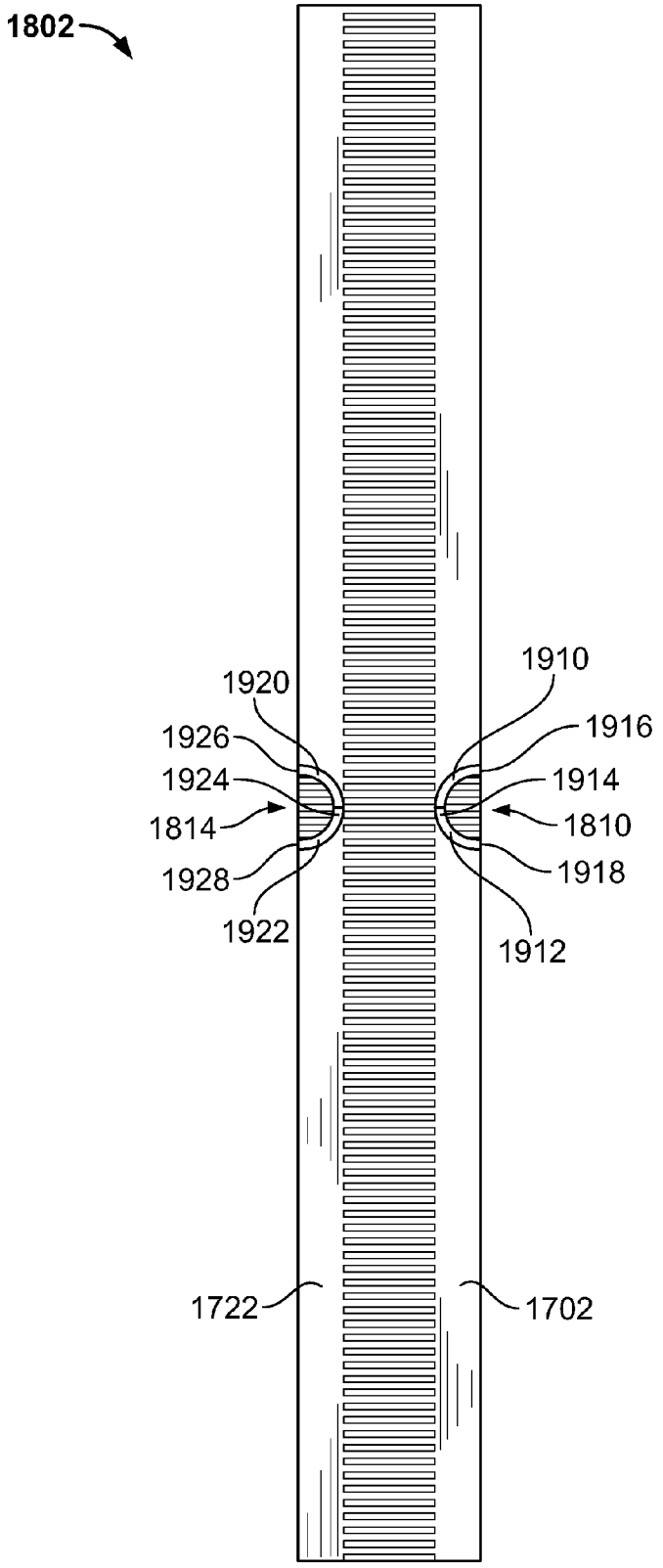
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FIG. 19

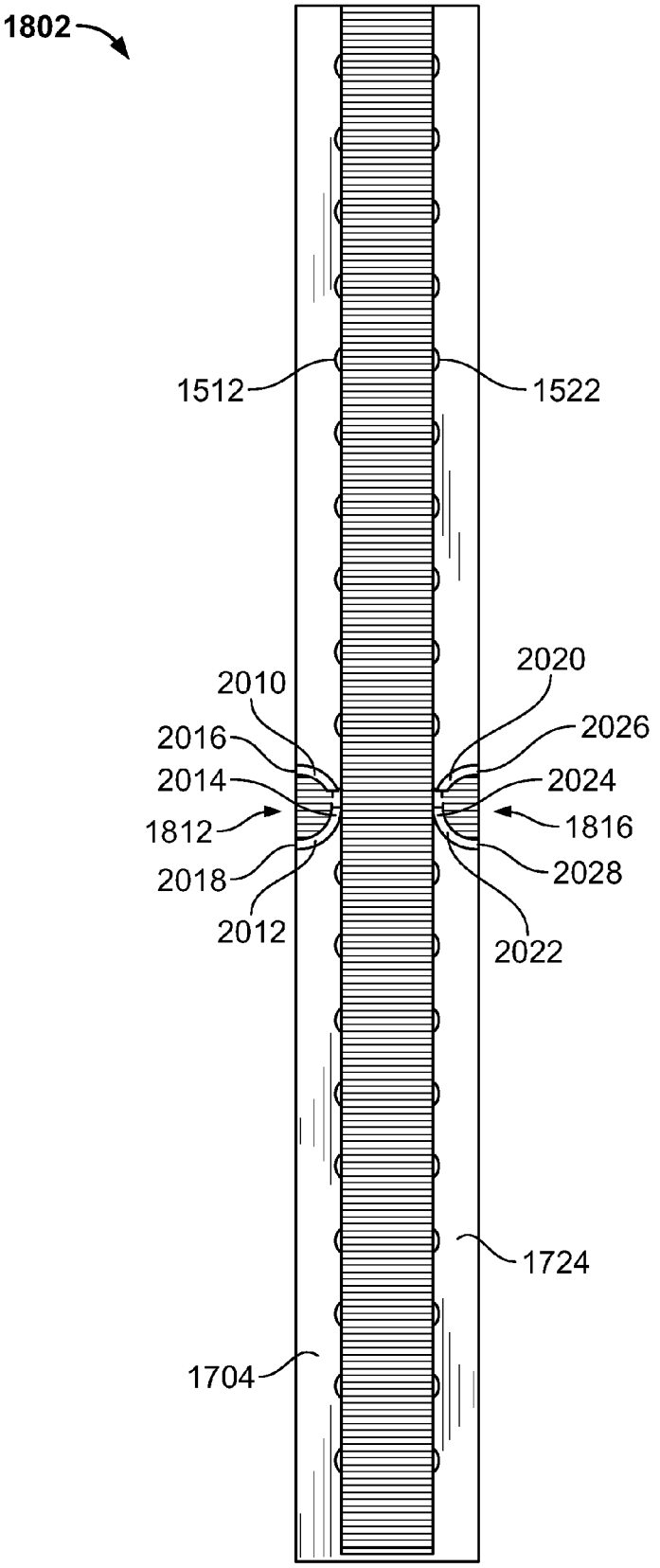
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FIG. 20

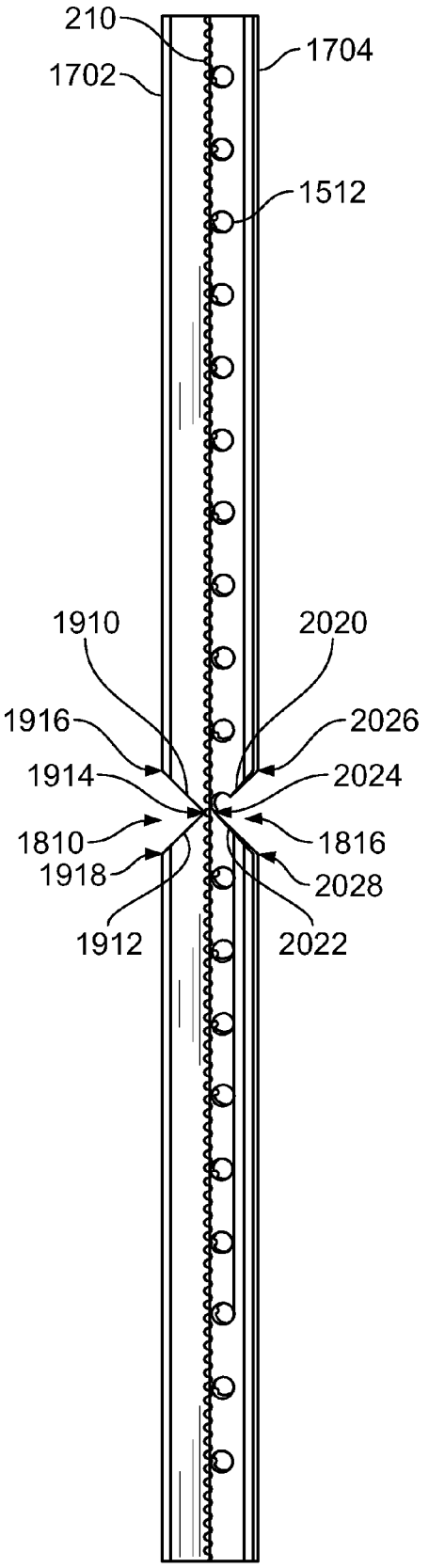
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FIG. 21

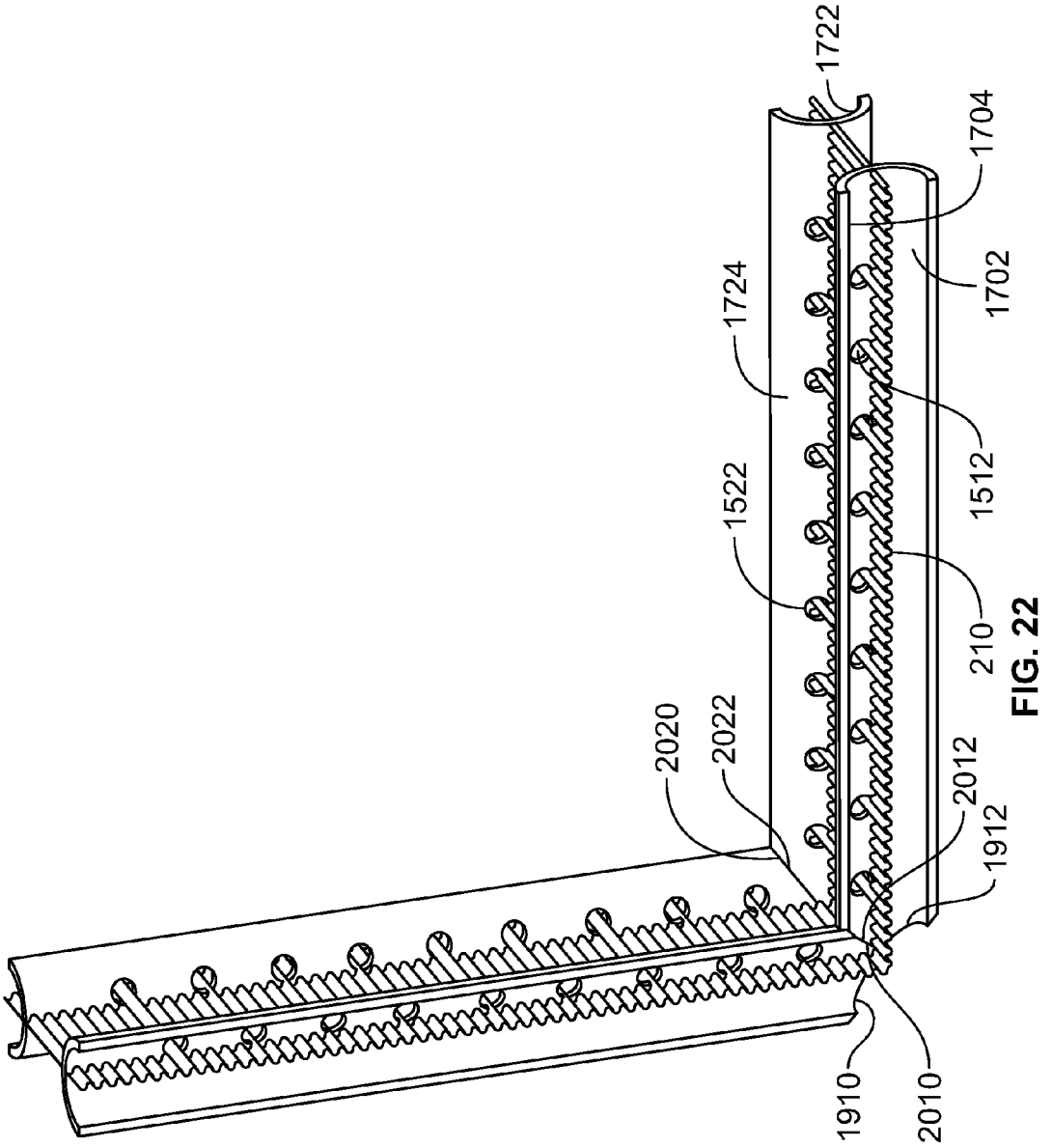
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FIG. 22

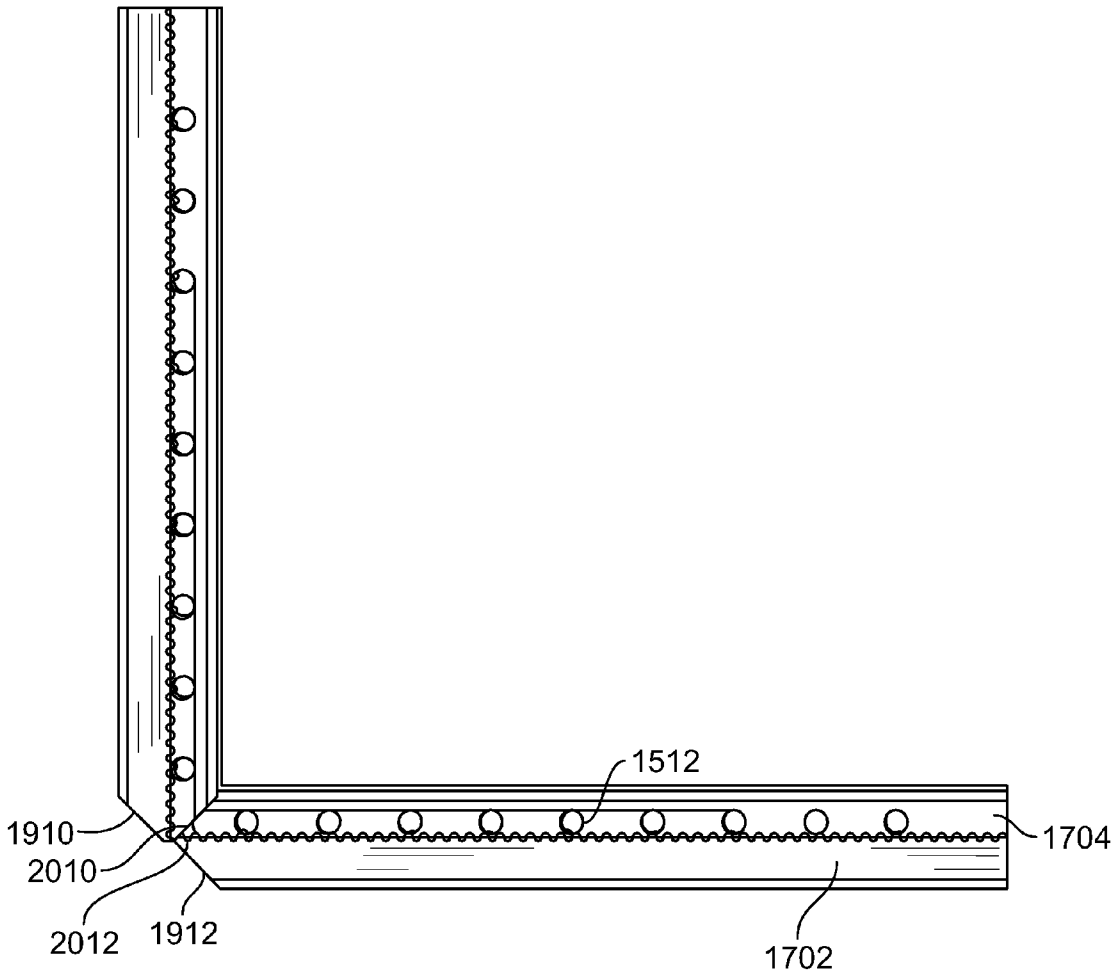

FIG. 23

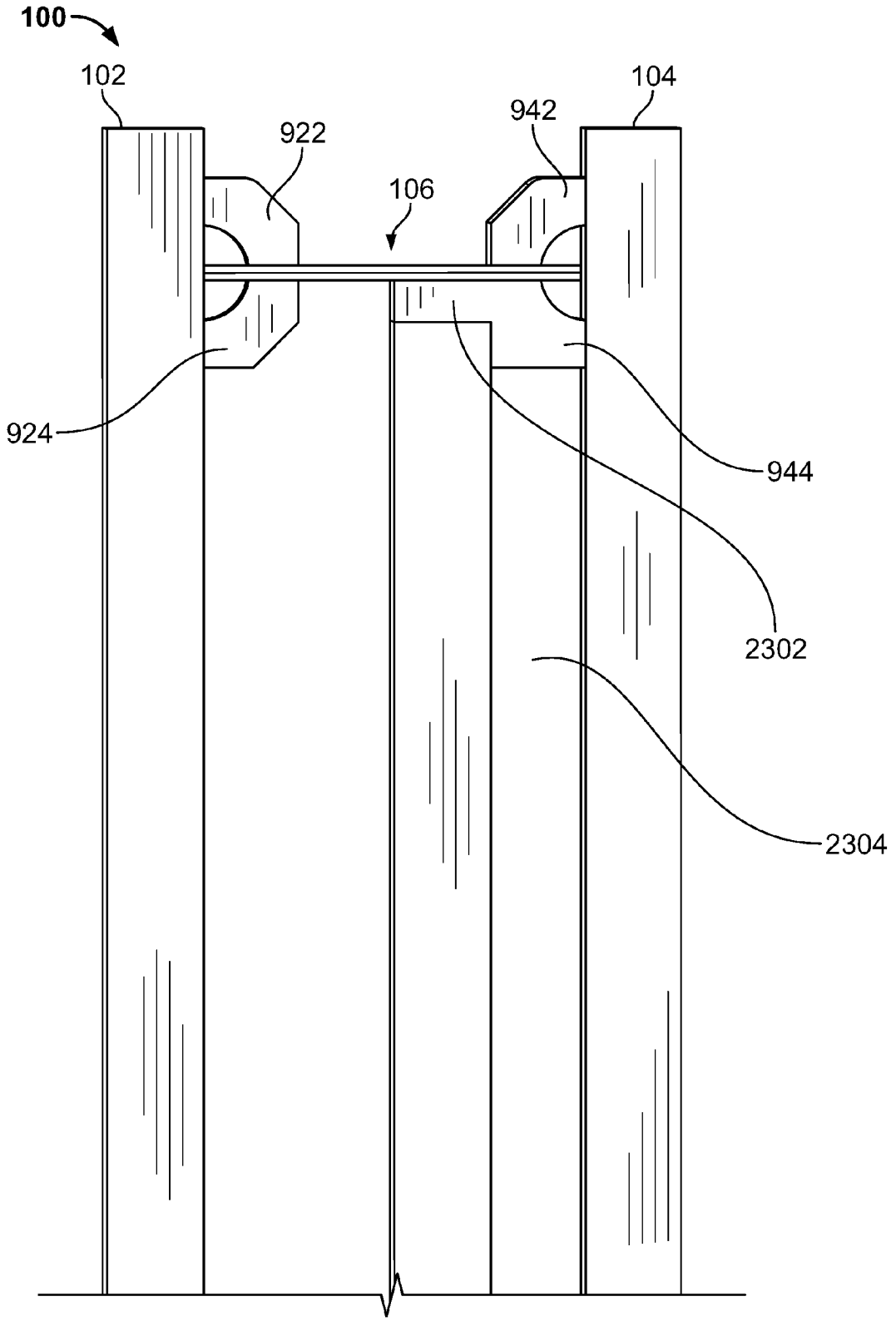

FIG. 24

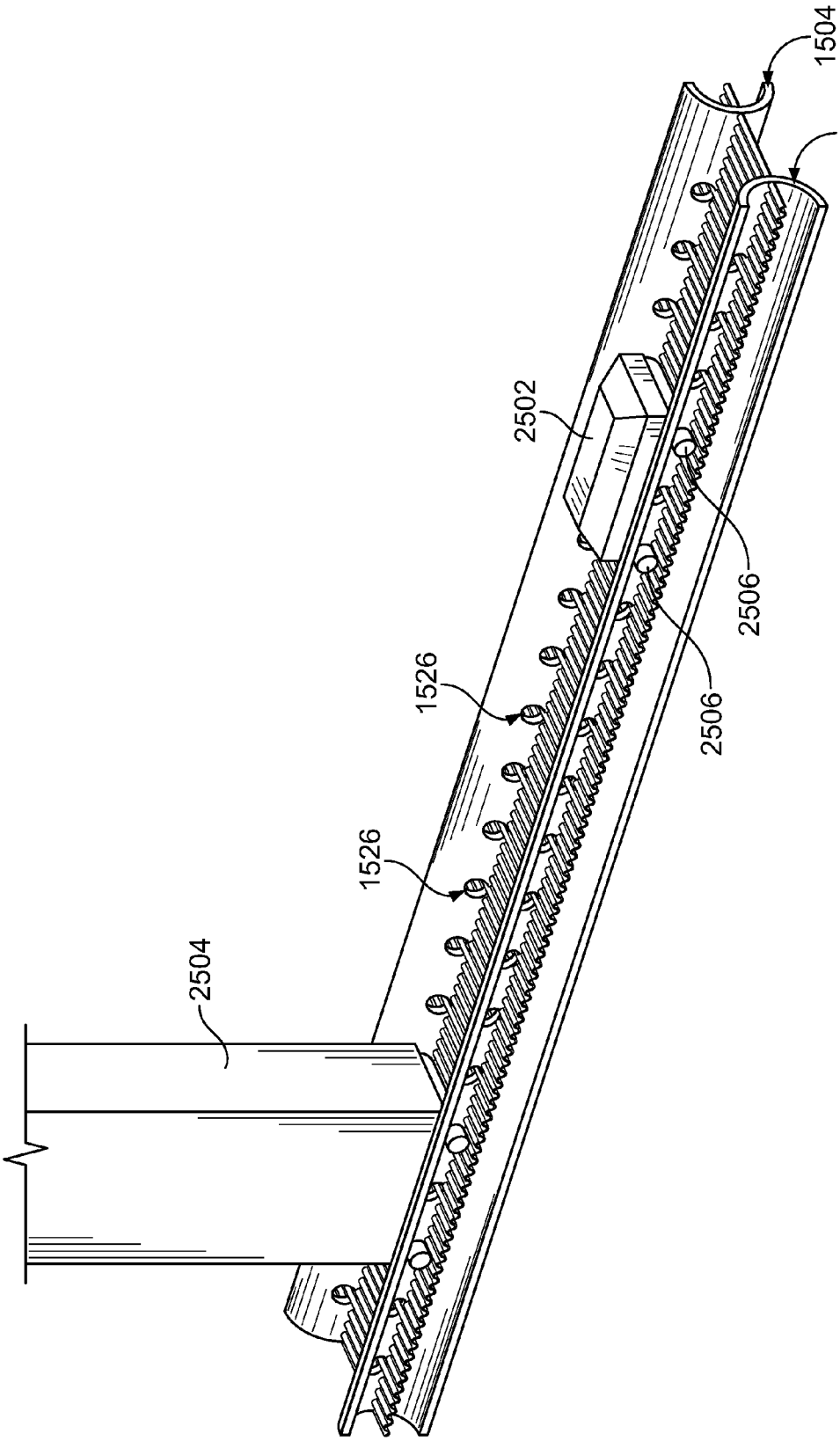

FIG. 25

SEALED UNIT AND SPACER WITH STABILIZED ELONGATE STRIP

RELATED APPLICATIONS

[0001] This application claims priority to U.S. Provisional Application No. 60/987,681, filed on Nov. 13, 2007, titled "WINDOW ASSEMBLY AND WINDOW SPACER"; and to U.S. Provisional Application No. 61/049,593, filed on May 1, 2008, titled "WINDOW ASSEMBLY AND WINDOW SPACER"; and to U.S. Provisional Application No. 61/049,599, filed on May 1, 2008, titled "MANUFACTURE OF WINDOW ASSEMBLY AND WINDOW SPACER"; and to U.S. Provisional Application No. 61/038,803, filed on Mar. 24, 2008, titled "WINDOW ASSEMBLY AND WINDOW SPACER"; the disclosures of which are each hereby incorporated by reference in their entirety.

BACKGROUND

[0002] Windows often include two facing sheets of glass separated by an air space. The air space reduces heat transfer through the window to insulate the interior of a building to which it is attached from external temperature variations. As a result, the energy efficiency of the building is improved, and a more even temperature distribution is achieved within the building. A rigid pre-formed spacer is typically used to maintain the space between the two facing sheets of glass.

SUMMARY

[0003] In general terms, this disclosure is directed to a sealed unit and a spacer. In one possible configuration and by non-limiting example, a sealed unit includes a first sheet, a second sheet, and a spacer arranged between the first sheet and the second sheet. The spacer includes an elongate strip and two sets of stabilizers. The first set of stabilizers is arranged along a first edge of the elongate strip and the second set of stabilizers is arranged along a second edge of the elongate strip.

[0004] One aspect is a spacer comprising: an elongate strip having a first longitudinal edge and a second longitudinal edge and defining a plane extending between at least portions of the first and second longitudinal edges; and a first stabilizer connected to the elongate strip adjacent the first longitudinal edge, the first stabilizer having a first surface arranged substantially perpendicular to the plane, the first surface adapted to support the elongate strip against a first sheet of material.

[0005] Another aspect is a method of making a spacer, the method comprising: forming an undulating shape in a first elongate strip, the undulating shape having a regular and repeating pattern, wherein the first elongate strip has a first longitudinal edge and a second longitudinal edge; and forming a first stabilizer on the elongate strip adjacent the first longitudinal edge.

[0006] Yet another aspect is a sealed unit comprising: a first sheet having a first surface; a second sheet having a second surface; a spacer arranged between the first and second sheets to maintain a gap between the first and second sheets, the spacer comprising: an elongate strip having a first edge and a second edge; a first stabilizer connected to the elongate strip adjacent the first edge of the elongate strip, the first stabilizer including a first sealant trough; and a second stabilizer connected to the elongate strip adjacent the second edge of the elongate strip, the first stabilizer including a second sealant trough; a first sealant bead arranged in the first sealant trough and connecting the spacer to the first sheet; and a second sealant bead arranged in the second sealant trough and connecting the spacer to the second sheet.

[0007] There is no requirement that an arrangement include all of the features characterized herein to obtain some advantage according to the present disclosure.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] FIG. **1** is a schematic front view of an example window assembly including a windows spacer according to the present disclosure.

[0009] FIG. **2** is a perspective view of a portion of the window assembly shown in FIG.

[0010] FIG. **3** is a top view of a portion of the window assembly shown in FIG. **1**.

[0011] FIG. **4** is a cross-sectional view of a portion of the window assembly shown in FIGS. **1-3**.

[0012] FIG. **5** is a schematic front view of an example embodiment of an elongate strip according to the present disclosure.

[0013] FIG. **6** is a perspective view of a portion of the spacer shown in FIG. **1**.

[0014] FIG. **7** is a top view of the portion of the spacer shown in FIG. **6**.

[0015] FIG. **8** is a front view of the portion of the spacer shown in FIG. **6**.

[0016] FIG. **9** is a cross-sectional view of the portion of the spacer shown in FIG. **6**.

[0017] FIG. **10** is a cross-sectional view of another embodiment of a window spacer according to the present disclosure including sealant and desiccant.

[0018] FIG. **11** is a perspective view of a portion of the spacer shown in FIG. **10**.

[0019] FIG. **12** is a front view of another example embodiment of a spacer according to the present disclosure arranged in a corner configuration and including a standard stabilizer configuration.

[0020] FIG. **13** is perspective view of the portion of the spacer shown in FIG. **12** including a modified stabilizer configuration.

[0021] FIG. **14** is a front view of the portion of the spacer shown in FIG. **13**.

[0022] FIG. **15** is a perspective view of a portion of another example embodiment of a spacer according to the present disclosure.

[0023] FIG. **16** is a top view of the portion of the spacer shown in FIG. **15**.

[0024] FIG. **17** is a cross-sectional view of the spacer shown in FIG. **15**.

[0025] FIG. **18** is a perspective view of a portion of another example embodiment of a spacer according to the present disclosure in an unbent configuration and including notches.

[0026] FIG. **19** is a bottom view of the portion of the spacer shown in FIG. **18**.

[0027] FIG. **20** is a top view of the portion of the spacer shown in FIG. **18**.

[0028] FIG. **21** is a front view of the portion of the spacer shown in FIG. **18**.

[0029] FIG. **22** is a front perspective view of the portion of the spacer shown in FIG. **18** and arranged in a corner configuration.

[0030] FIG. **23** is a front view of the portion the spacer shown in FIG. **22**.

[0031] FIG. **24** is a cross-sectional view of another example embodiment of a window assembly according to the present disclosure.

[0032] FIG. **25** is a perspective view of a portion of another example spacer according to the present disclosure and further including an example muntin bar.

DETAILED DESCRIPTION

[0033] Various embodiments will be described in detail with reference to the drawings, wherein like reference numerals represent like parts and assemblies throughout the several views. Reference to various embodiments does not limit the scope of the claims attached hereto. Additionally, any examples set forth in this specification are not intended to be limiting and merely set forth some of the many possible embodiments for the appended claims.

[0034] Although some of the examples discussed herein are directed to a window assembly and a window spacer, such embodiments can alternatively be used in any of various types of sealed units to form yet other embodiments according to the present disclosure. A sealed unit typically includes at least two sheets of material separated by a spacer, where the spacer provides a gap between the two sheets of material.

[0035] FIG. **1** is a schematic front view of example window assembly **100** according to the present disclosure. In some embodiments, window assembly **100** includes sheet **102**, sheet **104**, and spacer **106**. Sheets **102** and **104** are made of a material that allows at least some light to pass through. Typically, sheets **102** and **104** are made of a transparent material, such as glass, plastic, or other suitable materials. Alternatively, a translucent or semi-transparent material is used, such as etched, stained, or tinted glass or plastic.

[0036] Ends of spacer **106** can be connected together with one or more fasteners to form a closed loop in some embodiments. Spacer **106** and sheets **102** and **104** together define an interior space **120** of window assembly **100**. Interior space **120** reduces heat transfer through window assembly **100**.

[0037] A gas is typically sealed within interior space **120**. In some embodiments, the gas is air. Other embodiments include oxygen, carbon dioxide, nitrogen, or other gases. Yet other embodiments include an inert gas, such as helium, neon or a noble gas such as krypton, argon, and the like. Combinations of these or other gases are used in other embodiments.

[0038] In some embodiments, spacer **106** is flexible and can be bent to form corner configurations such as described herein. An example embodiment of a corner is corner **122**. Example embodiments of corner **122** will be discussed in further detail below in FIGS. **12-14** and **22-23**. In other embodiments, spacer **106** is not flexible and another fastener, such as a corner key, is used with rigid spacers to form corner **122**.

[0039] FIGS. **2-4** illustrate a portion of another example window assembly **100**. FIG. **2** is a perspective view. FIG. **3** is a top view. FIG. **4** is a cross-sectional view. In this example, spacer **106** includes elongate strip **210** and a plurality of stabilizers **212**. Spacer **106** is disposed between sheets **102** and **104** to keep sheets **102** and **104** spaced from each other. Typically, spacer **106** is arranged to form a closed loop near to the perimeter of sheets **102** and **104**. Spacer **106** is able to withstand compressive forces applied to sheets **102** and/or **104** to maintain a desired space between sheets **102** and **104**. An interior space **120** is defined within window assembly **100** by spacer **106** and sheets **102** and **104**.

[0040] Elongate strip **210** is typically a long and thin strip of a solid material, such as metal or plastic. An example of a suitable metal is stainless steel. An example of a suitable plastic is a thermoplastic polymer, such as polyethylene terephthalate. A material with low or no permeability is preferred in some embodiments. Other embodiments include a material having a low thermal conductivity.

[0041] Elongate strip **210** is typically flexible, including both bending and torsional flexibility. Bending flexibility allows spacer **106** to be bent to form corners. Bending and torsional flexibility also allow for ease of manufacturing. Such flexibility includes either elastic or plastic deformation such that elongate strip **210** does not fracture during installation into window assembly **100**.

[0042] A benefit of some embodiments having a single elongate strip **210** is increased flexibility of spacer **106**. Another benefit of some embodiments having a single elongate strip **210** is reduced thickness of spacer **106**. In some embodiments, spacer **106** has more than one elongate strip **210** (e.g. two, three, four, or more).

[0043] Another benefit of some embodiments having a single elongate strip **210** is reduced thermal transfer through spacer **106**. In another example embodiment, the thermal properties of spacer **106** are further enhanced by dividing elongate strip **210** into two strips that are separated by thermal break. The separation of elongate strip **210** by thermal breaks further reduces heat transfer through elongate strip **210** to improve the insulating properties of spacer **106**. For example, if sheet **102** is adjacent a relatively cold space and sheet **104** is adjacent a relatively warm space, less heat transfer will occur through elongate strip **210** due to the presence of the thermal break.

[0044] The thermal break is preferably made of a material with low thermal conductivity. In one embodiment, thermal break is a fibrous material, such as paper or fabric. In other embodiments, thermal break is an adhesive, sealant, paint, or other coating. In yet other embodiments, the thermal break is a polymer, such as plastic. Further embodiments include other materials, such as metal, vinyl, or any other suitable material. In some embodiments, the thermal break is made of multiple materials, such as paper coated with an adhesive or sealant material on both sides to adhere the paper to elongate strip **210**. Another alternative embodiment divides elongate strip **210** into at least three strips, and includes more than one thermal break.

[0045] Plurality of stabilizers **212** help stabilize elongate strip **210** between sheet **102** and sheet **104**. Due to the flexibility of elongate strip **210**, the added support of stabilizers **212** aids in the installation and improves the stability of spacer **106**. The plurality of stabilizers **212**, reduce the change that the thin elongate strip **210** will bend, buckle, or displace such a compressive force is applied to one or both of sheets **102** and **104**. Plurality of stabilizers **212** help keep elongate strip **210** in a generally perpendicular orientation to sheets **102** and **104**, promoting strength and stability of elongate strip **210**. Plurality of stabilizers **212** further allow spacer **106** to maintain appropriate spacing between sheets **102** and **104** and help reduce the change of buckling, bending, or breaking of elongate strip **210**. An advantage of some embodiments using plurality of stabilizers **212** is that the material thickness (e.g., T1 shown in FIG. **4**) of elongate strip **210** can be reduced. In doing so, material costs are reduced. Furthermore, thermal transfer through elongate strip **210** is also reduced.

[0046] FIG. **4** is a cross sectional view of a portion of window assembly **100**. In this embodiment, window assembly **100** includes sheet **102**, sheet **104**, and spacer **106**.

[0047] Sheet **102** includes outer surface **410**, inner surface **412**, and perimeter **414**. Sheet **104** includes outer surface **420**, inner surface **422**, and perimeter **424**. In one example, WI is the thickness of sheets **102** and **104**. WI is typically in a range from about 0.05 inches (about 0.15 centimeter) to about 1 inch (about 2.5 centimeters), and preferably from about 0.1 inches (about 0.25 centimeter) to about 0.5 inches (about 1.5 centimeters). Other embodiments include other dimensions. In some embodiments, the thickness of sheet **102** is the same as the thickness of sheet **104**. In other embodiments, the thickness of sheet **102** is different from the thickness of sheet **104**. Sheets **102** and **104** are not required in all embodiments.

[0048] In some embodiments, spacer **106** is arranged between inner surface **412** and inner surface **422**. Spacer **106** is typically arranged near perimeters **414** and **424**. In one example, D**1** is the distance between and connected to perimeters **414** and **424** and elongate strip **210** of spacer **106**. D**1** is typically in a range from about 0 inches (about 0 centimeter) to about 2 inches (about 5 centimeters), and preferably from about 0.1 inches (about 0.25 centimeter) to about 0.5 inches (about 1.5 centimeters). However, in other embodiments spacer **106** is arranged in other locations between sheets **102** and **104**.

[0049] Spacer **106** maintains a space between sheets **102** and **104**. In one example, W**3** is the overall width of spacer **106** and the distance between sheets **102** and **104**. W**3** is typically in a range from about 0.1 inches (about 0.25 centimeter) to about 2 inches (about 5 centimeters) and preferably from about 0.3 inches (about 0.75 centimeter) to about 1 inch (about 2.5 centimeters). Other embodiments include other spaces.

[0050] Spacer **106** is connected to sheets **102** and **104**. In some embodiments, stabilizers **212** connect spacer **106** to sheets **102** and **104**. In other embodiments, stabilizers **212** are connected to sheets **102** and **104** by any suitable fastener. An example of a fastener is a sealant or adhesive, as described in more detail below. In yet other embodiments, a frame, sash, or the like is constructed around window assembly **100** to support spacer **106** between sheets **102** and **104**. In some embodiments, spacer **106** is connected to the frame or sash by a fastener, such as adhesive. In example embodiments, spacer **106** is fastened to the frame or sash prior to installation of sheets **102** and **104**.

[0051] FIG. **5** is a schematic front view of an example embodiment of elongate strip **210** according to the present disclosure. In this embodiment, elongate strip **210** has an undulating shape. In some embodiments, elongate strip **210** is formed of a metal ribbon, such as stainless steel, which is then bent into the undulating shape. Some possible embodiments of the undulating shape include sinusoidal, arcuate, square, rectangular, triangular, and other desired shapes.

[0052] One benefit of stainless steel is that it is resistant to ultraviolet radiation. Other metals are used in other embodiments, such as titanium. Titanium has a lower thermal conductivity, a lower density, and better corrosion resistance than stainless steel. Other embodiments include other materials, such as aluminum. Some embodiments are formed by other processes, such as molding.

[0053] In some embodiments, elongate strip **210** has bending flexibility and torsional flexibility. Bending flexibility allows spacer **106** to be formed around a corner of a window, for example. In addition, bending flexibility allows elongate strip **210** to be made from rolled stock. Rolled stock saves space during transportation and is therefore easier and less expensive to transport. Portions of elongate strip **210** are then unrolled during assembly. In some embodiments a tool is used to guide elongate strip **210** into the desired arrangement and to attach plurality of stabilizers **212** to form spacer **106**. In other embodiments, a machine or robot is used to automatically manufacture spacer **106** and window assembly **100**.

[0054] One of the benefits of the undulating shape is that the flexibility of elongate strip **210** is increased, including bending and torsional flexibility. The undulating shape resists permanent deformation, such as kinks and fractures. This allows elongate strip **210** to be more easily handled during manufacturing without damaging elongate strip **210**. The undulating shape also increases the structural stability of elongate strip **210** to improve the ability of spacer **106** to withstand compressive and torsional loads. Some embodiments of elongate strip **210** are also able to extend and contract, which is beneficial, for example, when spacer **106** is formed around a corner. In some embodiments, the undulating shape reduces the need for notching or other stress relief.

[0055] In one example, elongate strip **210** has material thicknesses T**1**. T**1** is typically in a range from about 0.0001 inches (about 0.00025 centimeter) to about 0.010 inches (about 0.025 centimeter), and preferably from about 0.0003 inches (about 0.00075 centimeter) to about 0.004 inches (about 0.01 centimeter). Such thin material thickness reduces material costs and reduces thermal conductivity through elongate strip **210**. The undulating shape of elongate strip **210** defines a waveform having a peak-to-peak amplitude and a peak-to-peak period. The peak-to-peak amplitude is also the overall thickness T**3** of elongate strip **210**. T**3** is typically in a range from about 0.005 inches (about 0.015 centimeter) to about 0.1 inches (about 0.25 centimeter), and preferably from about 0.02 inches (about 0.05 centimeter) to about 0.04 inches (about 0.1 centimeter). P**1** is the peak-to-peak period of undulating elongate strip **210**. P**1** is typically in a range from about 0.005 inches (about 0.015 centimeter) to about 0.1 inches (about 0.25 centimeter), and preferably from about 0.02 inches (about 0.05 centimeter) to about 0.04 inches (about 0.1 centimeter).

[0056] Other embodiments include other dimensions. For example, some embodiments have an elongate strip **210** with a larger waveform. Elongate strips with larger waveforms have increased stability because the overall thickness is increased. This thickness resists torsional forces and in some embodiments provides increased resistance to compressive loads. Elongate strip **210** can be expanded and compressed, such as to form a corner. In one embodiment, an elongate strip **210** with a larger waveform is expandable between a first length (having the large undulating shape) and a second length (in which elongate strip **210** is substantially straight and substantially lacking an undulating shape) or any length there between. In some embodiments, the second length is in a range from 25 percent to about 60 percent greater than the first length, and preferably from about 30 percent to about 50 percent greater.

[0057] When elongate strip **210** has a larger waveform it also includes greater surface area. The greater surface area provides a stronger bond with a sealant or adhesive and one or more sheets. The greater surface area also provides increased strength and stability. In other embodiments, elongate strip **210** is generally flat and smooth (e.g. having an amplitude of

about 0 inches (about 0 centimeter) and a period of about 0 inches (about 0 centimeter)) without an undulating shape.

[0058] FIGS. **6-9** illustrate another example spacer **106** according to the present disclosure. FIG. **6** is a perspective view of a portion of spacer **106**. FIG. **7** is a top view of the portion of spacer **106**. FIG. **8** is a front view of the portion of spacer **106**. FIG. **9** is a cross-sectional view of spacer **106**.

[0059] Spacer **106** includes elongate strip **210**. Elongate strip **210** includes edge **632** and an edge **634**. When installed in example window assembly **100**, edge **632** of spacer **106** typically contacts and extends generally perpendicular to a surface of sheet **102**. When installed in example window assembly **100**, edge **634** typically contacts and extends generally perpendicular to a surface of sheet **104**. Elongate strip **210** also includes an external surface **636** and an internal surface **638**. Internal surface **638** is adjacent to interior space **120** when assembled into a window assembly. In some embodiments internal surface **638** of elongate strip **210** is visible by a person when looking through window assembly **100**. Internal surface **638** of elongate strip **210** provides a clean and finished appearance to spacer **106**.

[0060] In example embodiments, stabilizers **212** include a first set of stabilizers **642** and a second set of stabilizers **644**. First set of stabilizers **642** is attached to elongate strip **210** near edge **632**. When installed in example window assembly **100**, first set of stabilizers **642** is adjacent to sheet **102**. First set of stabilizers **642** is attached to the external surface **636** and internal surface **638** near edge **632** of elongate strip **210**. Second set of stabilizers **644** is attached to elongate strip **210** near edge **604**. When installed in example window assembly **100**, second set of stabilizers **642** is adjacent to sheet **104**. Second set of stabilizers **644** is attached to the external surface **636** and internal surface **638** near edge **634** of elongate strip **210**.

[0061] First set of stabilizers **642** and second set of stabilizers **644** are typically made of a strong, rigid material such as metal or plastic. In example embodiments, plastic stabilizers are preferable to metal because they are cheaper to manufacture and easier to install, while still providing the necessary strength to stabilize the elongate strip **210**.

[0062] FIGS. **7-8** illustrate dimensions for one example of spacer **106**. In this example, each of stabilizers **212** of example spacer **106** has a length L**1**. L**1** is typically in a range from about 0.01 inches (about 0.025 centimeter) to about 1 inch (about 2.5 centimeters), and preferably from about 0.05 inches (about 0.15 centimeter) to about 0.5 inches (about 1.5 centimeters). Additionally, each of stabilizers **212** of example spacer **106** is separated from its closest adjacent stabilizer by a length L**3**. L**3** is typically in a range from about 0.01 inches (about 0.025 centimeter) to about 1 inch (about 2.5 centimeters), and preferably from about 0.05 inches (about 0.15 centimeter) to about 0.5 inches (about 1.5 centimeters). Other embodiments include other dimensions.

[0063] Looking to FIG. **9**, spacer **106** is shown in further detail in a cross-sectional view. Spacer **106** includes elongate strip **210**, stabilizer **920** (of first set of stabilizers **642**), and stabilizer **940** (of second set of stabilizers **644**).

[0064] In some embodiments, stabilizer **920** includes an external stabilizer portion **922** and an internal stabilizer portion **924**. External stabilizer portion **922** is attached to external surface **636** near edge **632** of elongate strip **210**. Internal stabilizer portion **924** is attached to internal surface **638** near edge **632** of elongate strip **210**. External stabilizer portion **922** and internal stabilizer portion **924** are shaped so that when both are connected to elongate strip **210**, external stabilizer portion **922** and internal stabilizer portion **924** create a trough **926**. In specific embodiments, trough **926** has an arcuate shape with a radius RI. In this embodiment, RI is the distance between edge **632** and the surface of stabilizer **920** that forms trough **926**. In example embodiments, trough **926** is divided into two areas by edge **632** of elongate strip **210**. The area of trough **926** created between external surface **636** and external stabilizer portion **922** is external trough area **928**. The area of trough **926** created between internal surface **638** and internal stabilizer portion **924** is internal trough area **930**. External trough area **928** and internal trough area **930** are cavities into which material, such as sealants and desiccants, can be placed during installation of spacer **106**, as discussed in more detail below.

[0065] As with stabilizer **920**, stabilizer **940** includes an external stabilizer portion **942** and an internal stabilizer portion **944**. External stabilizer portion **942** is attached to external surface **636** near edge **634** of elongate strip **210**. Internal stabilizer portion **944** is attached to internal surface **638** near edge **634** of elongate strip **210**. External stabilizer portion **942** and internal stabilizer portion **944** are shaped so that when both are connected to elongate strip **210**, external stabilizer portion **942** and internal stabilizer portion **944** create a trough **946**. In specific embodiments, trough **946** has an arcuate shape with a radius RI. In this embodiment, RI is the distance between edge **634** and the surface of stabilizer **940** that forms trough **946**. In example embodiments, trough **946** is divided into two areas by edge **634** of elongate strip **210**. The area created between external surface **636** and external stabilizer portion **942** is external trough area **948**. The area created between internal surface **638** and internal stabilizer portion **944** is internal trough area **950**. External trough area **948** and internal trough area **950** are cavities into which material, such as sealant, can be placed during installation of spacer **106**, as discussed in more detail below.

[0066] In some embodiments, each of external stabilizer portion **922**, internal stabilizer portion **924**, external stabilizer portion **942**, and internal stabilizer portion **944** have a width w**5**. Looking to external stabilizer portion **922** as an example, W**5** is the width of external stabilizer portion **922** from a surface **932** nearer edge **632** of elongate strip **210** to a surface **934** at an opposite side of stabilizer portion **922**. W**5** is typically in a range from about 0.01 inches (about 0.025 centimeter) to about 1 inch (about 2.5 centimeters), and preferably from about 0.05 inches (about 0.15 centimeter) to about 0.5 inches (about 1.5 centimeters). Internal stabilizer portion **924**, external stabilizer portion **942**, and internal stabilizer portion **944** have W**5** values equal to or similar to external stabilizer portion **922** in some embodiments. In example embodiments, W**5** values are approximately the same for each individual stabilizer of plurality of stabilizers **212**. In other embodiments, W**5** varies.

[0067] In some embodiments, each of external stabilizer portion **922**, internal stabilizer portion **924**, external stabilizer portion **942**, and internal stabilizer portion **944** have a height H**1**. Looking again to external stabilizer portion **922** as an example, H**1** is the height of external stabilizer portion **922** from a surface **936** of external stabilizer portion **922**, where external stabilizer portion **922** is attached to external surface **636** of elongate strip **210**, to a distal surface **938** of external stabilizer portion **922**, farthest from surface **636** of elongate strip **210**. H**1** is typically in a range from about 0.01 inches (about 0.025 centimeter) to about 1 inch (about 2.5 centime-

ters), and preferably from about 0.05 inches (about 0.15 centimeter) to about 0.5 inches (about 1.5 centimeters). Internal stabilizer portion **924**, external stabilizer portion **942**, and internal stabilizer portion **944** have H1 values equal to or similar to external stabilizer portion **922** in some embodiments. In example embodiments, H1 values are approximately the same for each individual stabilizer of plurality of stabilizers **212**. In other embodiments, H1 varies.

[0068] First set of stabilizers **642**, including external stabilizer portion **922** and internal stabilizer portion **924**, and second set of stabilizers **644**, including external stabilizer portion **942** and internal stabilizer portion **944**, are attached to elongate strip **210**. In one example, first set of stabilizers **642** and second set of stabilizers **644** are made of plastic and extruded directly onto elongate strip **210**. As the plastic contacts elongate strip **210** and cools, the plastic bonds to elongate strip **210**. In other embodiments, first set of stabilizers **642** and second set of stabilizers **644** are preformed and subsequently attached to elongate strip **210** with an adhesive.

[0069] In other embodiments, external stabilizer portion **922** of first set of stabilizers **642** and internal stabilizer portion **924** of first set of stabilizers **642** are attached together with a fastener, thus sandwiching elongate strip **210** in between. Specifically, a metal fastener such as a screw, nail, or pin can connect external stabilizer portion **922** to internal stabilizer portion **924** by puncturing through elongate strip **210**. This same method is used to connect external stabilizer portion **942** of second set of stabilizers **644** and internal stabilizer portion **944** of second set of stabilizers **644** to each other and to elongate strip **210** in some embodiments.

[0070] FIGS. **10-11** illustrate another example spacer **106** further including sealant and desiccant. FIG. **10** is a cross-sectional view of spacer **106** including sealant and desiccant. FIG. **11** is a perspective view of spacer **106** including sealant and desiccant.

[0071] In example embodiments, sealants **1002** and **1004** are used to connect spacer **106** to sheets **102** and **104** of window assembly **100**. Examples of sealants **1002** and **1004** include polyisobutylene (PIB), butyl, curable PIB, reactive hot melt beutal (such as D-2000 manufactured by Delchem, Inc. located in Wilmington, Del.), curative hot melt (such as HL-5153 manufactured by H.B. Fuller Company), hot melt silicon, copolymers of silicon and polyisobutylene, acrylic adhesive, acrylic sealant, and other Dual Seal Equivalent (DSE) type materials.

[0072] In one embodiment, sealant **1002** is filled into external trough area **928** and internal trough area **930** of trough **926** until it covers edge **632** of elongate strip **210**. The sealant covered edge **632** and sealant filed trough **926** are then pressed against inner surface **412** of sheet **102**. Sealant **1004** is also filled into external trough area **948** and internal trough area **950** of trough **946** until it covers edge **634** of elongate strip **210**. The sealant covered edge **634** and sealant filed trough **926** are then pressed against inner surface **422** of sheet **104**. In other embodiments, beads of sealant **1002** and **1004** are applied to sheets **102** and **104**, and spacer **106** is then pressed into the beads. Edges **632** and **634** are covered with sealants **1002** and **1004** and troughs **926** and **946** are filled with sealants **1002** and **1004**.

[0073] In some embodiments, once spacer **106** is installed into a window assembly (e.g. **100** shown in FIG. **1**), first set of stabilizers **642**, edge **632** of elongate strip **210**, and sealant **1002** sit flush against sheet **102** and second set of stabilizers **644**, edge **634** of elongate strip **210**, and sealant **1004** sit flush against sheet **104**.

[0074] In some embodiments, sealants **1002** and **1004** are a material having adhesive properties, such that sealants **1002** and **1004** act to fasten spacer **106** to sheets **102** and **104**. Typically, sealant **1002** and **1004** is arranged to support spacer **106** is an orientation generally normal to inner surfaces **412** and **422** of sheets **102** and **104**. Sealants **1002** and **1004** also act to seal the joint formed between spacer **106** and sheets **102** and **104** to inhibit gas or liquid intrusion into interior space **120**.

[0075] In some embodiments, a desiccant **1006** is applied to internal surface **638** of elongate strip **210**. Desiccant **1006** acts to remove moisture from interior space **120**. Desiccants include molecular sieve and silica gel type desiccants. One example of a desiccant is a beaded desiccant, such as PHONOSORB® molecular sieve beads manufactured by W. R. Grace & Co. of Columbia, Md. If desired, an adhesive is used to attach beaded desiccant to internal surface **638** of elongate strip **210**. A matrix desiccant is used in some embodiments, such as those manufactured by W.R. Grace & Co. and H.B. Fuller Corporation. In some embodiments, desiccant **1006** also provides thermal insulation. Thermal insulation reduces heat transfer through spacer **106** both between sheets **102** and **104**, and between the interior space **120** and an exterior side of spacer **106**.

[0076] FIG. **12** is a front view of a portion of an example spacer **106** arranged in a corner configuration with a standard stabilizer configuration. In some embodiments, the spacer shown in FIG. **12** is the same as the spacer shown in FIG. **6** after a bending operation. Spacer **106** includes elongate strip **210** and plurality of stabilizers **212**. In this embodiment, elongate strip **210** has an undulating shape. The portion of spacer **106** is shown arranged as a corner, such that a first region **1202** of the spacer **106** is oriented at approximately a 90 degree angle from a second region **1204** of spacer **106**. Some embodiments of spacer **106** are able to be arranged to form a corner without kinking or breaking.

[0077] Elongate strip **210** includes an undulating shape. As a result, elongate strip **210** is arranged to expand and compress as necessary. The undulating shape is able to expand by stretching. In some embodiments, the undulating shape of elongate strip **210** is expandable from a first length (having an undulating shape) to a second length (at which point the elongate strip is substantially flat and without an undulating shape). The second length is typically in a range from about 5 percent to about 25 percent longer than the first length, and is preferably from about 10 percent to about 20 percent longer than the first length. In some embodiments, the undulating shape of elongate strip **210** is also compressible. The illustrated embodiment shows elongate strip **210** slightly compressed. In some embodiments, however, elongate strip **210** bends without significant compression or expansion of the undulating shape.

[0078] Spacer **106** has bending flexibility. For example, a radius of curvature (as measured from a centerline of spacer **106**, is typically in a range from about 0.05 inches (about 0.15 centimeter) to about 0.5 inches (about 1.5 centimeters), and preferably from about 0.05 inches (about 0.15 centimeter) to about 0.25 inches (about 0.65 centimeter) without undesired kinking, fracture, or damage to spacer **106**.

[0079] In the example embodiment illustrated in FIG. **12**, all of plurality of stabilizers **212** have approximately the same

size and shape. Thus, the corner configuration of FIG. **12** has a standard stabilizer configuration. Lengths L**1** and L**3** are such that spacer **106** can be arranged in corner configuration without any of the plurality of stabilizers **212** prohibiting the bending of spacer **106**, even in the standard configuration. Because the stabilizer configuration has not been modified, the L**3** value between the stabilizers in the corner is changed from the standard L**3** value found between the others of the plurality of stabilizers **212**. In other embodiments, such as the embodiment illustrated in FIGS. **13-14**, the stabilizer configuration can be modified.

[0080] FIGS. **13-14** illustrate an example spacer **106** arranged in a corner configuration with a modified stabilizer configuration. FIG. **13** is perspective view of a portion of spacer **106** arranged in a corner configuration with a modified stabilizer configuration. FIG. **14** is a front view of a portion of spacer **106** arranged in a corner configuration with a modified stabilizer configuration.

[0081] In the example embodiment illustrated by FIGS. **13-14**, spacer **106** includes elongate strip **210** and plurality of stabilizers **212**. Elongate strip **210** has an undulating shape. The portion of spacer **106** is shown arranged as a corner, such that a first region **1202** of the spacer **106** is oriented at approximately a 90 degree angle from a second region **1204** of the spacer **106**. Spacer **106** is able to be arranged to form a corner without kinking or breaking.

[0082] As described above, the undulating shape of elongate strip **210** allows elongate strip **210** to expand and compress as necessary to form a corner **122**. The example embodiment of spacer **106** illustrated in FIGS. **13-14** differs from that illustrated in FIG. **12** in its stabilizer shape and size. In this embodiment, the stabilizer configuration of spacer **106** has been modified. Modified corner stabilizers **1310** have been modified from the standard stabilizer size and shape to better suit usage in corner **122**.

[0083] Looking to FIG. **14**, modified corner stabilizers **1310** include internal stabilizer portions **1402** on the inside of the window assembly **100** in the interior space **120** and external stabilizer portion **1404** on the exterior of window assembly **100**. Internal stabilizer portions **1402** of modified corner stabilizers **1310** have been reduced slightly in size, while external stabilizer portions **1404** of modified corner stabilizers **1310** have been enlarged slightly in size. In specific embodiments, the modified corner stabilizers **1310** taper from being slightly smaller than the others of plurality of stabilizers **212** at internal stabilizer portions **1402** to being slightly larger than the others of plurality of stabilizers **212** at the external stabilizer portions **1404**. In example embodiments, the distance between each individual stabilizer and the next individual stabilizer is kept constant by the modifications to the size of internal stabilizer portions **1402** and external stabilizer portions **1404** on modified corner stabilizers **1310**.

[0084] Although FIGS. **12-14** illustrate bending in only one direction, spacer **106** is capable of bending in multiple directions at once. Furthermore, spacer **106** is also capable of stretching and twisting without causing permanent damage to spacer **106**, such as buckling, cracking, or breaking.

[0085] FIGS. **15-17** illustrate another example spacer **1502** according to the present disclosure. FIG. **15** is a perspective view of spacer **1502**. FIG. **16** is a top view of spacer **1502**. FIG. **17** is a cross-sectional view of spacer **1502**.

[0086] Example spacer **1502** can be designed to further enhance the aesthetics of window assembly **100** compared to other spacers. Spacer **1502** includes elongate strip **210** and a plurality of stabilizers **1504**.

[0087] Elongate strip **210** includes edge **632** and an edge **634**. When installed in example window assembly **100**, edge **632** of spacer **1502** is adjacent and perpendicular to sheet **102**. When installed in example window assembly **100**, edge **634** is adjacent and perpendicular to sheet **104**. Elongate strip **210** also includes an external surface **636** and an internal surface **638**. Internal surface **638** is adjacent to interior space **120**. In some embodiments internal surface **638** of elongate strip **210** is visible by a person when looking through window assembly **100**. Internal surface **638** of elongate strip **210** provides a clean and finished appearance to spacer **1502**.

[0088] Plurality of stabilizers **1504** includes a first stabilizer **1510** and a second stabilizer **1520**. First stabilizer **1510** is a single piece of material attached to elongate strip **210** near edge **632**. First stabilizer **1510** is approximately the same length as elongate strip **210**. When installed in example window assembly **100**, first stabilizer **1510** is adjacent to sheet **102**. First stabilizer **1510** is attached to the external surface **636** and internal surface **638** near edge **632** of elongate strip **210**. Second stabilizer **1520** is a single piece of material attached to elongate strip **210** near edge **604**. Second stabilizer **1520** is approximately the same length as elongate strip **210**. When installed in example window assembly **100**, second stabilizer **1520** is adjacent to sheet **104**. Second stabilizer **1520** is attached to the external surface **636** and internal surface **638** near edge **634** of elongate strip **210**.

[0089] In example embodiments, first stabilizer **1510** and second stabilizer **1520** are arcuate in shape, each forming a semicircle. First stabilizer **1510** and second stabilizer **1520** are made of a strong, rigid material such as metal or plastic. In example embodiments, plastic is preferable to metal because it is cheaper to manufacture and easier to install, while still providing the necessary strength to stabilize the elongate strip **210**.

[0090] In example embodiments, stabilizer **1510** includes a plurality of apertures **1512** and stabilizer **1520** includes a plurality of apertures **1522**. Apertures **1512** and **1522** will be detailed further below.

[0091] Looking to the cross-sectional view of spacer **1502** in FIG. **17**, stabilizer **1510** has two parts, an external stabilizer portion **1702** and an internal stabilizer portion **1704**. External stabilizer portion **1702** is attached to external surface **636** near edge **632** of elongate strip **210**. Internal stabilizer portion **1704** is attached to internal surface **638** near edge **632** of elongate strip **210**. External stabilizer portion **1702** and internal stabilizer portion **1704** are shaped so that when both are connected to elongate strip **210**, external stabilizer portion **1702** and internal stabilizer portion **1704** create a trough **1706**. In specific embodiments, trough **1706** has an arcuate shape with a radius R**3**. In this embodiment, R**3** is the distance between edge **632** and the surface of stabilizer **1510** that forms trough **1706**. In example embodiments, trough **1706** is divided into two areas by edge **632** of elongate strip **210**. The area of trough **1706** created between external surface **636** and external stabilizer portion **1702** is external trough area **1708**. The area of trough **1706** created between internal surface **638** and internal stabilizer portion **1704** is internal trough area **1710**. External trough area **1708** and internal trough area **1710** are cavities into which material, such as sealants and desiccants, can be placed during installation of spacer **106**.

Sealants and desiccants can be applied to spacer **1502** in a manner similar to that shown in FIGS. **10-11** and described above.

[0092] In example embodiments, plurality of apertures **1512** are included in internal stabilizer portion **1704** of stabilizer **1510**. Apertures **1512** allow gas and moisture to pass through internal stabilizer portion **1704** of stabilizer **1510**. As a result, moisture located within interior space **120** is allowed to pass through internal stabilizer portion **1704** of stabilizer **1510** and into internal trough area **1710**, where it is removed by a desiccant placed within inner trough area **1710**. In another embodiment, apertures **1512** are used for registration. In yet another embodiment, apertures provide reduced thermal transfer. In one example, apertures **1512** have a diameter in a range from about 0.002 inches (about 0.005 centimeter) to about 0.050 inches (about 0.15 centimeter). Apertures **1512** are made by any suitable method, such as cutting, punching, drilling, laser forming, or the like.

[0093] As with stabilizer **1510**, stabilizer **1520** has two parts, an external stabilizer portion **1722** and an internal stabilizer portion **1724**. External stabilizer portion **1722** is attached to external surface **636** near edge **634** of elongate strip **210**. Internal stabilizer portion **1724** is attached to internal surface **638** near edge **634** of elongate strip **210**. External stabilizer portion **1722** and internal stabilizer portion **1724** are shaped so that when both are connected to elongate strip **210**, external stabilizer portion **1722** and internal stabilizer portion **1724** create a trough **1726**. In specific embodiments, trough **1726** has an arcuate shape with a radius R**3**. In this embodiment, R**3** is the distance between edge **634** and the surface of stabilizer **1520** that forms trough **1726**. In example embodiments, trough **1726** is divided into two areas by edge **634** of elongate strip **210**. The area of trough **1726** created between external surface **636** and external stabilizer portion **1722** is external trough area **1728**. The area of trough **1726** created between internal surface **638** and internal stabilizer portion **1724** is internal trough area **1730**. External trough area **1728** and internal trough area **1730** are cavities into which material, such as sealants and desiccants, can be placed during installation of spacer **106**. Sealants and desiccants can be applied to spacer **1502** in a manner similar to that shown in FIGS. **10-11** and described above.

[0094] In example embodiments, plurality of apertures **1522** are included in internal stabilizer portion **1724** of stabilizer **1520**. Apertures **1522** allow gas and moisture to pass through internal stabilizer portion **1724** of stabilizer **1520**. As a result, moisture located within interior space **120** is allowed to pass through internal stabilizer portion **1724** of stabilizer **1520** and into internal trough area **1730**, where it is removed by a desiccant placed within inner trough area **1730**. In another embodiment, apertures **1522** are used for registration. In yet another embodiment, apertures provide reduced thermal transfer. In one example, apertures **1522** have a diameter in a range from about 0.002 inches (about 0.005 centimeter) to about 0.050 inches (about 0.15 centimeter). Apertures **1522** are made by any suitable method, such as cutting, punching, drilling, laser forming, or the like.

[0095] First stabilizer **1510**, including external stabilizer portion **1702** and internal stabilizer portion **1704**, and second stabilizer **1520**, including external stabilizer portion **1722** and internal stabilizer portion **1724**, can be attached to elongate strip **210** by various means and methods. In example embodiments, first stabilizer **1510** and second stabilizer **1520** are made of plastic extruded directly onto elongate strip **210**. In other embodiments, first stabilizer **1510** and second stabilizer **1520** are attached to elongate strip **210** with an adhesive.

[0096] As with the example embodiment previously described, external stabilizer portion **1702** of first stabilizer **1510** and internal stabilizer portion **1704** of first stabilizer **1510** may also be attached together with a fastener, thus sandwiching elongate strip **210** in between. Specifically, a metal fastener such as a screw or nail can connect external stabilizer portion **1702** to internal stabilizer portion **1704** by puncturing through elongate strip **210**. This same method can be used to connect external stabilizer portion **1722** of second stabilizer **1520** and internal stabilizer portion **1724** of second stabilizer **1520** to each other and to elongate strip **210**.

[0097] In some embodiments, each of external stabilizer portion **1702**, internal stabilizer portion **1704**, external stabilizer portion **1722**, and internal stabilizer portion **1724** have a width W**7**. Looking to internal stabilizer portion **1704** as an example, W**7** is the width of internal stabilizer portion **1704** from a surface **1712** nearer edge **632** of elongate strip **210** to an outer edge **1714** farther from edge **632** of elongate strip **210**. W**7** is typically in a range from about 0.01 inches (about 0.025 centimeter) to about 1 inch (about 2.5 centimeters), and preferably from about 0.05 inches (about 0.15 centimeter) to about 0.5 inches (about 1.5 centimeters). External stabilizer portion **1702**, external stabilizer portion **1722**, and internal stabilizer portion **1724** have W**7** values equal to or similar to external stabilizer portion **1702** in some embodiments. In example embodiments, W**7** values are approximately the same for both first stabilizer **1510** and second stabilizer **1520**. In other embodiments, W**7** varies.

[0098] In some embodiments, each of external stabilizer portion **1702**, internal stabilizer portion **1704**, external stabilizer portion **1722**, and internal stabilizer portion **1724** also have a height H**3**. Looking again to internal stabilizer portion **1704** as an example, H**3** is the height of internal stabilizer portion **1704** from a surface **1716** of internal stabilizer portion **1704**, where internal stabilizer portion **1704** is attached to internal surface **638** of elongate strip **210**, to a surface **1718** of internal stabilizer portion **1704**, farthest from surface **638** of elongate strip **210**. H**3** is typically in a range from about 0.01 inches (about 0.025 centimeter) to about 1 inch (about 2.5 centimeters), and preferably from about 0.05 inches (about 0.15 centimeter) to about 0.5 inches (about 1.5 centimeters). External stabilizer portion **1702**, external stabilizer portion **1722**, and internal stabilizer portion **1724** have H**3** values equal to or similar to internal stabilizer portion **1704**. In example embodiments, H**3** values are approximately the same for each individual stabilizer of plurality of stabilizers **212**. In other embodiments, H**3** varies.

[0099] FIGS. **18-21** illustrate another example spacer **1802** according to the present disclosure. FIG. **18** is a perspective view of spacer **1802**. FIG. **19** is a bottom view of spacer **1802**. FIG. **20** is a top view of spacer **1802**. FIG. **21** is a front view of spacer **1802**. Spacer **1802** includes elongate strip **210** and a plurality of stabilizers **1504**.

[0100] Unlike spacer **106**, spacer **1502** of FIGS. **15-17** cannot be easily bent into corner **122** because first stabilizer **1510** and second stabilizer **1520** are rigid and span the entire length of elongate strip **210**. Example spacer **1802** solves this problem by including several notches in first stabilizer **1510** and second stabilizer **1520**. Notch **1810** is included in external stabilizer portion **1702** of first stabilizer **1510** and notch **1812** is included in internal stabilizer portion **1704** of first stabilizer **1510**. Notch **1814** (not visible in FIG. **18**) is included in

external stabilizer portion **1722** of second stabilizer **1520** and notch **1816** is included in internal stabilizer portion **1724** of second stabilizer **1520**.

[0101] Notches **1810**, **1812**, **1814**, and **1816** allow spacer **1802** to be bent to form the 90 degree angles necessary for corner **122**. Notches **1810**, **1812**, **1814**, and **1816** can be created in a number of ways. In example embodiments, notches **1810**, **1812**, **1814**, and **1816** are cut out of first stabilizer **1510** and second stabilizer **1520**.

[0102] Looking to the bottom view of spacer **1802** in FIG. **19**, notch **1810** is cut out of external stabilizer portion **1702** creating two surfaces **1910** and **1912**. Surfaces **1910** and **1912** converge at a point **1914** on elongate strip **210** and extend in opposite directions to points **1916** and **1918** on the edge of external stabilizer portion **1702**. Notch **1814** is cut out of external stabilizer portion **1722** creating two surfaces **1920** and **1922**. Surfaces **1920** and **1922** converge at a point **1924** on elongate strip **210** and extend in opposite directions to points **1926** and **1928** on the edge of external stabilizer portion **1722**.

[0103] Looking to the top view of spacer **1802** in FIG. **20**, notch **1812** is cut out of internal stabilizer portion **1704** creating two surfaces **2010** and **2012**. Surfaces **2010** and **2012** converge at a point **2014** on elongate strip **210** and extend in opposite directions to points **2016** and **2018** on the edge of internal stabilizer portion **1704**. Notch **1816** is cut out of internal stabilizer portion **1724** creating two surfaces **2020** and **2022**. Surfaces **2020** and **2022** converge at a point **2024** on elongate strip **210** and extend in opposite directions to points **2026** and **2028** on the edge of internal stabilizer portion **1724**.

[0104] With notches **1810**, **1812**, **1814**, and **1816** created, spacer **1802** can now be bent along the line between points **1914** and **1924** and **2014** and **2024**. In example embodiments, spacer **1802** can be bent approximately 90 degrees so that surfaces **2010** and **2012** come into contact with one another and so that surface **2020** and **2022** come into contact with one another. This corner configuration of spacer **1802** is shown in further detail in FIG. **21-22**.

[0105] FIG. **22-23** illustrate example spacer **1802** in corner configuration. FIG. **22** is a perspective view of spacer **1802** in corner configuration. FIG. **23** is a front view of spacer **1802** in a corner configuration. As noted above, example spacer **1802** includes elongate strip **210** and a plurality of stabilizers **1504**.

[0106] With notches **1810**, **1812**, **1814**, and **1816** created as described above, spacer **1802** is now bent along the line between points **1914** and **1924** and **2014** and **2024**. Spacer **1802** is bent approximately 90 degrees so that surface **2010** comes into contact with surface **2012** and so that surface **2020** comes into contact with surface **2022**. When spacer **1802** is installed in window assembly **100**, surface **2010** is flush against surface **2012** and surface **2020** is flush against surface **2022**. Thus, the aesthetics of installed spacer **1802** and window assembly **100** as a whole are enhanced due to the clean finished look of stabilizers **1510** and **1520** in combination with elongate strip **210**.

[0107] Apertures **1512** of stabilizers **1510** and apertures **1522** of stabilizer **1520** allow desiccant to be hidden in internal trough area **1710** and internal trough area **1730** behind the clean finished look of stabilizers **1510** and **1520**. The sealant is also hidden in trough **1706** of first stabilizer **1510** and trough **1726** of second stabilizer **1520** so that installed spacer **1802** in window assembly **100** is aesthetically appealing while maintaining the functional benefits of the stabilizers and hidden desiccant.

[0108] FIG. **24** is a cross-sectional view of another embodiment of window assembly **100** according to the present disclosure. Window assembly **100** includes sheet **102**, sheet **104**, and spacer **106**. Spacer **106** is similar to the spacer shown in FIG. **6-9** in that it includes elongate strip **210** and plurality of stabilizers **212**. In this embodiment, spacer further includes sheet attachment means **2402** for attachment of a sheet **2404**. This third sheet of window material forms a triple paned window. In example embodiments, sheet attachment means **2402** is a continuation of interior stabilizer portion **944**. Interior stabilizer portion **944** extends in front of elongate strip **210** on interior surface **638**. This embodiment is advantageous, because it allows for an additional sheet **2404** to be attached in between sheets **102** and **104**. The addition of sheet **2404** potentially increases the insulating properties of window assembly **100**. The inclusion of sheet attachment means **2402** is advantageous because elongate strip **210** by itself might not be rigid enough to support sheet **2404**.

[0109] In certain embodiments, sheet **2404** is a film or plate. For example, sheet **2404** is a film or plate of material that absorbs or reflects ultraviolet radiation, thereby warming interior space **120**. In some embodiments, sheet **2404** divides interior space **120** into two or more regions. Sheet **2404** can incorporate a Mylar film in some embodiments. A benefit of some embodiments is that the addition of sheet **2404** does not require additional spacers or sealants.

[0110] FIG. **25** is a perspective view of another example spacer **1502** according to the present disclosure. Example spacer **1502** is similar to that shown in FIGS. **15-17** in that it includes elongate strip **210** and plurality of stabilizers **1504**. In this embodiment, spacer **1502** includes a plurality of muntin bar clips **2502** and a plurality of muntin bars **2504** (only one is visible in FIG. **25**). Plurality of muntin bar clips **2502** are connected to spacer **1502** by a series of muntin bar connector supports **2506**. In example embodiments, muntin bar connector supports **2506** are permanently attached to muntin bar clips **2502**. Next, muntin bar connector supports **2506** are connected to spacer **1502** through apertures **1512** and apertures **1522**. In specific embodiments, muntin bar connector supports can be added and removed from spacer **106** after plurality of stabilizers **1504** are attached to elongate strip **210**. In other embodiments, muntin bar connector supports **2506** must be added before spacer **106** is assembled. Plurality of muntin bars **2504** are connected to plurality of muntin bar clips **2502** as shown in FIG. **24**. The use of muntin bars **2504** in addition to the clean look of plurality of stabilizers **1504** in spacer **1502** make spacer **1502** of FIG. **25** particularly advantageous for use in applications where aesthetics are paramount.

[0111] The various embodiments described above are provided by way of illustration only and should not be construed to limit the claims attached hereto. Those skilled in the art will readily recognize various modifications and changes that may be made without following the example embodiments and applications illustrated and described herein, and without departing from the intended scope of the following claims.

What is claimed is:

1. A spacer comprising:

an elongate strip having a first longitudinal edge and a second longitudinal edge and defining a plane extending between at least portions of the first and second longitudinal edges; and

a first stabilizer connected to the elongate strip adjacent the first longitudinal edge, the first stabilizer having a first surface arranged substantially perpendicular to the plane, the first surface adapted to support the elongate strip against a first sheet of material.

2. The spacer of claim **1**, further comprising a second stabilizer connected to the elongate strip adjacent the second longitudinal edge, the first stabilizer having a second surface arranged substantially perpendicular to the plane, the second surface adapted to support the elongate strip against a second sheet of material, wherein the spacer is adapted to maintain a space between the first and second sheets when arranged therebetween.

3. The spacer of claim **2**, wherein the elongate strip has an undulating shape.

4. The spacer of claim **3**, wherein the undulating shape is regular and repeating.

5. The spacer of claim **2**, wherein the elongate strip includes an external surface and an internal surface.

6. The spacer of claim **5**, wherein the first stabilizer includes an external portion connected to the external surface and an internal portion connected to an internal surface.

7. The spacer of claim **6**, wherein the first and second stabilizers are plastic.

8. The spacer of claim **2**, wherein the first and second stabilizers include a plurality of stabilizers, each stabilizer being separated from an adjacent stabilizer by a space.

9. The spacer of claim **1**, wherein the first surface includes a trough, the trough arranged and configured to support at least one bead of sealant thereon.

10. The spacer of claim **1**, wherein the spacer further comprises a desiccant connected to an interior surface of the elongate strip.

11. A method of making a spacer, the method comprising:

forming an undulating shape in a first elongate strip, the undulating shape having a regular and repeating pattern, wherein the first elongate strip has a first longitudinal edge and a second longitudinal edge; and

forming a first stabilizer on the elongate strip adjacent the first longitudinal edge.

12. The method of claim **11**, further comprising forming a second stabilizer on the elongate strip adjacent the second longitudinal edge.

13. The method of claim **12**, wherein forming further comprises extruding.

14. The method of claim **13**, wherein the first and second stabilizers are made of plastic.

15. The method of claim **11**, wherein forming the first and second stabilizers further comprises:

pre-forming the first and second stabilizers; and

connecting the first and second stabilizers to the elongate strip after pre-forming.

16. The method of claim **15**, wherein connecting comprises adhering the pre-formed first and second stabilizers using an adhesive.

17. A sealed unit comprising:

a first sheet having a first surface;

a second sheet having a second surface;

a spacer arranged between the first and second sheets to maintain a gap between the first and second sheets, the spacer comprising:

an elongate strip having a first edge and a second edge;

a first stabilizer connected to the elongate strip adjacent the first edge of the elongate strip, the first stabilizer including a first sealant trough; and

a second stabilizer connected to the elongate strip adjacent the second edge of the elongate strip, the first stabilizer including a second sealant trough;

a first sealant bead arranged in the first sealant trough and connecting the spacer to the first sheet; and

a second sealant bead arranged in the second sealant trough and connecting the spacer to the second sheet.

18. The sealed unit of claim **17**, wherein the elongate strip has an undulating shape.

19. The sealed unit of claim **18**, wherein the undulating shape has a period in a range from about 0.005 inches to about 0.1 inches and an amplitude from about 0.005 inches to about 0.1 inches.

20. The sealed unit of claim **17**, further comprising a desiccant connected to an interior surface of the elongate strip.

21. The sealed unit of claim **17**, further comprising secondary sealant beads arranged adjacent the first and second sealant beads.

22. The sealed unit of claim **17**, wherein the elongate strip has a material thickness in a range from about 0.0001 inches to about 0.010 inches.

23. The sealed unit of claim **17**, wherein the elongate strip has a material thickness in a range from about 0.0001 inches to about 0.005 inches.

24. The sealed unit of claim **17**, wherein the elongate strip has a material thickness in a range from about 0.0003 inches to about 0.004 inches.

25. The sealed unit of claim **17**, wherein the first and second stabilizers are plastic.

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