US 20090120019A1

(19) **United States**

(12) **Patent Application Publication**

Trpkovski

(10) **Pub. No.: US 2009/0120019 A1**

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

(54) **REINFORCED WINDOW SPACER**

(75) Inventor: **Paul Trpkovski**, Buffalo, WY (US)

Correspondence Address:
MERCHANT & GOULD PC
P.O. BOX 2903
MINNEAPOLIS, MN 55402-0903 (US)

(73) Assignee: **INFINITE EDGE TECHNOLOGIES, LLC**, Avoca, WI (US)

(21) Appl. No.: **12/270,289**

(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.** **52/204.595**; 52/786.13; 52/309.1; 52/745.19

(57) **ABSTRACT**

A window assembly includes a first sheet and a second sheet separated by a window spacer. A window spacer includes an elongate body bent to define an interior space. The window spacer has increased strength due to the presence of reinforcing features. One example of a reinforcing feature is a support member provided inside the window spacer. Another example of a reinforcing feature is an undulating shape formed into at least a portion of the elongate body. Methods of manufacturing window spacers are also disclosed.

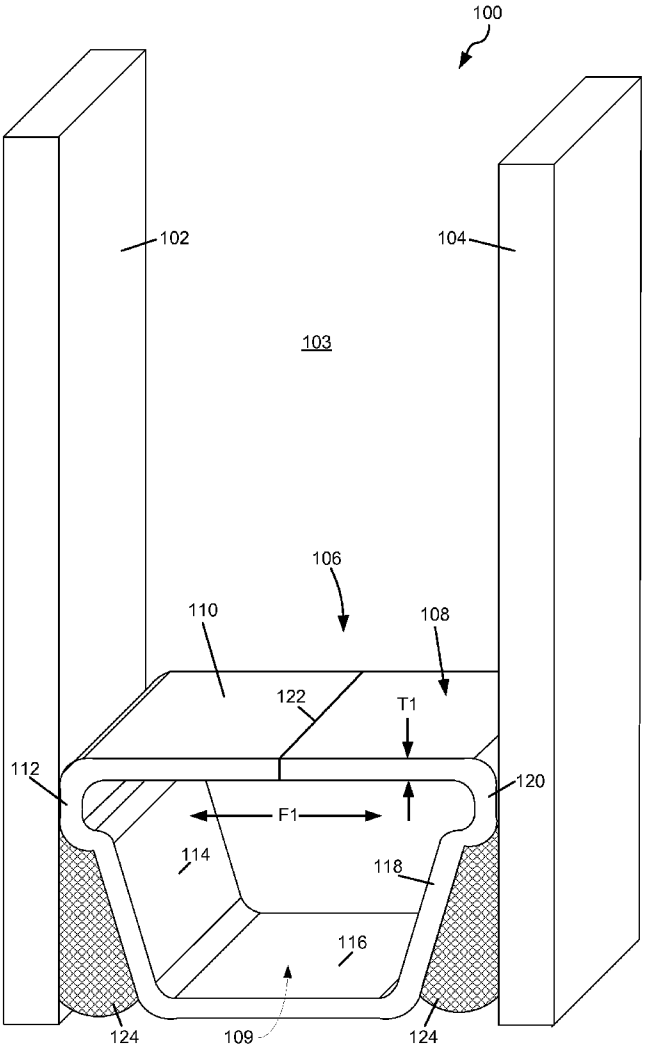


FIG. 1

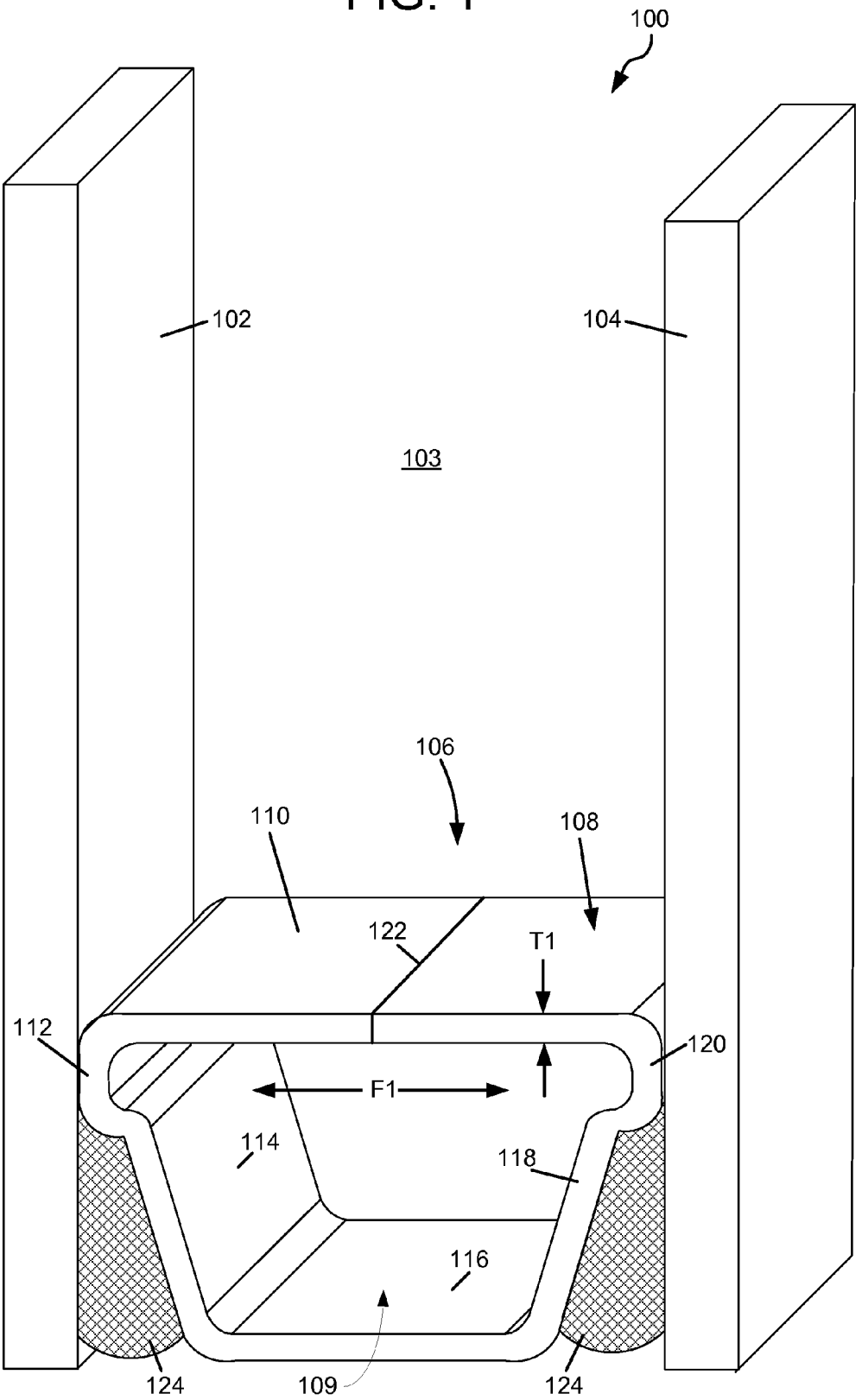

100
102
104
103
106
110
108
122
T1
112
120
F1
114
118
116
124
109
124

FIG. 2

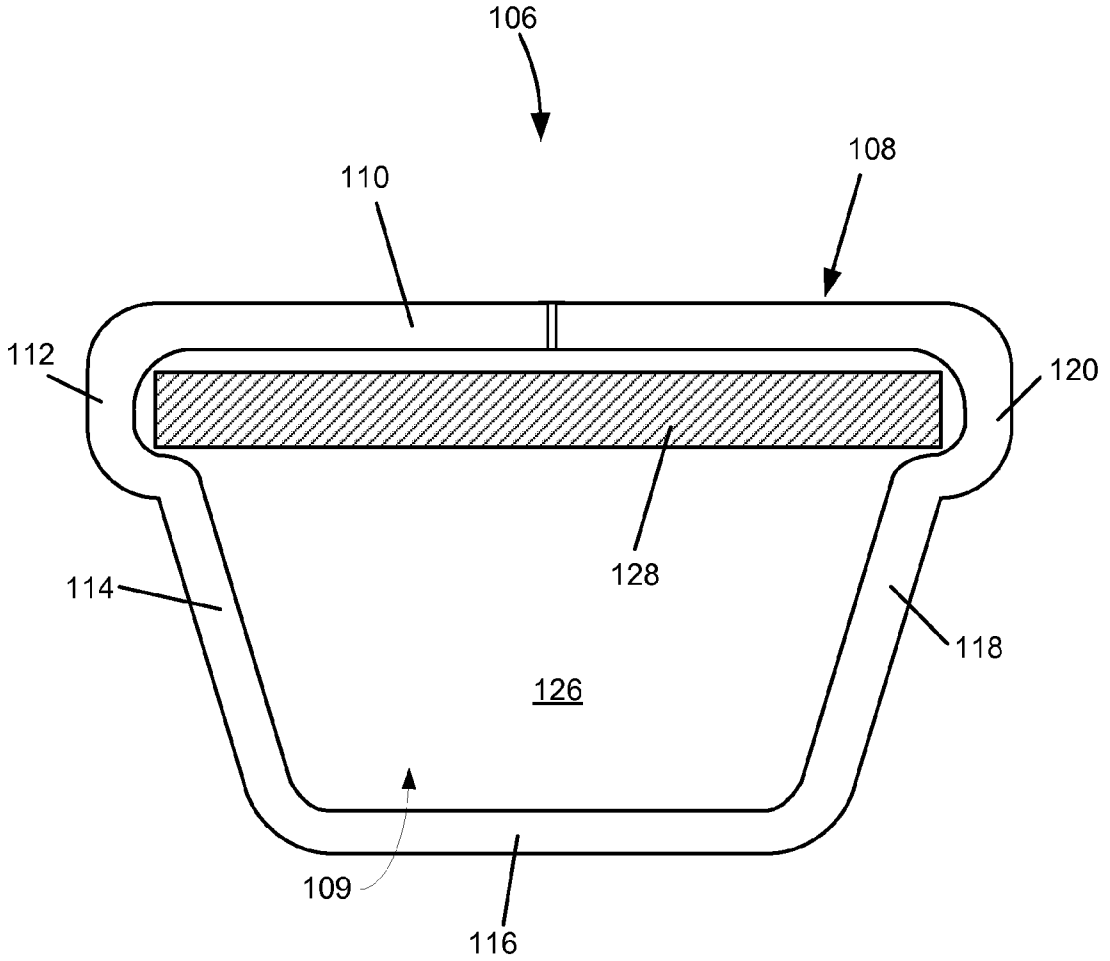


FIG. 3

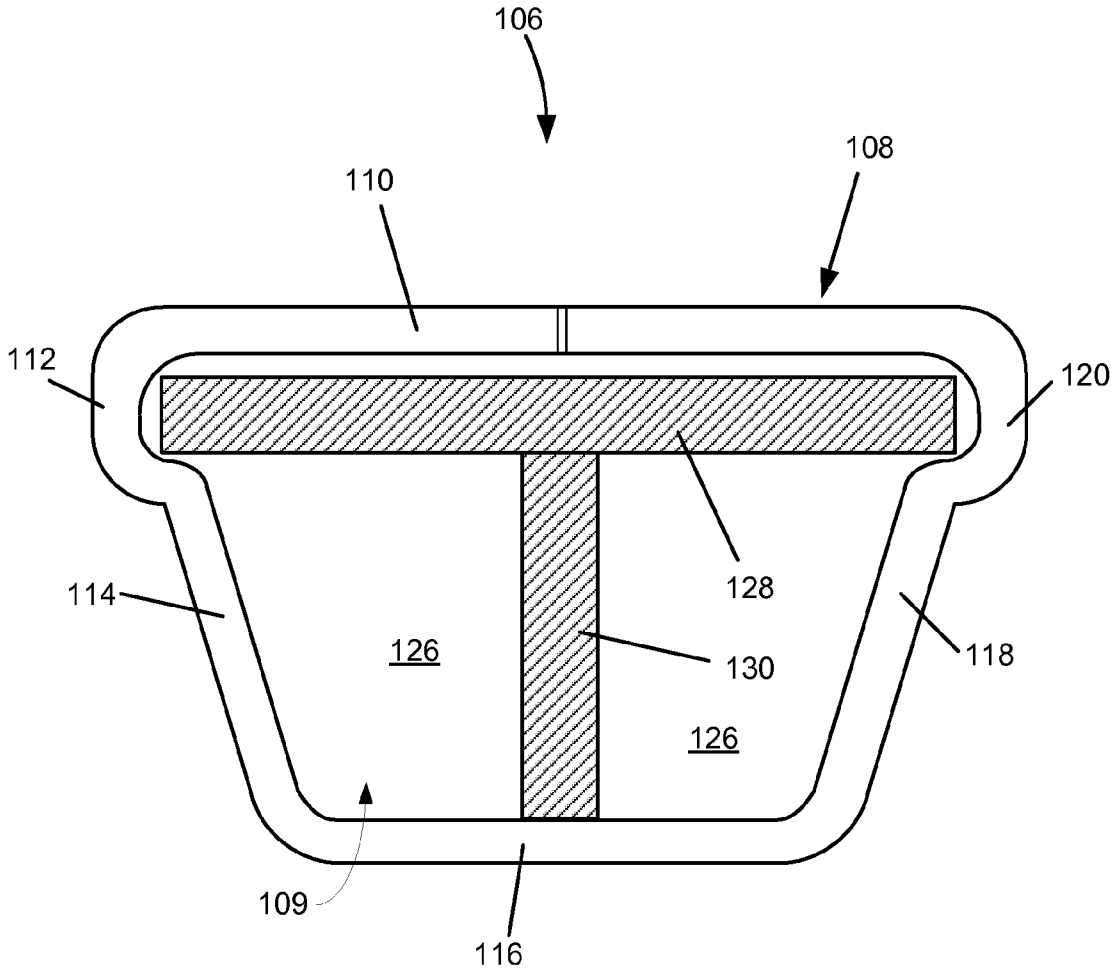


FIG. 4

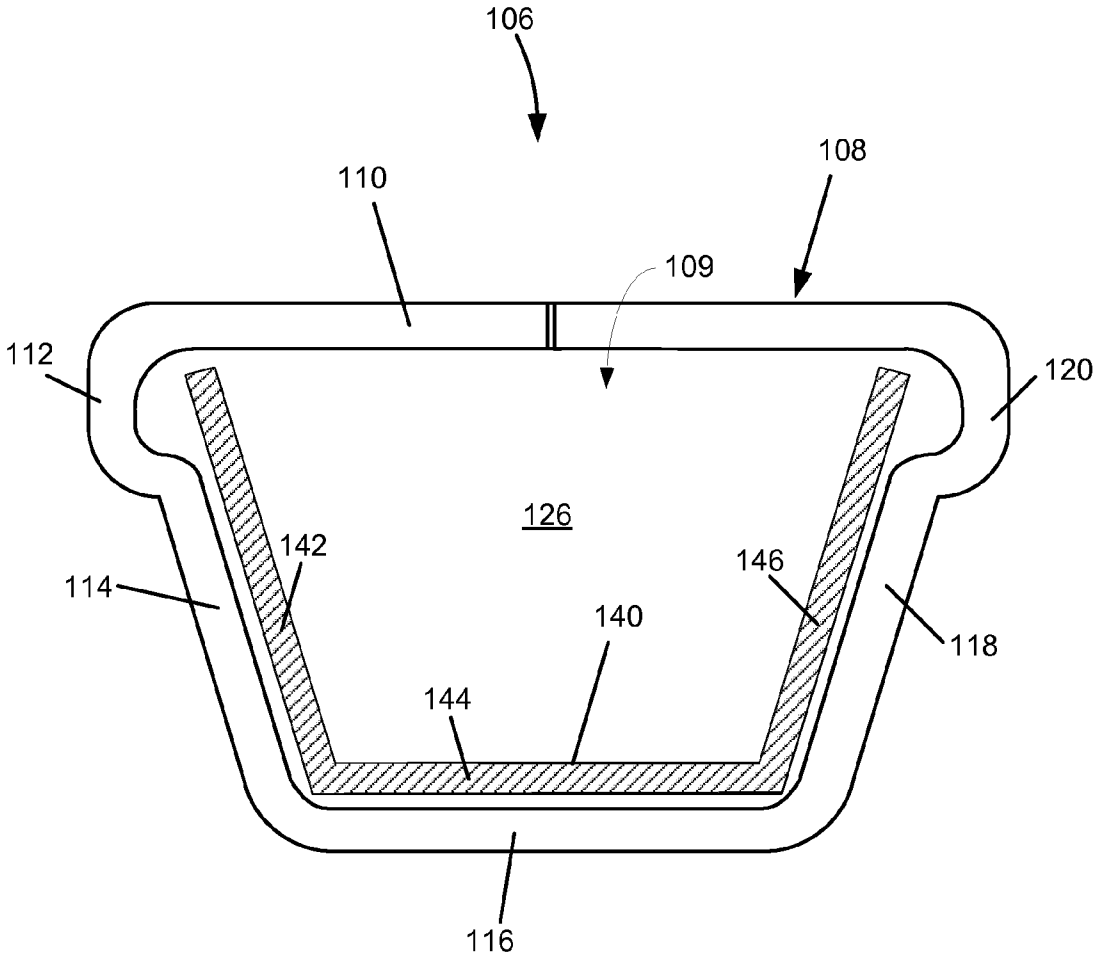


FIG. 5

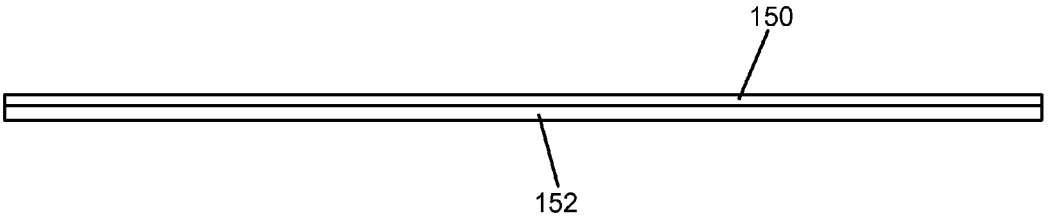


FIG. 6

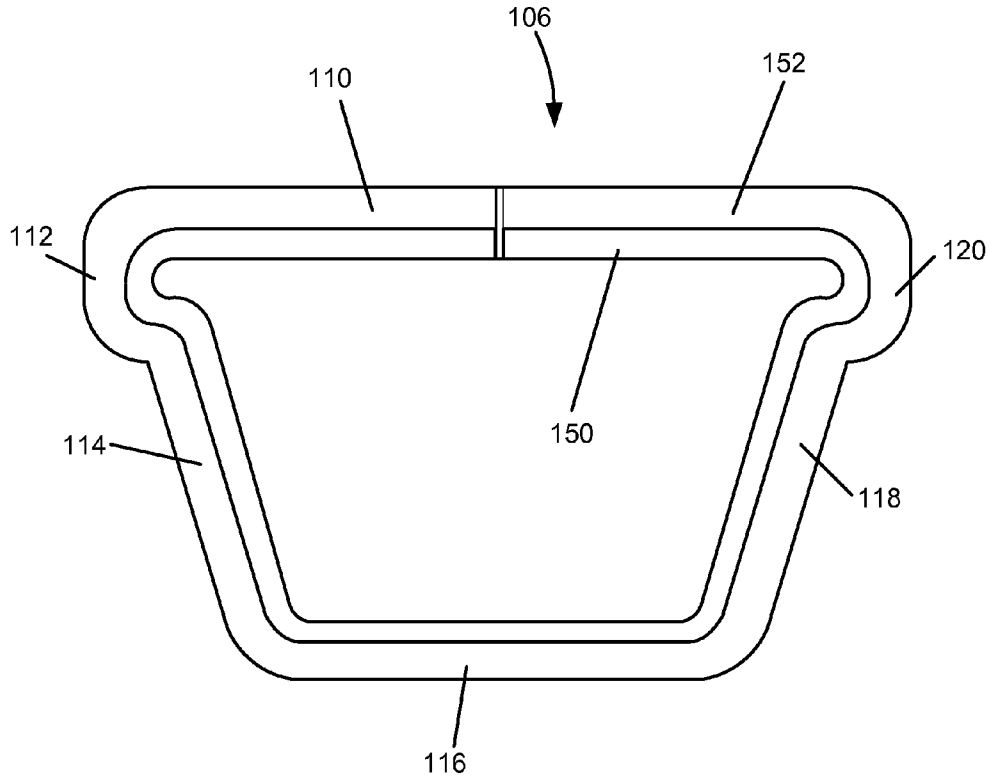


FIG. 7

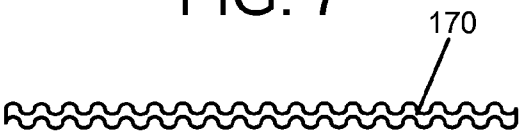


FIG. 8

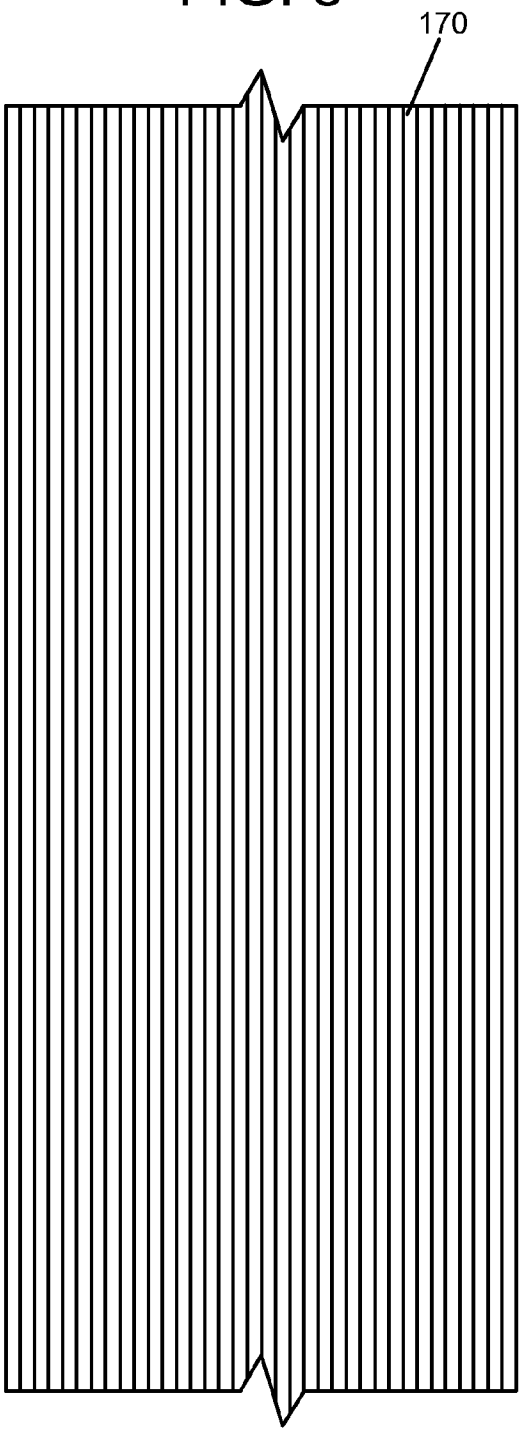


FIG. 9

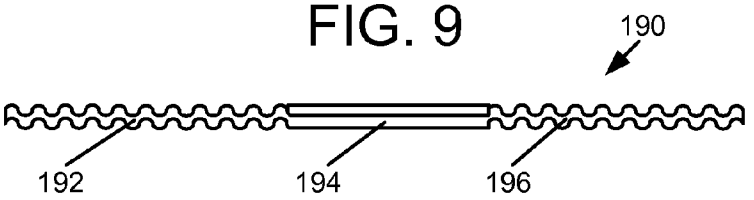
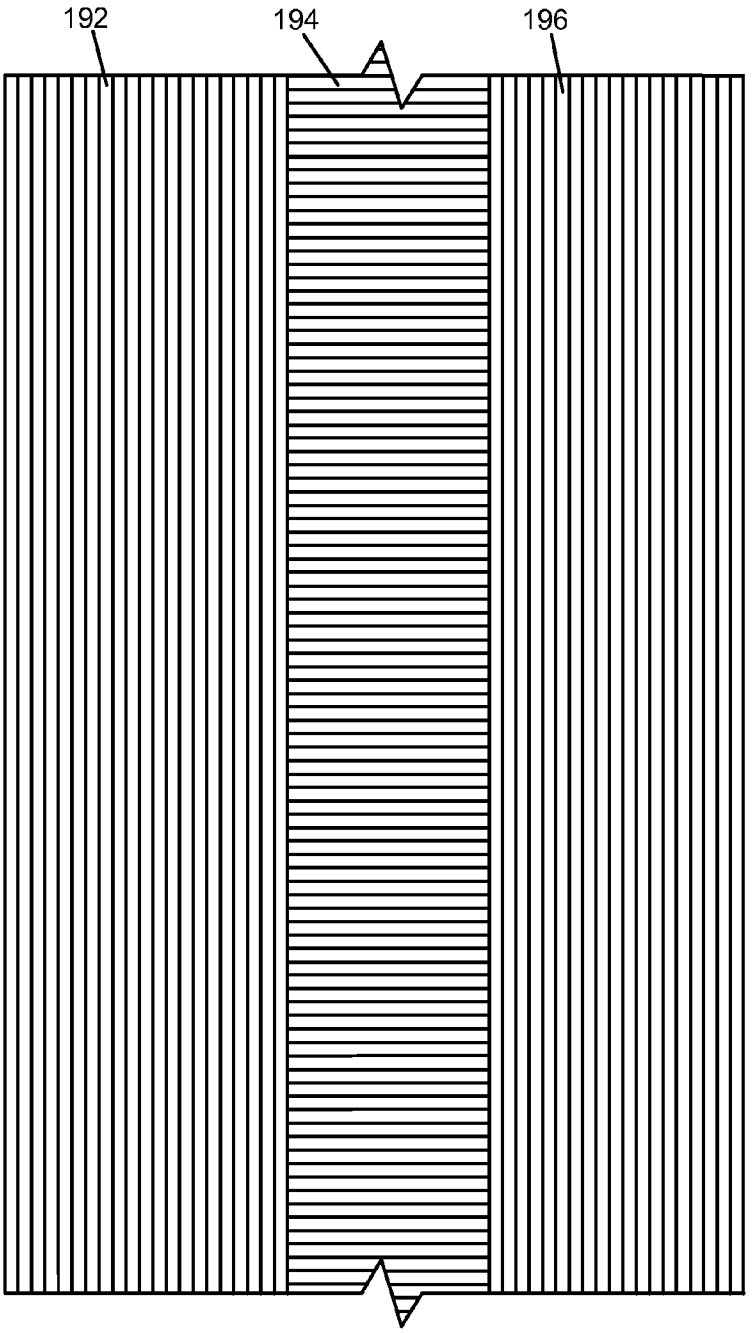


FIG. 10



REINFORCED WINDOW SPACER

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. A spacer is typically arranged between the two facing sheets and at or near the outer periphery of the sheets. The spacer maintains the appropriate spacing between the two sheets, and seals the edges of the air space. The air space reduces heat transfer through the window to insulate the interior of a building 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.

SUMMARY

[0003] In general terms, this disclosure is directed to a window assembly including a window spacer. In some embodiments, the window spacer includes features that provide increased strength and rigidity.

[0004] One aspect is a window spacer comprising an elongate body formed of at least one layer of a first material, the body defining an interior space and including a first side wall and an opposite second side wall; and a support member arranged within the interior space to provide support to the body.

[0005] Another aspect is a window assembly comprising a first sheet of an at least partially translucent or transparent material; a second sheet of the at least partially translucent or transparent material; and a spacer arranged between the first sheet and the second sheet, wherein the spacer comprises an elongate body defining an interior space and including a first side portion connected to the first sheet and a second side portion connected to the second sheet; and a support member arranged within the interior space to provide support to the body.

[0006] A further aspect is a window spacer comprising an elongate body formed of at least one layer of a first material, the body defining an interior space and including a first side wall and an opposite second side wall, and wherein at least a portion of the body includes an undulating shape.

[0007] Yet another aspect is a method of manufacturing a window spacer, the method comprising obtaining an elongate strip of material; forming an undulating shape in the elongate strip of material; and bending the elongate strip of material after forming the undulating shape to form the window spacer.

[0008] A further aspect is a method of manufacturing a window spacer, the method comprising: obtaining a first elongate strip of a first material; obtaining a second elongate strip of a second material; bending the first elongate strip to define an interior space; arranging the second elongate strip within the interior space.

[0009] Another aspect is a method of manufacturing a window spacer, the method comprising: obtaining a first elongate strip of a first material; obtaining a second elongate strip of a second material; connecting the first elongate strip in a facing arrangement with the second elongate strip; bending the first elongate strip and the second elongate strip simultaneously to form the window spacer.

[0010] 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

[0011] FIG. **1** is a schematic perspective view of a portion of a window assembly including a window spacer according to the present disclosure.

[0012] FIG. **2** is a schematic cross-sectional view of another embodiment of the spacer shown in FIG. **1**.

[0013] FIG. **3** is a schematic cross-sectional view of another exemplary embodiment of the spacer shown in FIG. **1**.

[0014] FIG. **4** is a schematic cross-sectional view of another exemplary embodiment of the spacer shown in FIG. **1**.

[0015] FIG. **5** is a schematic cross-sectional view of materials used to form another exemplary embodiment of the spacer shown in FIG. **1**.

[0016] FIG. **6** is a schematic cross-sectional view of a spacer formed from the materials shown in FIG. **5**.

[0017] FIG. **7** is a schematic cross-sectional view of a material layer that is used to form another exemplary embodiment of the spacer shown in FIG. **1**.

[0018] FIG. **8** is a schematic plan view of a portion of the material layer shown in FIG. **7**.

[0019] FIG. **9** is a schematic cross-sectional view of a material layer that is used to form another exemplary embodiment of the spacer shown in FIG. **1**.

[0020] FIG. **10** is a schematic plan view of a portion of the material layer shown in FIG. **8**.

DETAILED DESCRIPTION

[0021] 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.

[0022] FIG. **1** is a schematic perspective view of a portion of a window assembly **100** according to the present disclosure. Window assembly **100** includes sheet **102**, sheet **104**, spacer **106**, and sealant **124**. Window assembly **100** defines an interior space **103**. Spacer **106** includes body **108** and defines an interior space **109**. Body **108** includes inner portion **110**, inner side portion **112**, outer side portion **114**, outer portion **116**, outer side portion **118**, and inner side portion **120**. In some embodiments, interior space **109** is filled with a filler **126** (such as shown in FIG. **2**).

[0023] Sheets **102** and **104** are typically formed of a material such as glass or plastic that allows at least some light to

pass through. Some embodiments include an at least partially translucent or transparent material, while other embodiments include a substantially transparent material. Examples of suitable materials for sheets **102** and **104** are glass and plastic, or combinations of glass and plastic.

[0024] Spacer **106** is arranged between sheet **102** and sheet **104** to maintain sheet **102** in a spaced relationship with sheet **104**. Spacer **106** together with sheets **102** and **104** define interior space **103**, which is a sealed interior region of window assembly **100**. Interior space **109** typically includes interior space **103** because joint **122** is formed with holes or a gap that allows air and moisture to pass through. Sealant **124** is used to seal the intersection between sheet **102** and spacer **106** and to seal the intersection between sheet **104** and spacer **106**. In some embodiments, one or more additional sealant or adhesive layers are arranged between spacer **106** and sheets **102** and **104** (such as between inner side portion **112** and sheet **102** and between inner side portion **120** and sheet **104**) to connect and seal spacer **106** with sheets **102** and **104**.

[0025] Body **108** includes inner portion **110**, inner side portion **112**, outer side portion **114**, outer portion **116**, outer side portion **118**, and inner side portion **120**. Inner portion **110** is connected between inner side portions **112** and **120**. Inner side portion **112** is connected between inner portion **110** and outer side portion **114**. Inner side portion **120** is connected between inner portion and outer side portion **118**. Outer portion **116** is connected between outer side portion **114** and outer side portion **118**. Corners are formed between respective portions of body **100**.

[0026] In some embodiments, body **108** is formed of a single sheet of material. Examples of suitable materials include metal and plastic, having a material thickness T**1**. The material is first obtained in an elongated strip form and is subsequently bent into the desired shape, such as using a roll former. The elongated strip material typically has a length in a range from about 50 inches to about 250 inches, although other lengths are used in other embodiments. The elongated strip is passed through a roll former that bends the elongated strip to form corners between portions of spacer **106**, and any other desired features of spacer **106**. Edges of the elongated strip are joined together at joint **122** by any suitable means, such as by welding, gluing, fastening, and the like. Edges are slightly overlapped in some embodiments to improve the strength of joint **122**. In some embodiments holes are formed at joint **122** to allow gas and moisture to communicate between interior space **109** and the rest of interior space **103**.

[0027] Due to the relatively long length of spacer **106**, rigidity and strength of spacer **106** is important. For example, when installing a spacer into a particular window, an end of the spacer is often inserted into a die to bend the spacer to match the windows shape. In doing so, a majority of the spacer is often suspended in the air. If a spacer is not rigid enough to support its own weight, the spacer will be damaged when it bends under the weight. A damaged spacer is typically discarded as waste. Therefore, embodiments of spacer **106** include features that provide adequate rigidity or strength to resist damage during manufacture and use.

[0028] After spacer **106** has been formed, a sealant **124** is applied between spacer **106** and sheets **102** and **104** to seal edges of window assembly **100**. Examples of sealant **124** include polyisobutylene (PIB), butyl, curable PIB, holt melt silicon, acrylic adhesive, acrylic sealant, reactive hot melt butyl (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), silicon, copolymers of silicon and polyisobutylene, and other Dual Seal Equivalent (DSE) type materials.

[0029] When forces are applied to sheets **102** and **104** in the direction F**1**, the forces are transferred through sheets **102** and **104** to spacer **106**. Spacer **106** applies an approximately equal and opposite force to the respective window sheet to maintain window sheets **102** and **104** appropriately spaced apart. As a result, interior space **103** continues to provide reduced thermal conductivity between sheets **102** and **104**.

[0030] In some embodiments, a filler **126** (such as shown in FIG. **2**) is placed within interior space **109** of spacer **106**. An example of a suitable filler material is a desiccant that acts to remove moisture from the interior space of window assembly **100**. Desiccants include molecular sieve and silica gel type desiccants. One particular 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 between elongate strips **110** and **114**. Other examples of filler materials include an adhesive, foam, putty, resin, silicon rubber, or other material or combination of materials.

[0031] In other embodiments, filler **126** (shown in FIG. **2**) is a material that provides added support to spacer **106** to provide increased structural strength. The structural strength is increased because the filler resists compression and buckling of body **108**. In this way, spacer **106** does not rely solely on the structural strength of body **108**. In some embodiments, the added strength provided by the filler enables spacer **106** to be formed using a thinner material for body **108**, without reducing the overall strength of spacer **106**. Thinner material reduces heat transfer through the material (such as between sheets **102** and **104**) and also reduces the amount of material required to make body **108**, thereby reducing the cost of body **108**.

[0032] In yet other embodiments, filler **126** is a matrix desiccant material that both provides structural support to body **108** and also removes moisture from the interior space of window assembly **100**. Some filler materials are a desiccant or include a desiccant, such as a matrix material. Matrix material includes desiccant and other filler material. Examples of matrix desiccants include those manufactured by W.R. Grace & Co. and H.B. Fuller Corporation. A beaded desiccant can also be combined with another filler material, if desired.

[0033] FIG. **2** is a schematic cross-sectional view of another embodiment of window spacer **106**. Spacer **106** includes body **108** including inner portion **110**, inner side portion **112**, outer side portion **114**, outer portion **116**, outer side portion **118**, and inner side portion **120**. Spacer **106** also includes support member **128**.

[0034] When a force is applied to window spacer **106**, the majority of the force is typically applied in direction F**1** (shown in FIG. **1**). The force is resisted by spacer **106**, which applies an approximately equal and opposite force to maintain the sheets appropriately spaced apart. Some of the force is supplied by inner portion **110** and inner side portions **112** and **120**. Although inner portion **110** is shown as being substantially planar, other embodiments include non-planar shapes. Additional force is supplied through outer portion **116**, outer side portions **114** and **118**, and inner side portions **112** and **120**.

[0035] In this embodiment, window spacer **106** further includes support member **128**. Support member **128** is

arranged within body **108**, and extends generally between inner side portion **112** and inner side portion **120**. Support member provides additional strength to window spacer **106** to assist body **108** in withstanding forces applied by sheets **102** and **104** (shown in FIG. **1**) in direction F**1**.

[0036] In some embodiments, support member **128** is a fibrous material, such as paper, paperboard, cardboard, carbon fiber, wood, or other fibrous materials. An advantage of such materials is that they are breathable, such that they do not block the flow of air and moisture through joint **122** or other holes in spacer **106**. In other embodiments, support member **128** is a laminate of two or more materials. A composite material is used in some embodiments. Adhesive, such as epoxy, is suitable in some embodiments to connect two or more layers together. Yet other embodiments include biaxially-oriented polyethylene terephthalate polyester film (such as Mylar® brand film). Holes can be formed in such embodiments to improve the ability of the material to pass air and moisture, if desired.

[0037] In some embodiments, support member **128** is a long strip of material. For example, support member **128** is typically in a range from about 50 inches to about 250 inches, although other lengths are used in other embodiments. Support member **128** can be inserted within body **108** before body **108** is bent into the desired shape, or alternatively can be inserted through an open end of body **108** after body **108** is formed, and slid through body **108** until it is in the desired position. In some embodiments an adhesive is used to connect support member **128** with body **108**.

[0038] The added strength provided by support member **128** increases the strength of spacer **106** in some embodiments. In other embodiments, the presence of support member **128** reduces the strength requirements of body **108**. As a result, the thickness of body **108** material can be reduced, which reduces the overall amount of material needed to construct body **108**. Reduced material leads to reduced material costs and reduced weight. In some embodiments, support member **128** is made of a material that is less expensive than the material of body **108**, such that the overall material costs are reduced despite the added cost of support member **128** material.

[0039] Reduced thickness of body **108** material also has the further advantage of improving thermal properties of spacer **106**. The thinner the material of body **108**, the less heat transfer occurs through body **108** between sheet **102** and sheet **104**.

[0040] Another advantage of some embodiments is that support member **128** fills some of the space within body **108**, such that less filler **126** is needed to fill the space surrounded by body **108**. If the material cost of support member **128** is less than the cost of filler material, the overall material cost is further reduced. In addition, some embodiments include a support member **128** that is less weight per unit volume than filler **126**. As a result, the overall weight of spacer **106** is reduced.

[0041] In another possible embodiment, rather than reducing the thickness of body **108** material, a different material is used that could not otherwise have been used. The material has improved characteristics, such as better thermal properties, reduced cost, or other beneficial characteristics.

[0042] FIG. **3** is a schematic cross-sectional view of another exemplary embodiment of spacer **106**. Spacer **106** includes body **108** including inner portion **110**, inner side portion **112**, outer side portion **114**, outer portion **116**, outer side portion **118**, and inner side portion **120**. Spacer **106** also includes support member **128** and support member **130**.

[0043] When a force is applied to spacer **106** (e.g., a force in direction F**1**, shown in FIG. **1**) between inner side **112** and inner side **120**, the force is resisted by an approximately equal and opposite force. This equal and opposite force is applied to the sheets from body **108** and strength member **128**. However, the force becomes too large, inner portion **110** may begin to buckle, such as by moving toward outer portion **116**. Such movement is resisted in this embodiment by the addition of a second support member **130** that extends between support member **128** and outer portion **116**. In some embodiments strength members **128** and **130** are formed of a single strip of material that is bent into the desired shape, such as a "T" shape. Other embodiments are formed of multiple materials that are fastened together at a joint. Yet other embodiments include a filler material on both open sides of support member **130** that maintains support member **130** in the illustrated (or other desired) orientation.

[0044] Other embodiments include additional support members, and some embodiments include other configurations of support members. As one example, support member **130** is replaced by a V-shaped or triangular support member. The support member extends from the midpoint of support member **128** to the corner between lower side portion **114** and outer portion **116**, and also from the midpoint of support member **128** to the corner between outer side portion **118** and outer portion **116**. Other examples included a cylindrical, outer portion square, or rectangular, support members. Other embodiments include other shapes, sizes, numbers, and configurations of support members.

[0045] FIG. **4** is a schematic cross-sectional view of another exemplary embodiment of spacer **106**. Spacer **106** includes body **108** including inner portion **110**, inner side portion **112**, outer side portion **114**, outer portion **116**, outer side portion **118**, and inner side portion **120**. Spacer **106** also includes support member **140**.

[0046] Support member **140** includes segments **142**, **144**, and **146**. Segment **144** is adjacent and generally parallel with outer portion **116**. Segment **142** extends from one side of segment **144**, and generally parallel with outer side portion **114**. Segment **146** extends from an opposite side of segment **144**, and generally parallel with outer side portion **118**. Support member **140** provides additional support to adjacent portions of body **108**.

[0047] In one embodiment, support member **140** is made of a single strip of material that is bent to form corners between adjacent segments. In some embodiments, support member **140** and body **108** are formed of planar elongated strips that are fastened together prior to bending. After fastening, support member **140** and body **108** are bent simultaneously. In other embodiments, support member **140** is bent separately and then inserted into body **108**. Examples of suitable materials for support member **140** are described above. Filler is inserted into interior space **109** in some embodiments.

[0048] FIG. **5** is a schematic cross-sectional view of materials used to form another exemplary embodiment of a spacer. Spacer **106** includes support layer **150** and body layer **152**. Support layer **150** and body layer **152** are in facing arrangement to each other. Support layer **150** is a material that provides additional support to body layer **152**. Examples of suitable materials for support layer **150** include those described, is suitable for support members discussed above. In some embodiments, support layer **150** is fastened to body

layer **152**, such as with an adhesive or other fastener. In one example, embodiment body layer **152** is stainless steel and support layer **150** is biaxially-oriented polyethylene terephthalate polyester film. A MYLAR® core laminate spacer is then formed as shown in FIG. **6**.

[0049] After formation and arrangement of layers **150** and **152**, the layers are bent into the desired shape of spacer **106**, as shown in FIG. **6**.

[0050] FIG. **6** is a schematic cross-sectional view of another exemplary embodiment of a spacer **106** after bending of the material layers shown in FIG. **5**. Spacer **106** includes body **108** including inner portion **110**, inner side portion **112**, outer side portion **114**, outer portion **116**, outer side portion **118**, and inner side portion **120**. Body **108** is formed of body layer **152**. Spacer **106** also includes support member **140** arranged adjacent to a surface of body layer **152**.

[0051] After forming and arranging layers **150** and **152** as shown in FIG. **5**, layers **150** and **152** are bent, such as using one or more roll formers. Support layer **150** provides added strength to spacer **106**, providing various advantages as described herein.

[0052] FIGS. **7** and **8** illustrate a material layer **170** that can be used to form another exemplary embodiment of a spacer. FIG. **7** is a schematic cross-sectional view of material layer **170**. FIG. **8** is a schematic plan view of a portion of material layer **170**.

[0053] Material layer **170** is a relatively long and narrow strip of one or more layers. Material **170** has an undulating shape. An example of an undulating shape is a sinusoidal shape. Other examples of undulating shapes include triangular-wave, square-wave, or other shapes having a repeating or non-repeating pattern. Material layer **170** is a material such as metal or plastic that can be formed to have an undulating shape. In one example, the undulating shape is formed in a planar strip of material by bending, such as using a roll former to impress the undulating pattern into the strip of material. In another embodiment, the undulating shape is formed by molding or melting the material into the desired undulating shape.

[0054] In some embodiments, the undulating pattern has small undulations in a range from about 10 to about 100 peaks per inch. In other embodiments, the undulating pattern has larger undulations, such as from about 0 to about 10 undulations per inch. The peak to peak amplitude of the undulations are typically in a range from about 0.01 inches to about 0.2 inches. In other embodiments, the peak to peak amplitude of the undulations are in a range from about 0.1 inches to about 0.5 inches.

[0055] After material layer **170** has been formed, material layer **170** is bent into the desired spacer configuration. The undulations present in material layer **170** are advantageous to the spacer. In some embodiments, the undulations provide increased strength along a longitudinal direction, increasing the rigidity of spacer **106** to resist buckling, kinking, or other damage to the spacer.

[0056] In some embodiments, the undulations also cause material layer **170** to have increased flexibility in a lateral direction. This is beneficial, for example, to make material layer **170** bend more easily when forming into the desired spacer configuration. Although the embodiments of FIGS. **7-8** illustrate longitudinal undulations, another embodiment includes lateral or angled undulations.

[0057] FIGS. **9** and **10** illustrate a material layer **190** that can be used to form another exemplary embodiment of a spacer. FIG. **9** is a schematic cross-sectional view of material layer **190**. FIG. **10** is a schematic plan view of a portion of material layer **190**.

[0058] Material layer **190** is a relatively long and narrow strip of one or more layers and includes three distinct regions: region **192**, region **194**, and region **196**. Each region has an undulating shape. In this example, regions **192** and **196** have undulations that extend longitudinally along material layer **190** and region **194** has undulations that extend laterally along material layer **190** between regions **192** and **196**.

[0059] Material layer **190** is a material such as metal or plastic. In one example, the undulating shapes are formed in a planar material strip by bending the metal strip, such as by passing the material strip through two or more adjacent rollers. The rollers have a shape that cause the material strip to bend as it passes between the rollers. As a result, an undulating shape is formed. In this embodiment, the rollers have multiple regions having different shapes, each region of the roller is used to form one of regions **192**, **194**, and **196**. Alternatively, multiple rollers are used to form the regions in separate steps. Further, other embodiments for undulations in other ways, such as by molding material layer **190** in a mold to form the desired undulating pattern.

[0060] After material layer **190** has been formed to include the desired undulating shape, material layer **190** is then bent into the desired spacer shape, such as the shape illustrated in FIG. **1**. In this embodiment, region **194** is used to form the outer portion **116** and regions **192** and **196** are used to form the other portions of body **108**. (See FIG. **1**.)

[0061] In some embodiments, region **194** includes lateral undulations that increase the flexibility of outer portion **116** to resist kinking, bending, buckling, cracking or other damage. Regions **192** and **196** include longitudinal undulations. The longitudinal undulations provide added strength and stability in the longitudinal direction, increasing the rigidity of spacer **106** in this dimension. This improves spacer **106** by, for example, making spacer **106** easier to manipulate and handle during manufacturing without damaging to spacer **106**. On the other hand, added flexibility is added in other dimensions of spacer **106**, such as making spacer **106** easier to bend into the desired shape (such as the shape shown in FIG. **1**).

[0062] Other embodiments include other undulating patterns, combinations of undulating regions, or combinations of undulating regions and planar regions. For example, any of regions **192**, **194**, and **196** could alternatively be formed to have a planar shape, where one or more of the other regions have an undulating shape. Additional regions are included in some embodiments, which have either an undulating shape or a non-undulating shape.

[0063] Although spacer **106** has been described as having a particular general body structure, as shown in FIG. **1**, other embodiments include other spacer shapes and configurations. For example, a simple box shape is used in some embodiments having a square or rectangular cross-sectional shape. In another embodiment, a spacer has a three-sided cross-sectional shape, such as arranged in a U-shape. Yet other embodiments include additional features to that shown in FIG. **1**, such as including additional wings or protrusions. The protrusions are useful, for example, to provide additional surface area for adhering spacer **106** to sheets **102** and **104**. Further, the embodiment of FIG. **1** illustrates portions having generally planar shapes. Other embodiments include portions with non-planar shapes. Some embodiments include conventional box spacers.

[0064] 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 window spacer comprising:
an elongate body formed of at least one layer of a first material, the body defining an interior space and including a first side wall and an opposite second side wall; and
a support member arranged within the interior space to provide support to the body.

2. The window spacer of claim **1**, wherein the first material is selected from the group consisting of metal and plastic.

3. The window spacer of claim **2**, wherein the first material is stainless steel.

4. The window spacer of claim **1**, wherein the support member is an elongate strip of a second material, and wherein the support member extends between the side walls.

5. The window spacer of claim **4**, wherein the second material is a fibrous material, biaxially-oriented polyethylene terephthalate, or a combination of fibrous material and biaxially-oriented polyethylene terephthalate.

6. The window spacer of claim **4**, wherein the second material includes a material selected from the group consisting of: paper, paperboard, cardboard, card stock, and biaxially-oriented polyethylene terephthalate.

7. The window spacer of claim **4**, wherein the second material is a laminate or a composite.

8. The window spacer of claim **4**, wherein the body includes an inner surface that is connected between the sidewalls and wherein the support member is substantially parallel with at least a majority of the inner surface.

9. The window spacer of claim **8**, wherein the window spacer further comprises a second support member.

10. The window spacer of claim **9**, wherein the body further comprises an outer surface opposite the inner surface, and wherein the second support member extends from the support member to the outer surface.

11. A window assembly comprising:
a first sheet of an at least partially translucent or transparent material;
a second sheet of the at least partially translucent or transparent material; and
a spacer arranged between the first sheet and the second sheet, wherein the spacer comprises:
an elongate body defining an interior space and including a first side portion connected to the first sheet and a second side portion connected to the second sheet; and
a support member arranged within the interior space to provide support to the body.

12. The window assembly of claim **11**, wherein the support member is a substantially planar elongate strip extending between the first side portion and the second side portion.

13. The window assembly of claim **11**, wherein the support member has a T-shaped cross-section.

14. The window assembly of claim **11**, wherein the support member has a U-shaped cross-section.

15. The window assembly of claim **11**, wherein the support member is a laminate arranged along at least part of an interior surface of the body.

16. A window spacer comprising an elongate body formed of at least one layer of a first material, the body defining an interior space and including a first side wall and an opposite second side wall, and wherein at least a portion of the body includes an undulating shape.

17. The window spacer of claim **16**, wherein the undulating shape includes at least ten undulations per inch.

18. The window spacer of claim **17**, wherein the undulating shape includes less than 100 undulations per inch.

19. The window spacer of claim **16**, wherein the undulating shape has a peak to peak amplitude in a range from about 0.01 inches to about 0.1 inches.

20. The window spacer of claim **16**, wherein the elongate body further comprises a first region having a first undulating shape and a second region having a second undulating shape that is different than the first undulating shape.

21. The window spacer of claim **20**, wherein the elongate body further comprises a third region having the first undulating shape.

22. The window spacer of claim **21**, wherein the second region is between the first region and the third regions.

23. A method of manufacturing a window spacer, the method comprising:
obtaining an elongate strip of material;
forming an undulating shape in the elongate strip of material; and
bending the elongate strip of material after forming the undulating shape to form the window spacer.

24. A method of manufacturing a window spacer, the method comprising:
obtaining a first elongate strip of a first material;
obtaining a second elongate strip of a second material;
bending the first elongate strip to define an interior space;
arranging the second elongate strip within the interior space.

25. A method of manufacturing a window spacer, the method comprising:
obtaining a first elongate strip of a first material;
obtaining a second elongate strip of a second material;
connecting the first elongate strip in a facing arrangement with the second elongate strip;
bending the first elongate strip and the second elongate strip simultaneously to form the window spacer.

* * * * *