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(54) **CANOPY STRUCTURE**

(71) Applicant: **BRAVO SPORTS**, Santa Fe Springs, CA (US)

(72) Inventors: **Jack Lovley**, Lake Forest, CA (US); **Mark Groenhuyzen**, Huntington Beach, CA (US); **Joe Klingl**, Los Angeles, CA (US)

(73) Assignee: **Bravo Sports**, Santa Fe Springs, CA (US)

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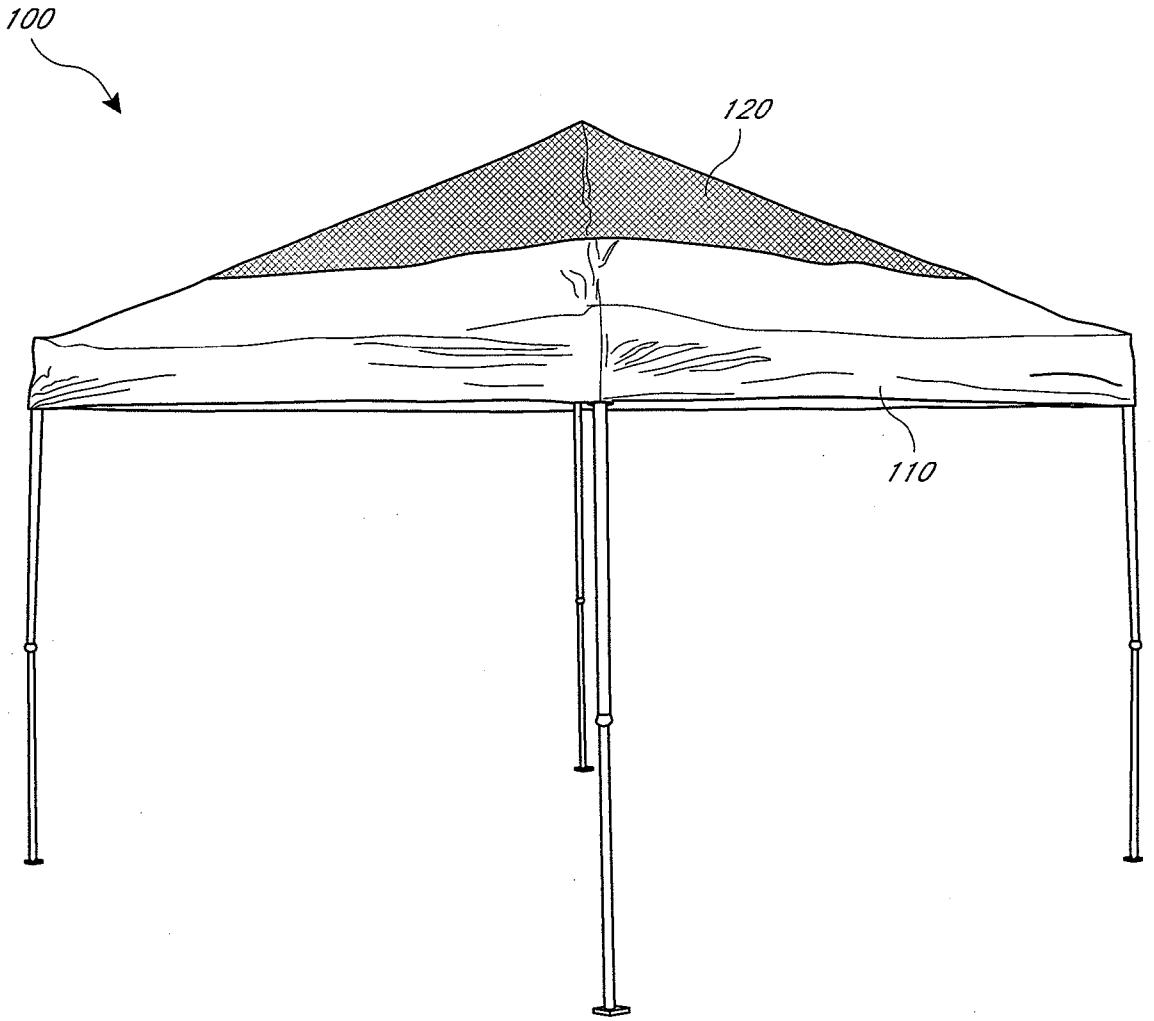
USPC **135/145**

(57) **ABSTRACT**

A canopy structure can comprise a frame comprising a base portion and a top portion. The top portion can comprise a plurality of support members configured to facilitate transition of the top portion between an extended position and a collapsed position. The top portion can comprise a low-friction bearing coupled to a first support member and a second support member so that the first support member and second support member are rotatable relative to one another. The bearing can comprise PTFE.



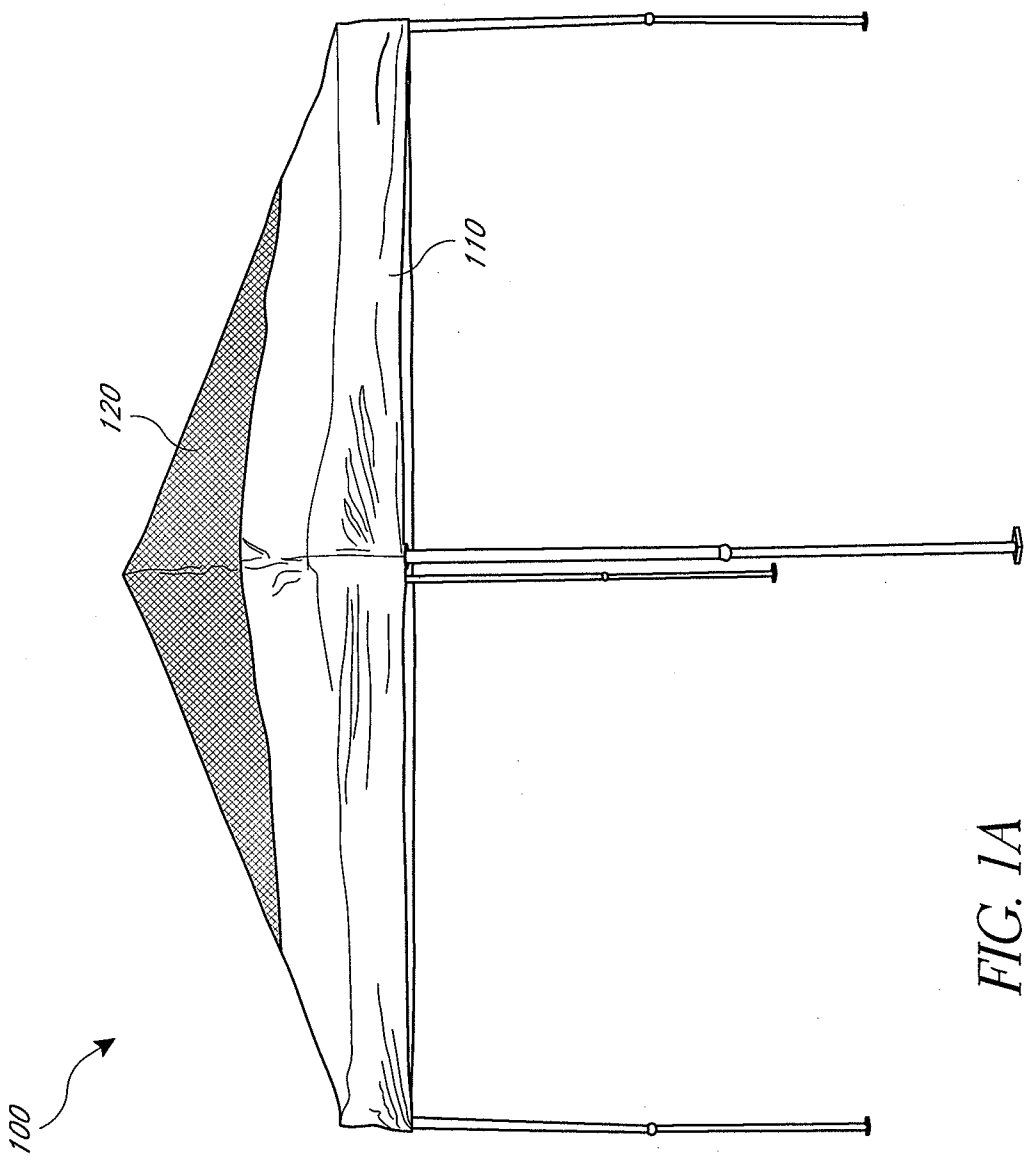


FIG. 1A

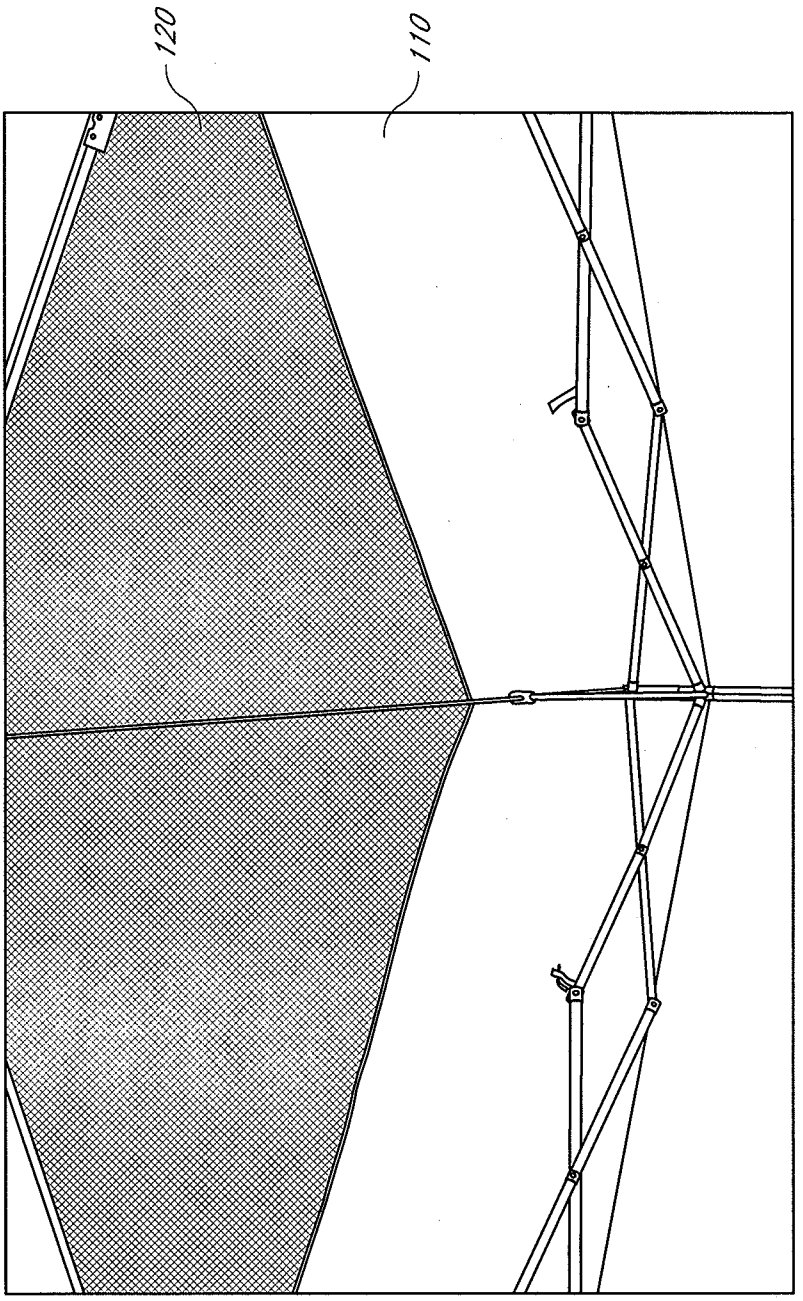


FIG. 1B

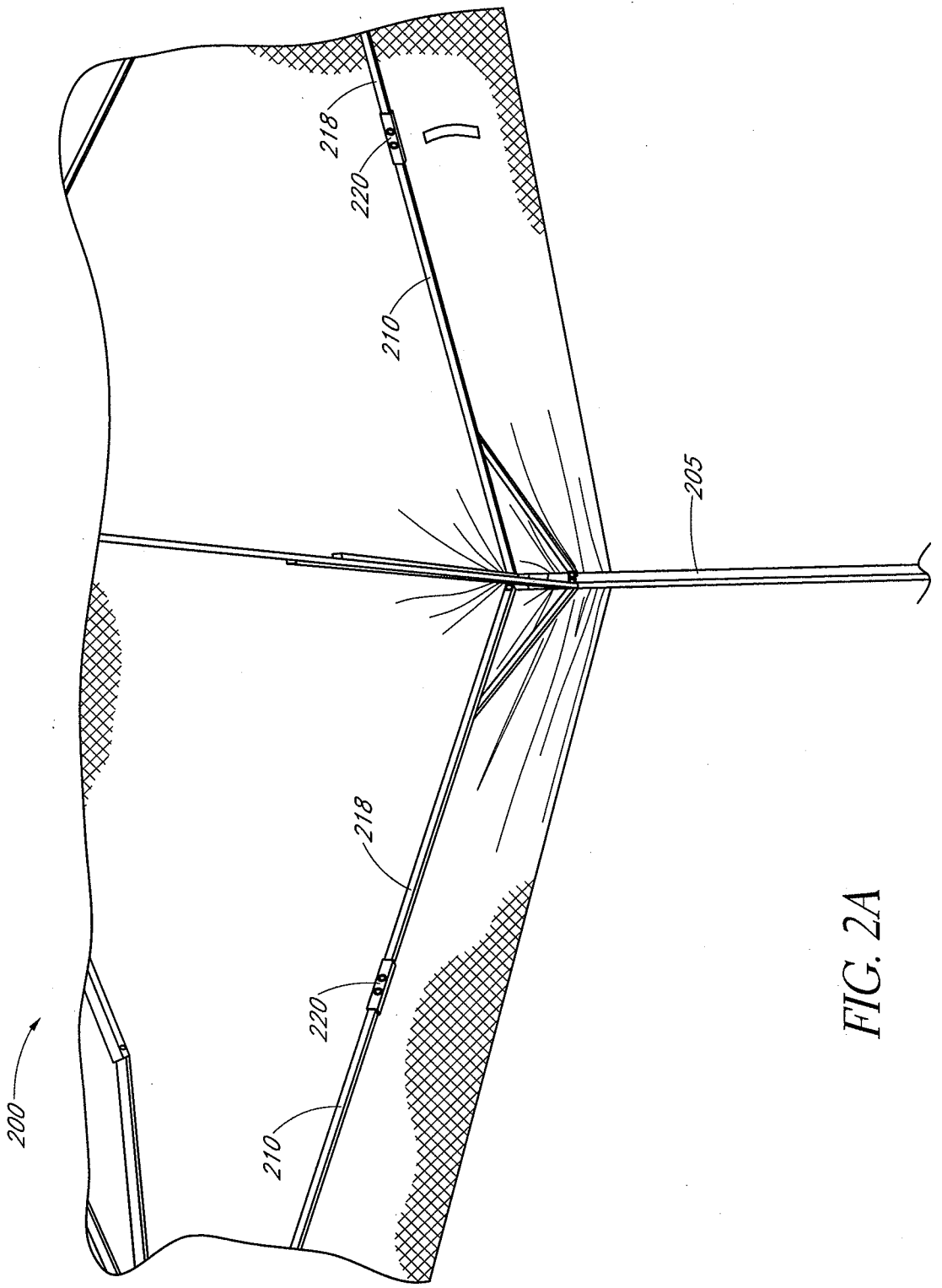


FIG. 2A

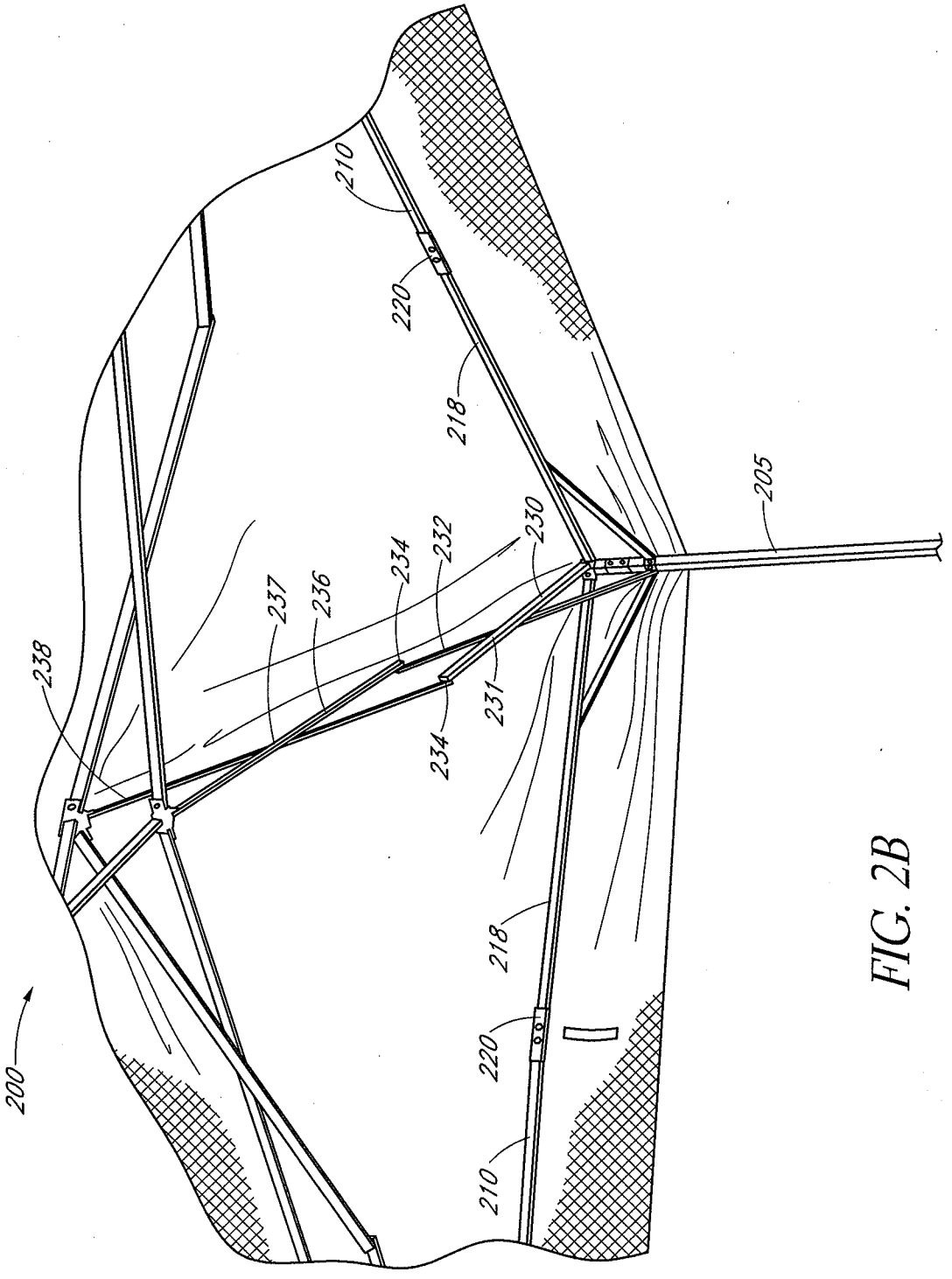


FIG. 2B

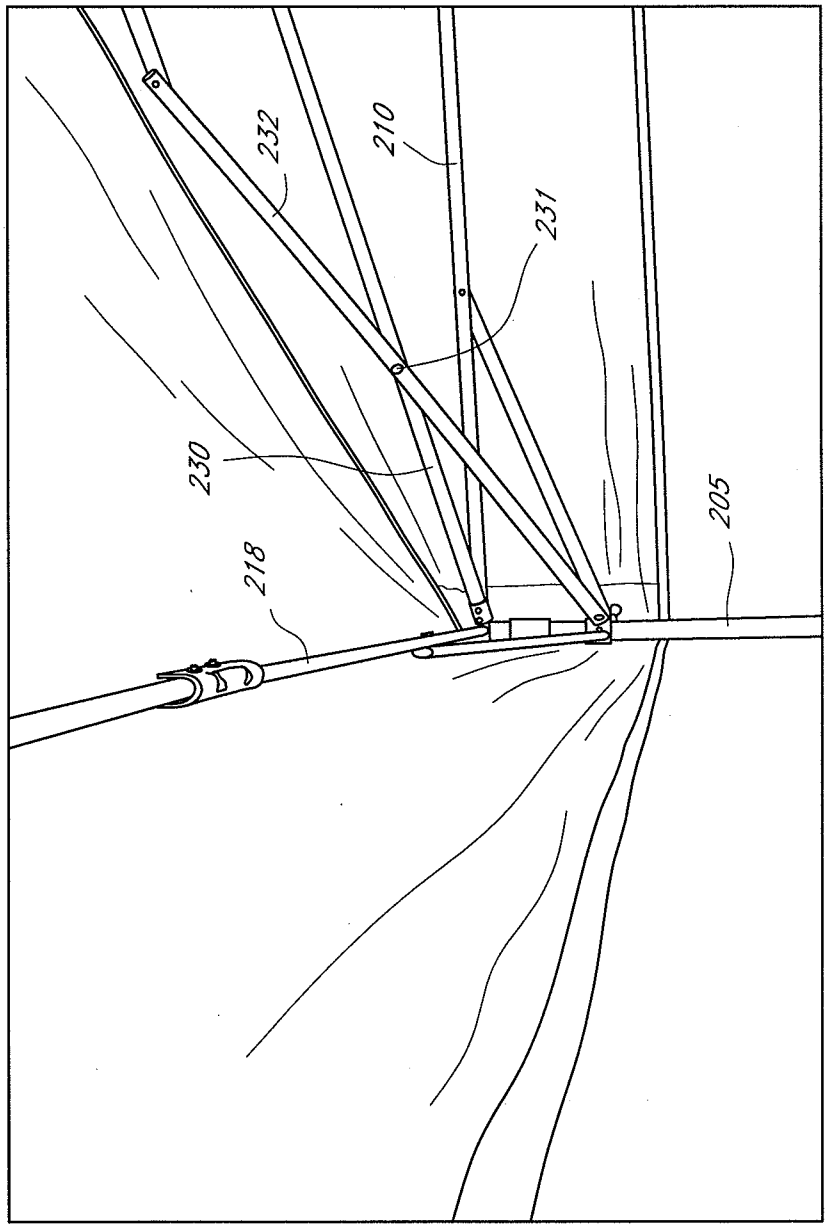


FIG. 2C

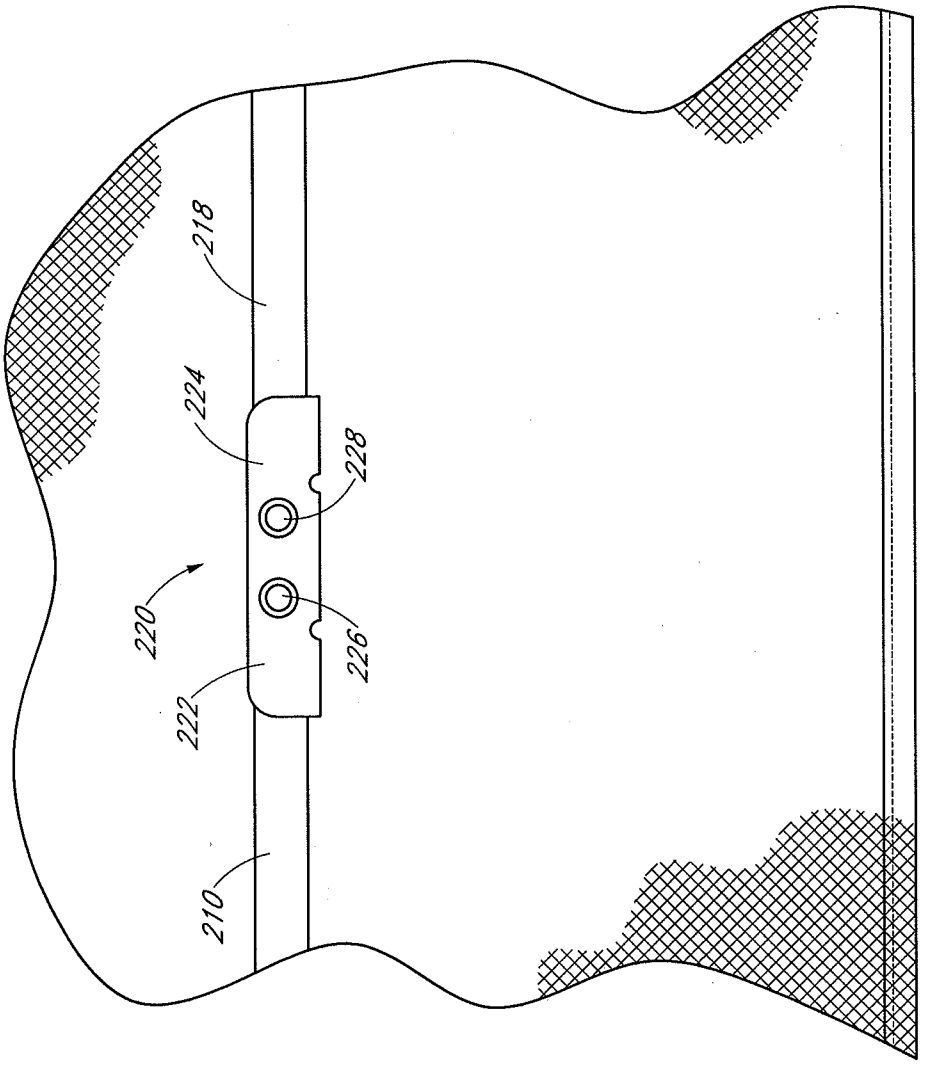


FIG. 2D

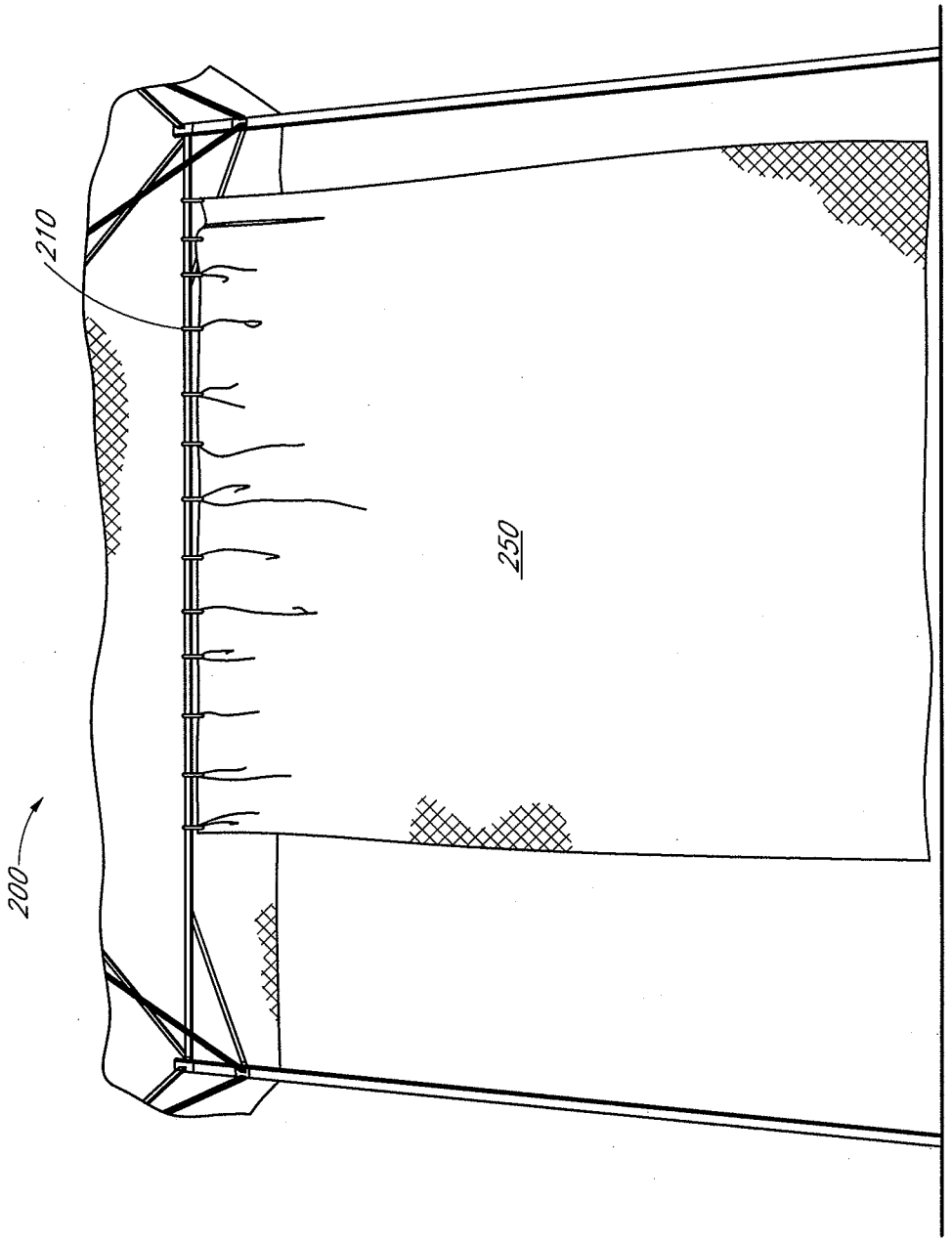


FIG. 2E

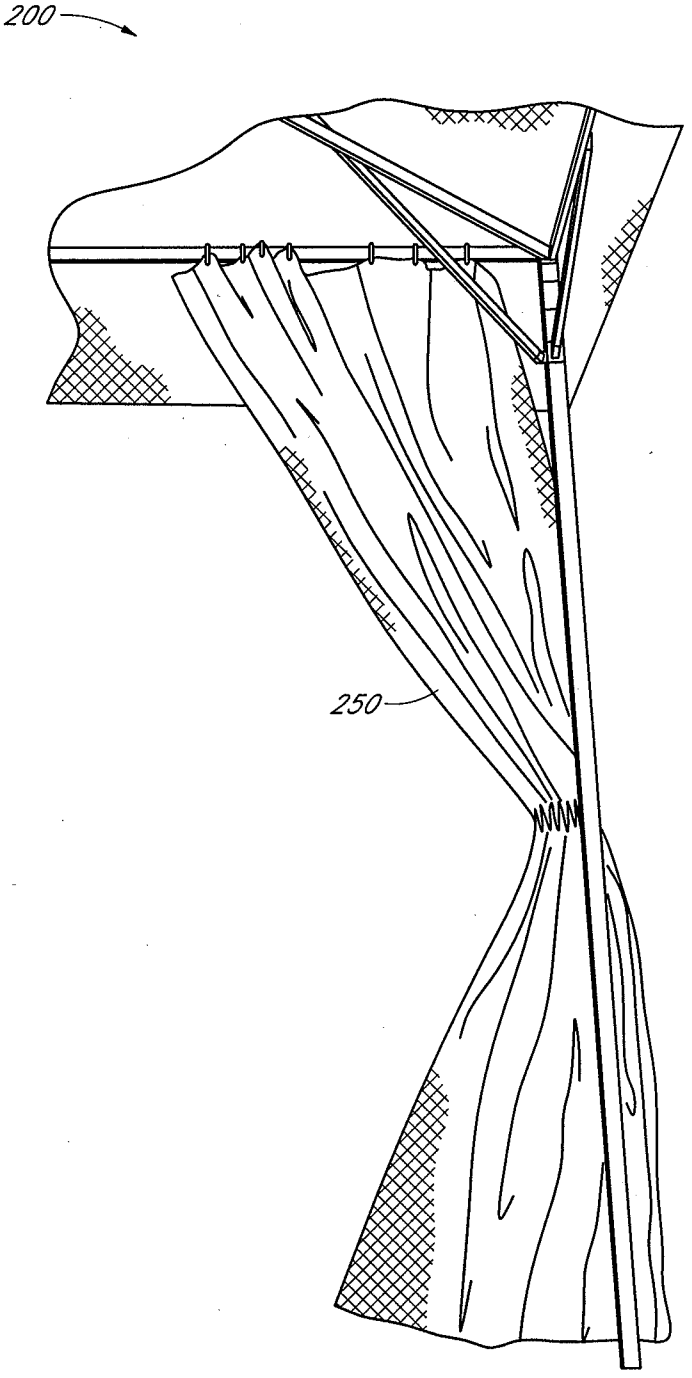


FIG. 2F

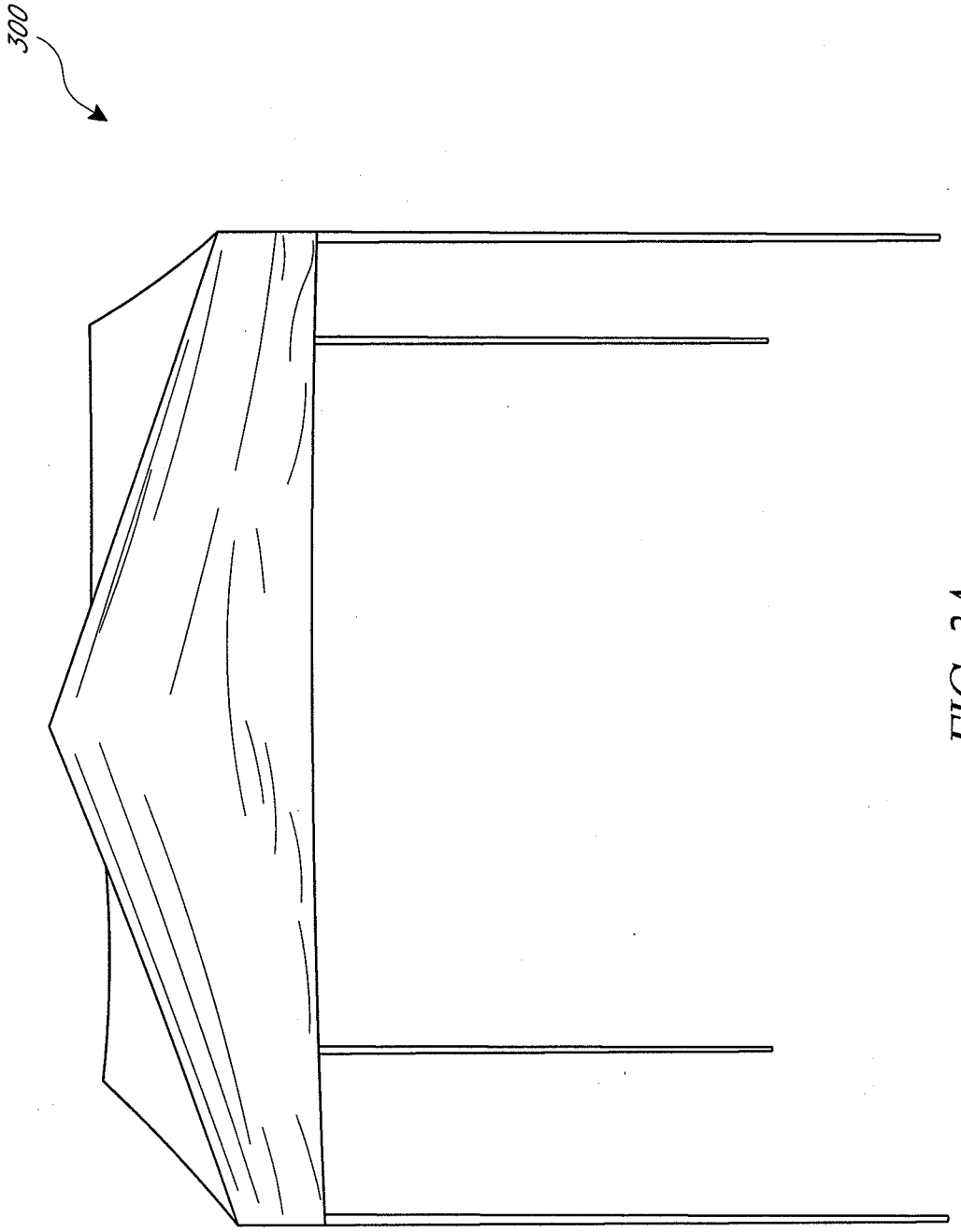


FIG. 3A

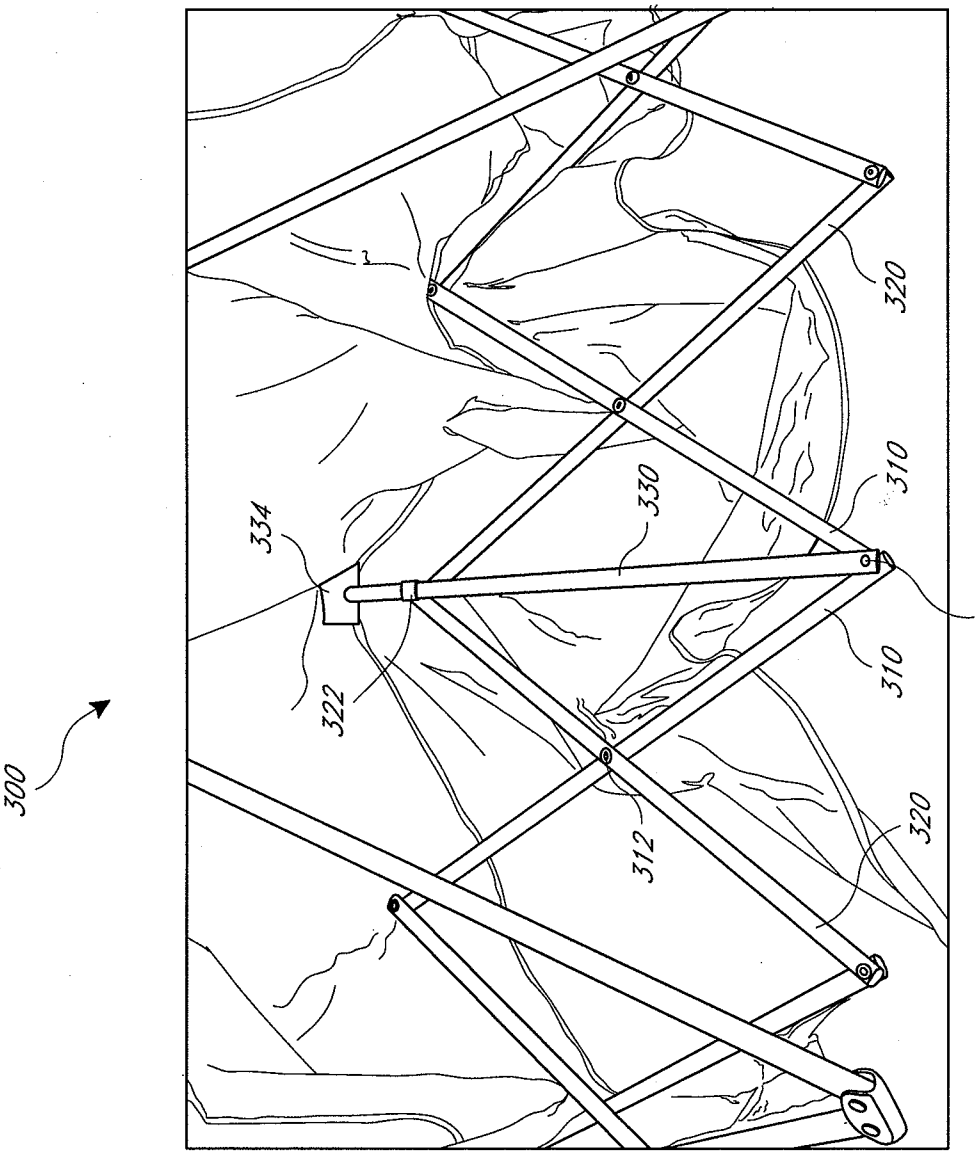


FIG. 3B

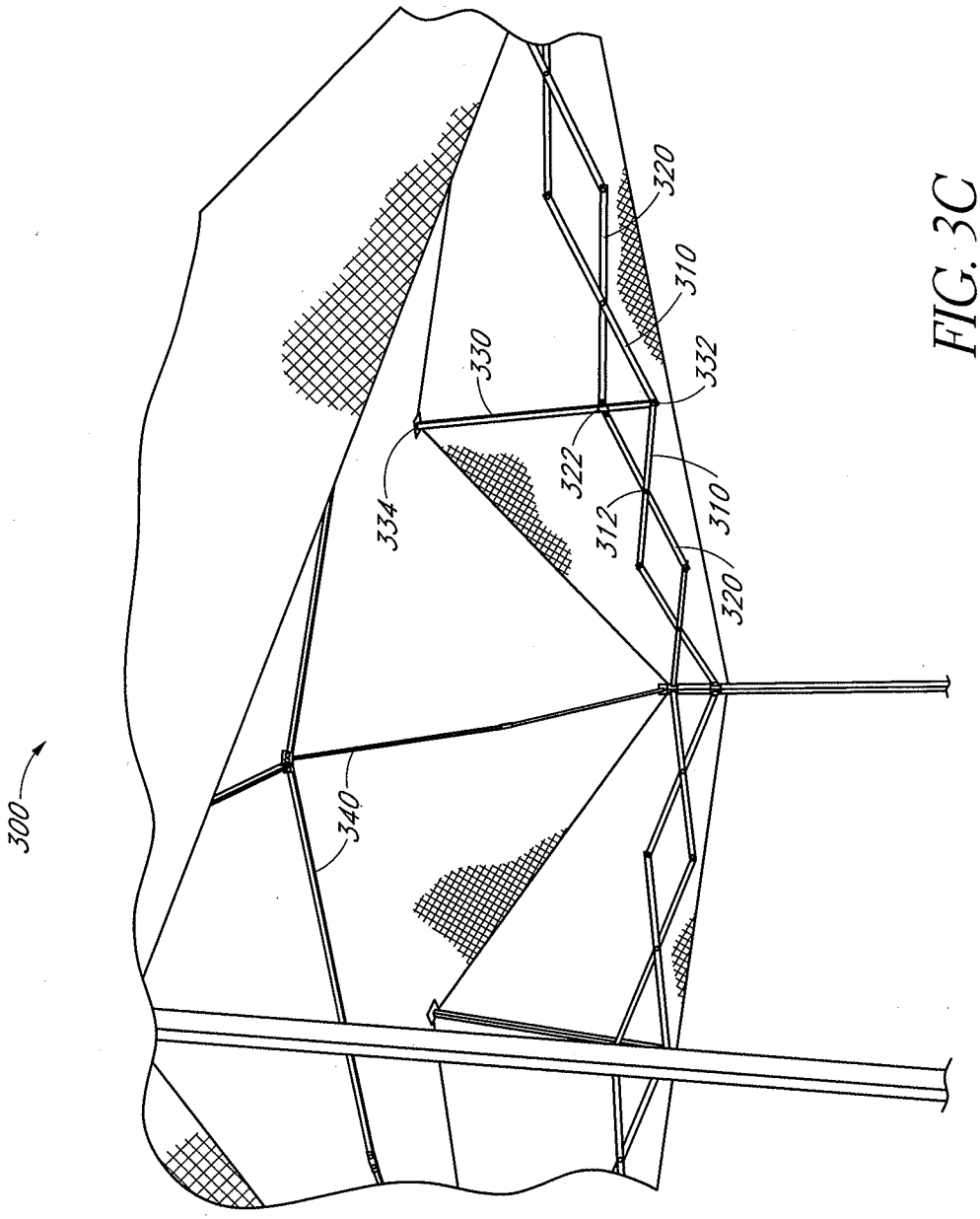


FIG. 3C

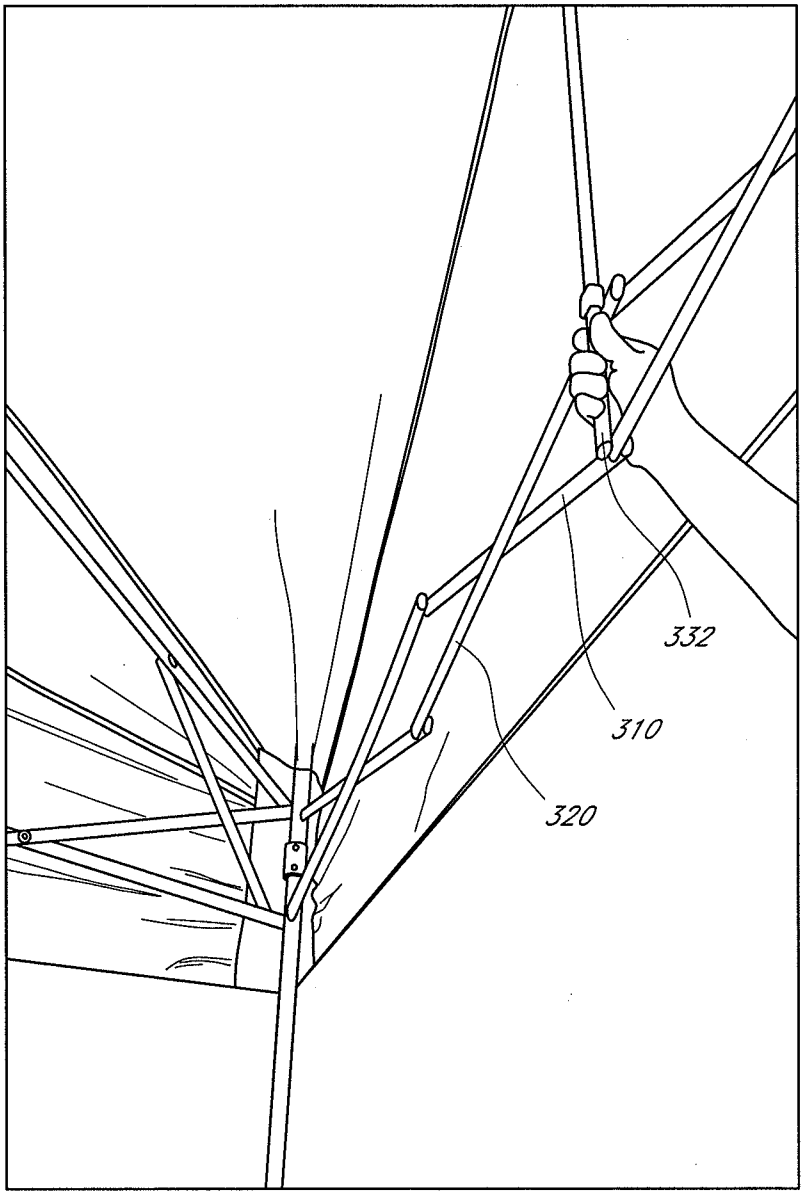


FIG. 3D

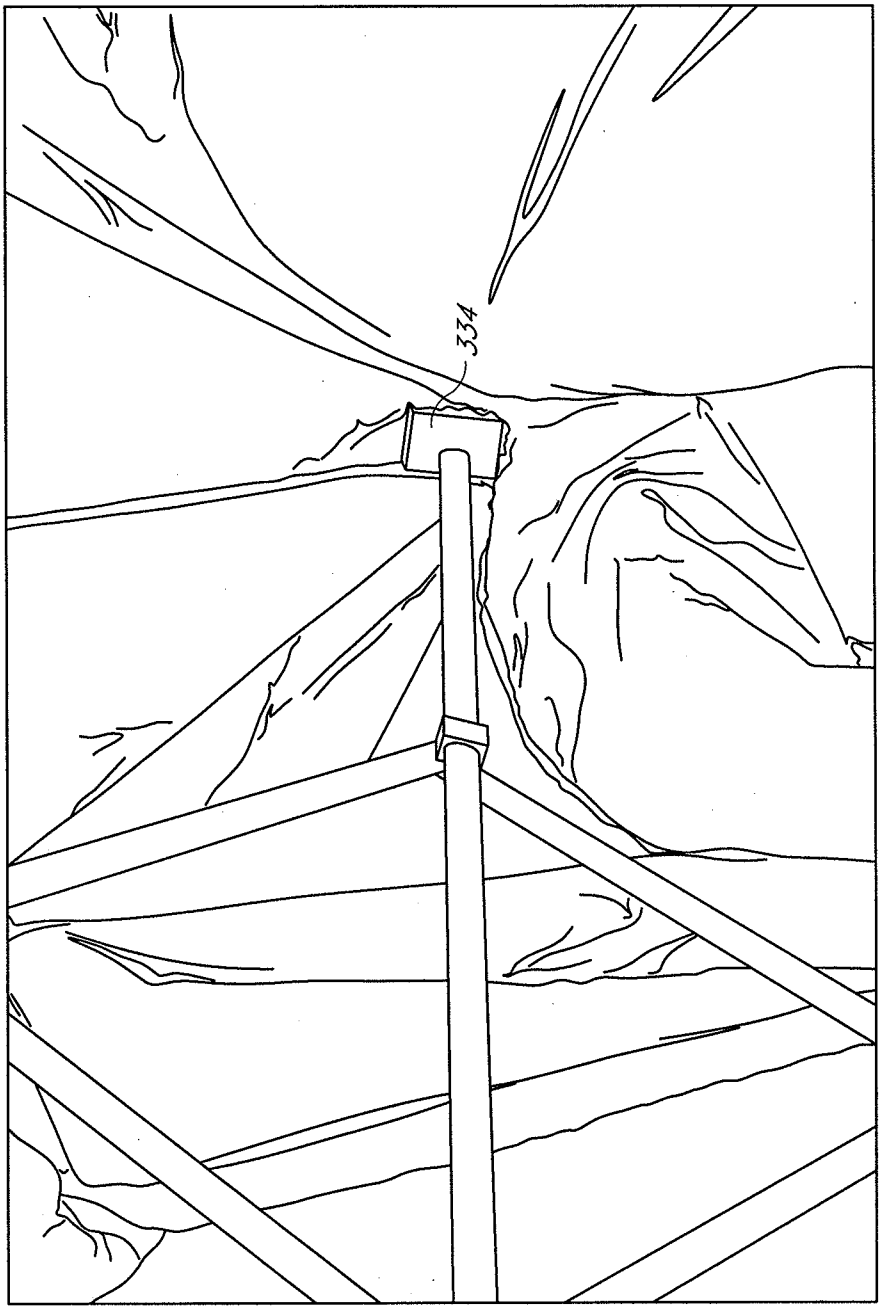


FIG. 3E

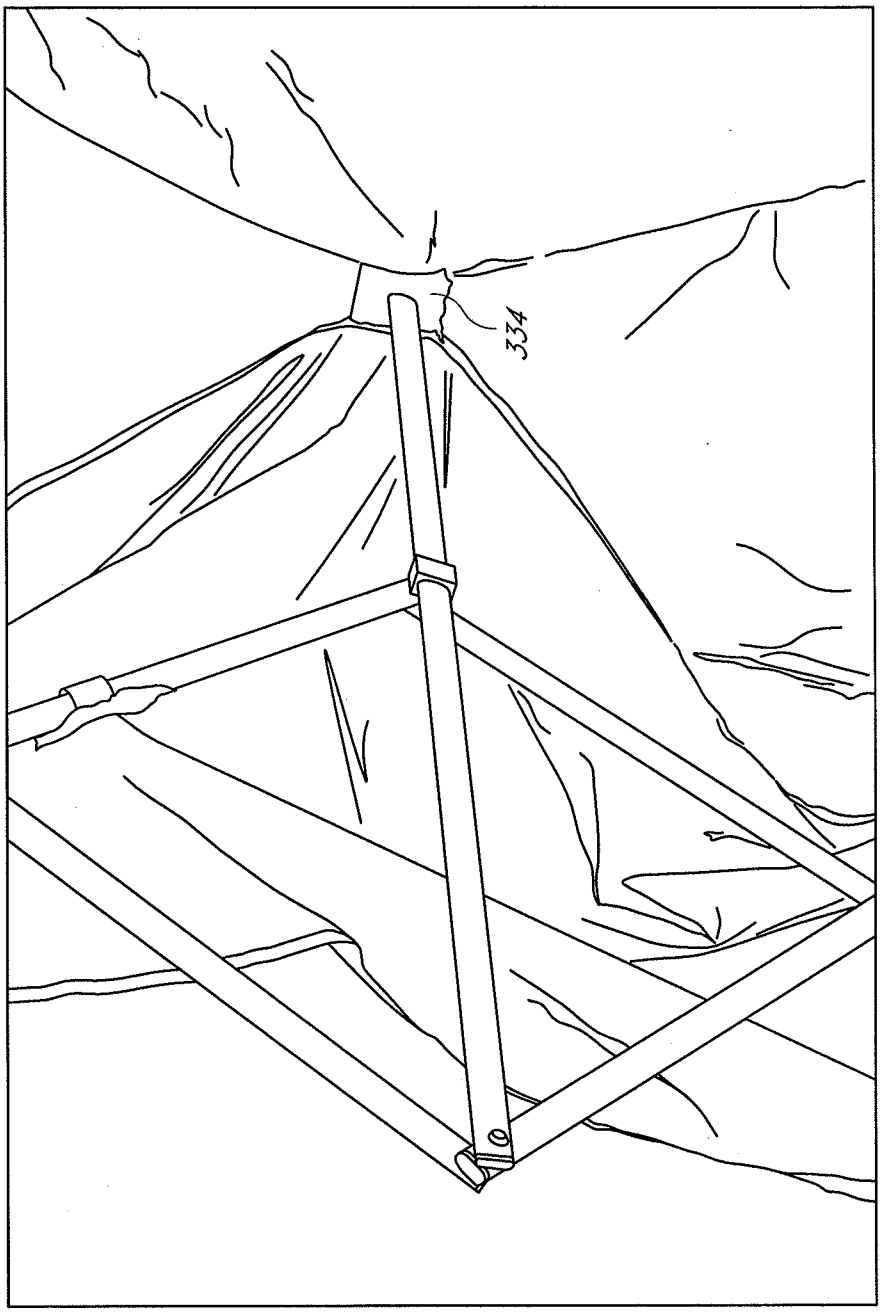


FIG. 3F

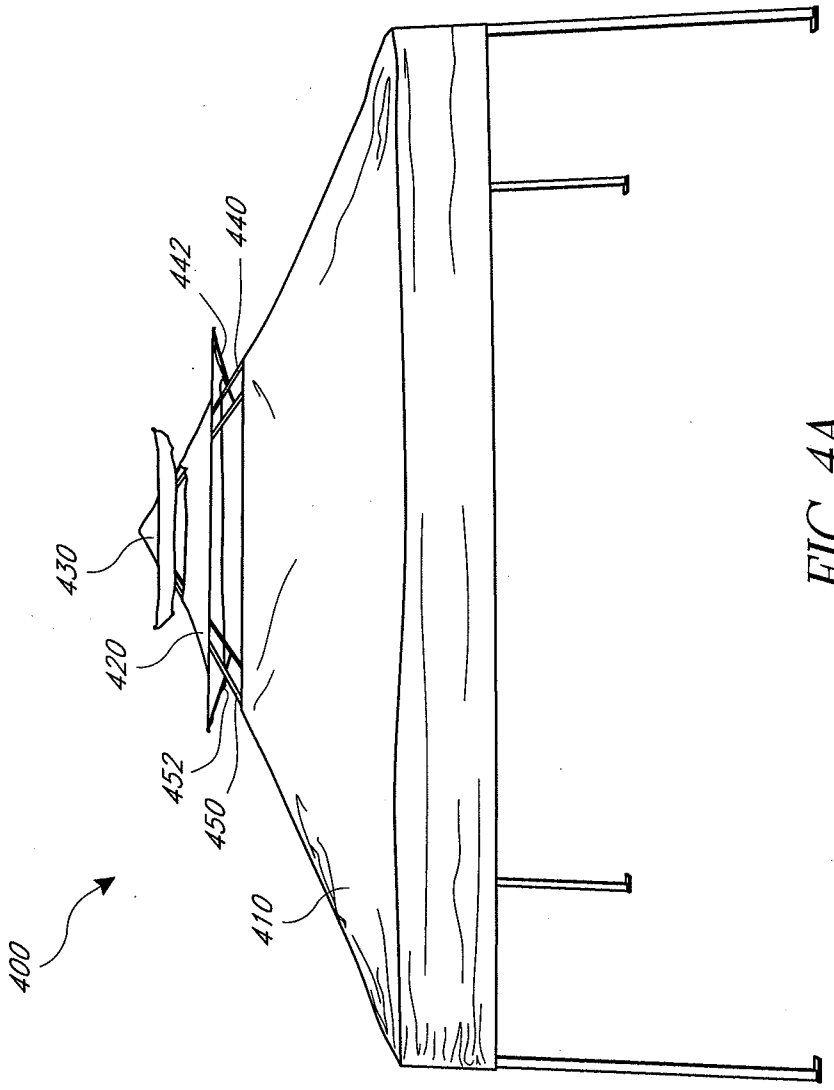


FIG. 4A

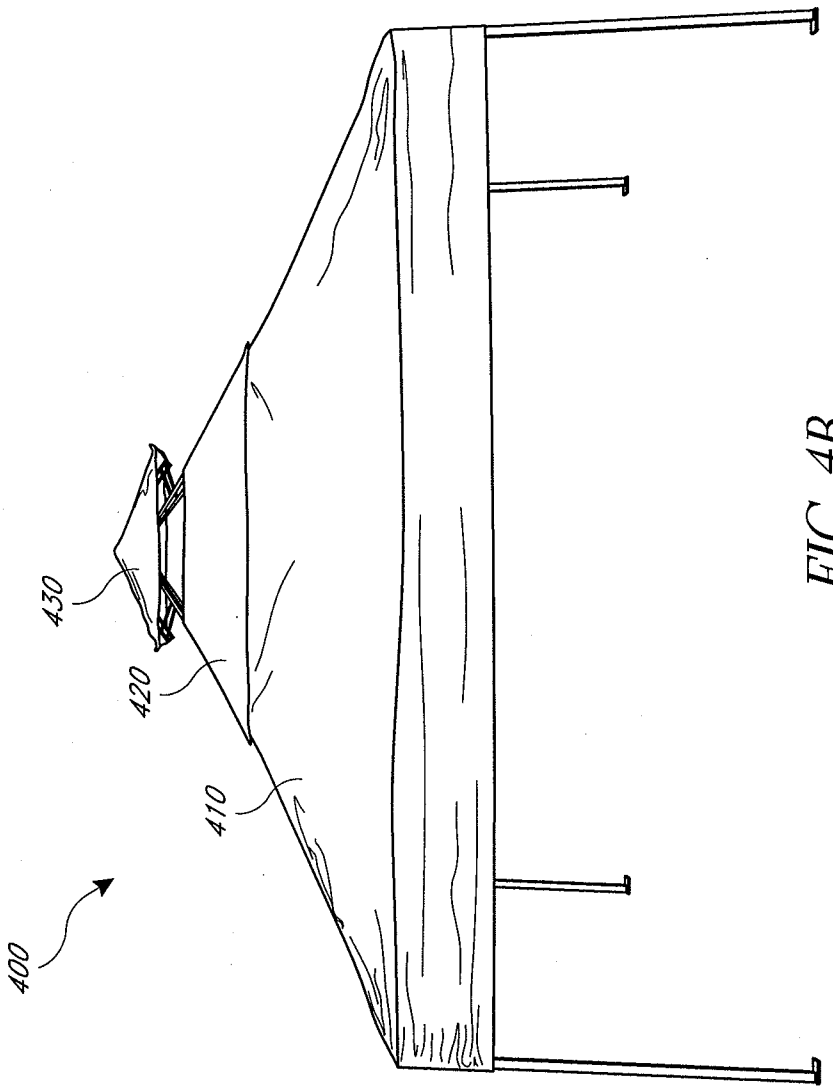


FIG. 4B

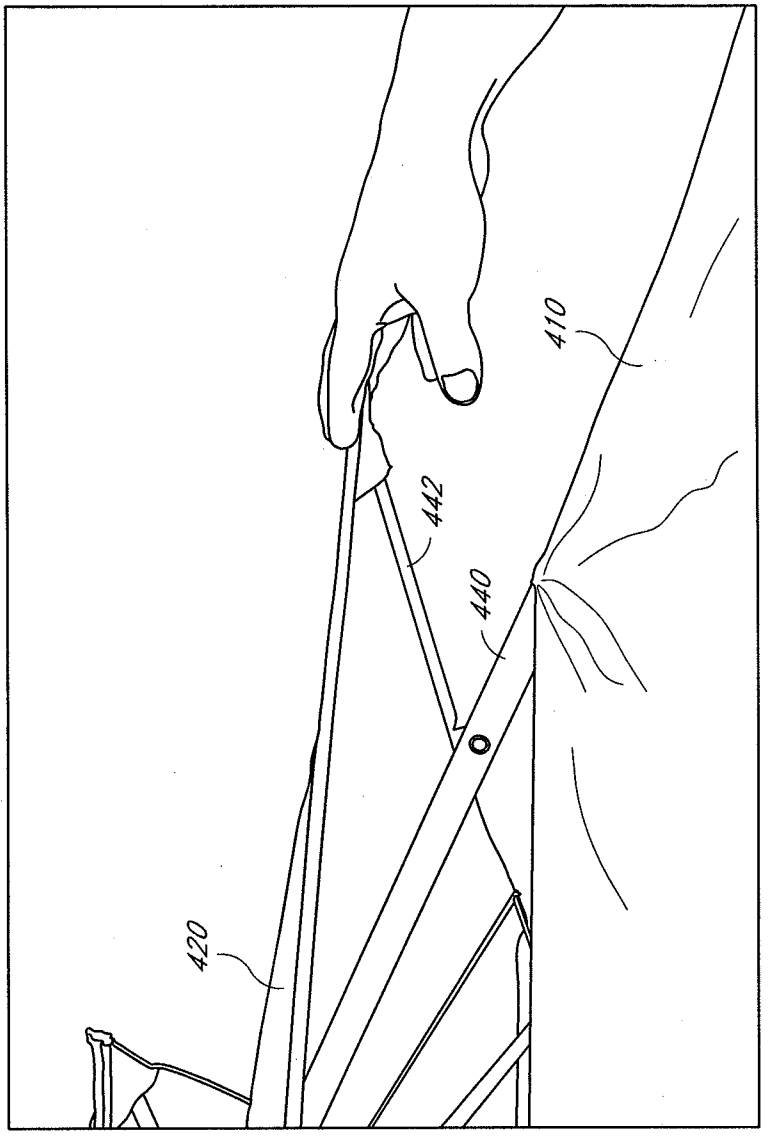


FIG. 4C

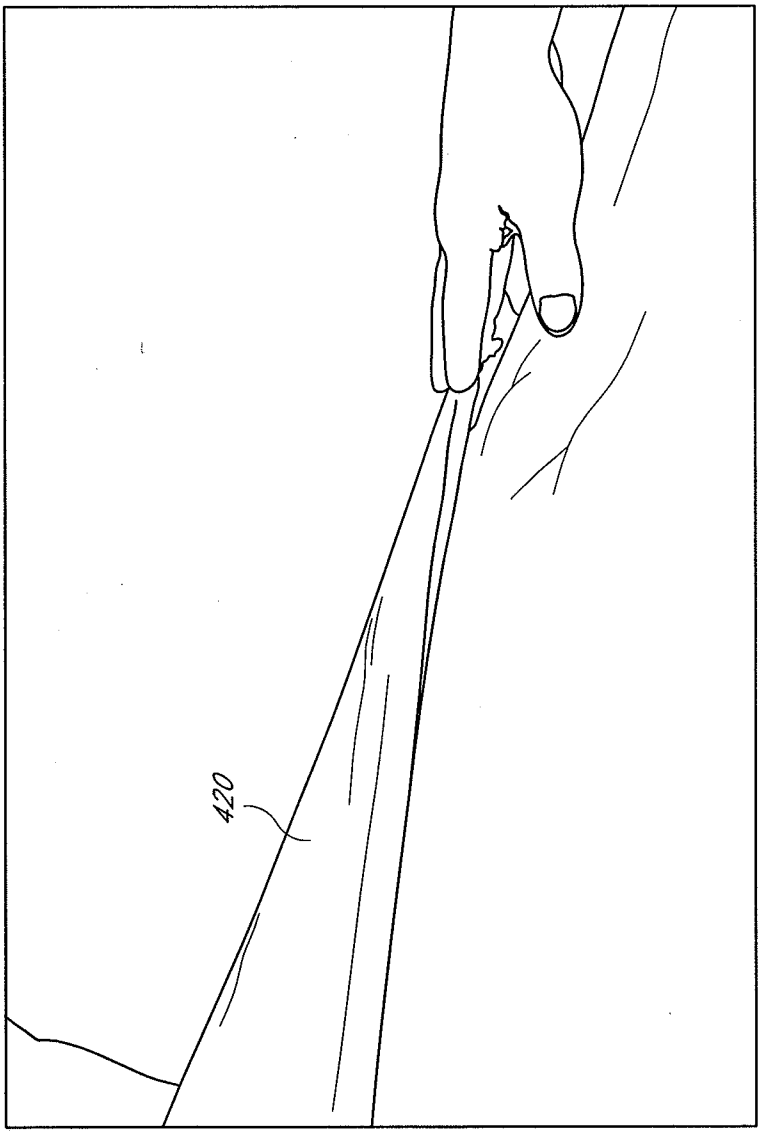


FIG. 4D

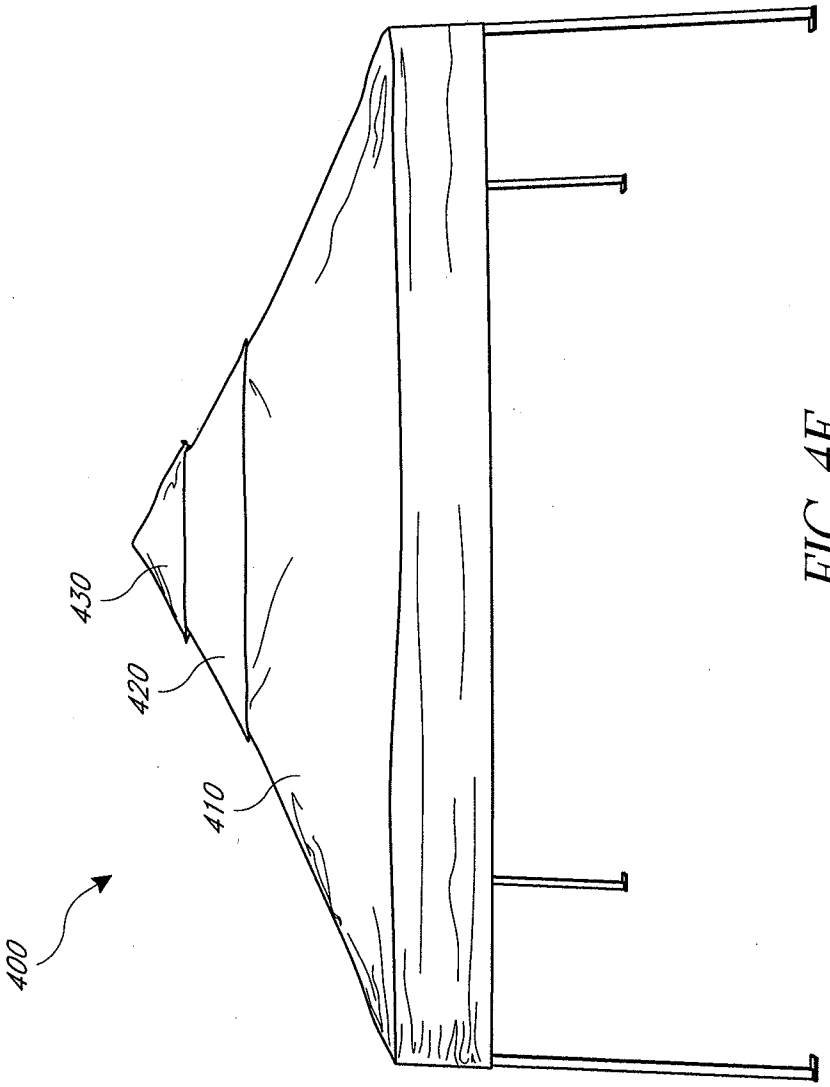


FIG. 4E

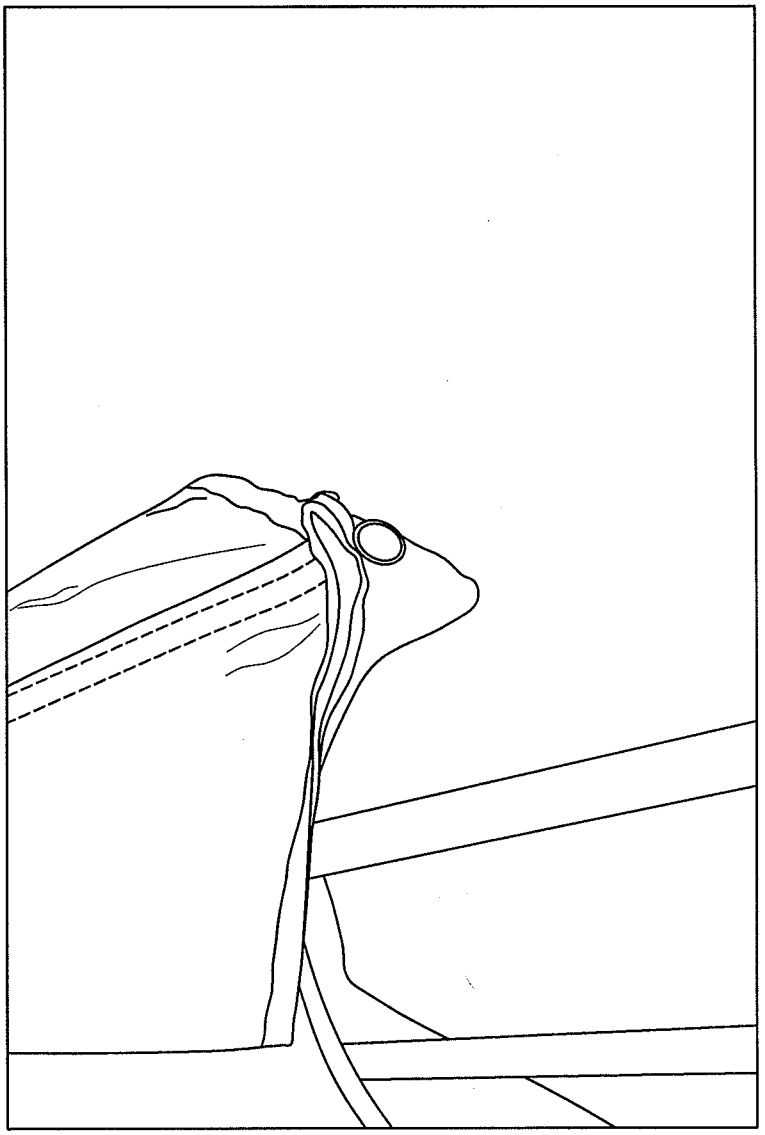


FIG. 4F

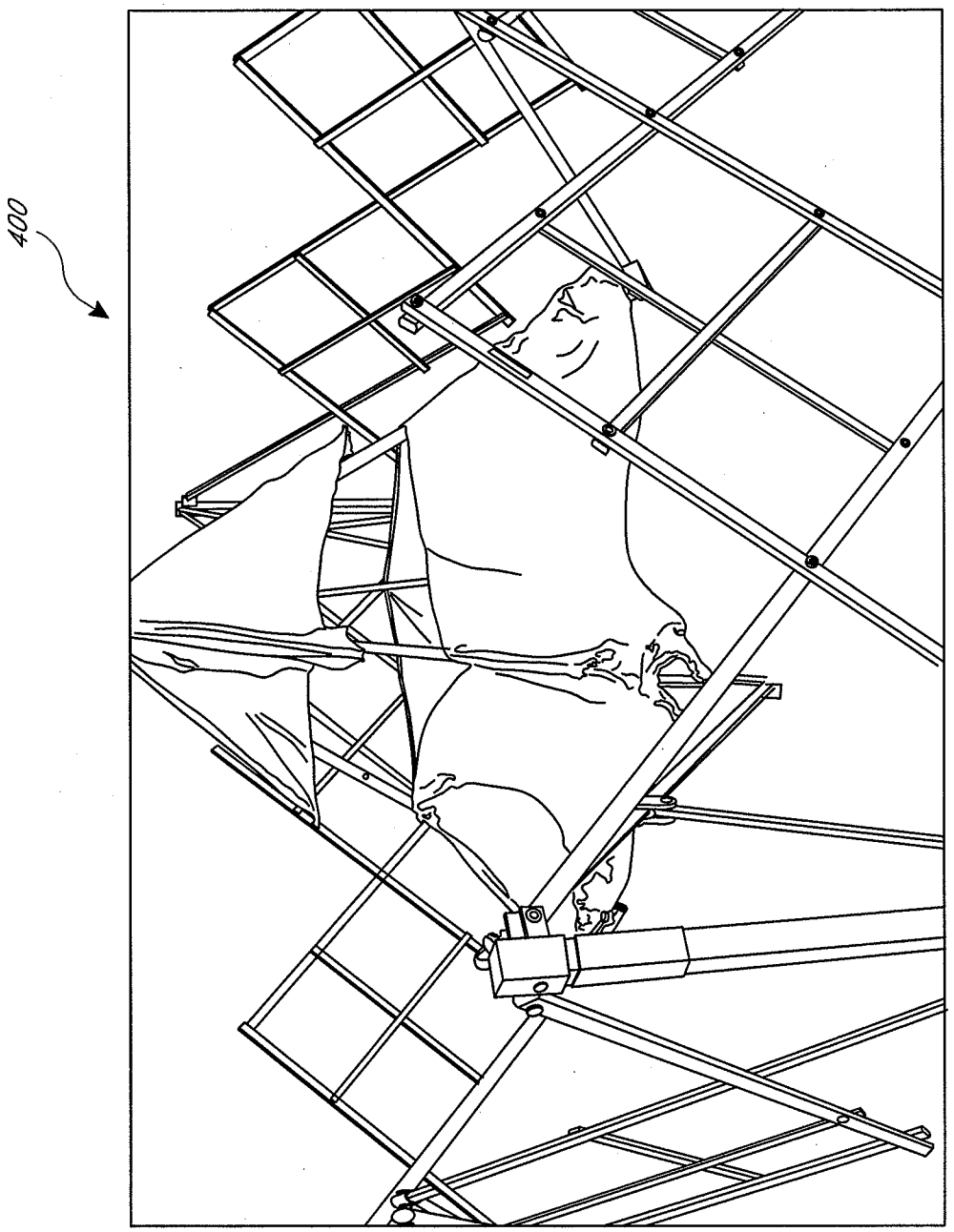
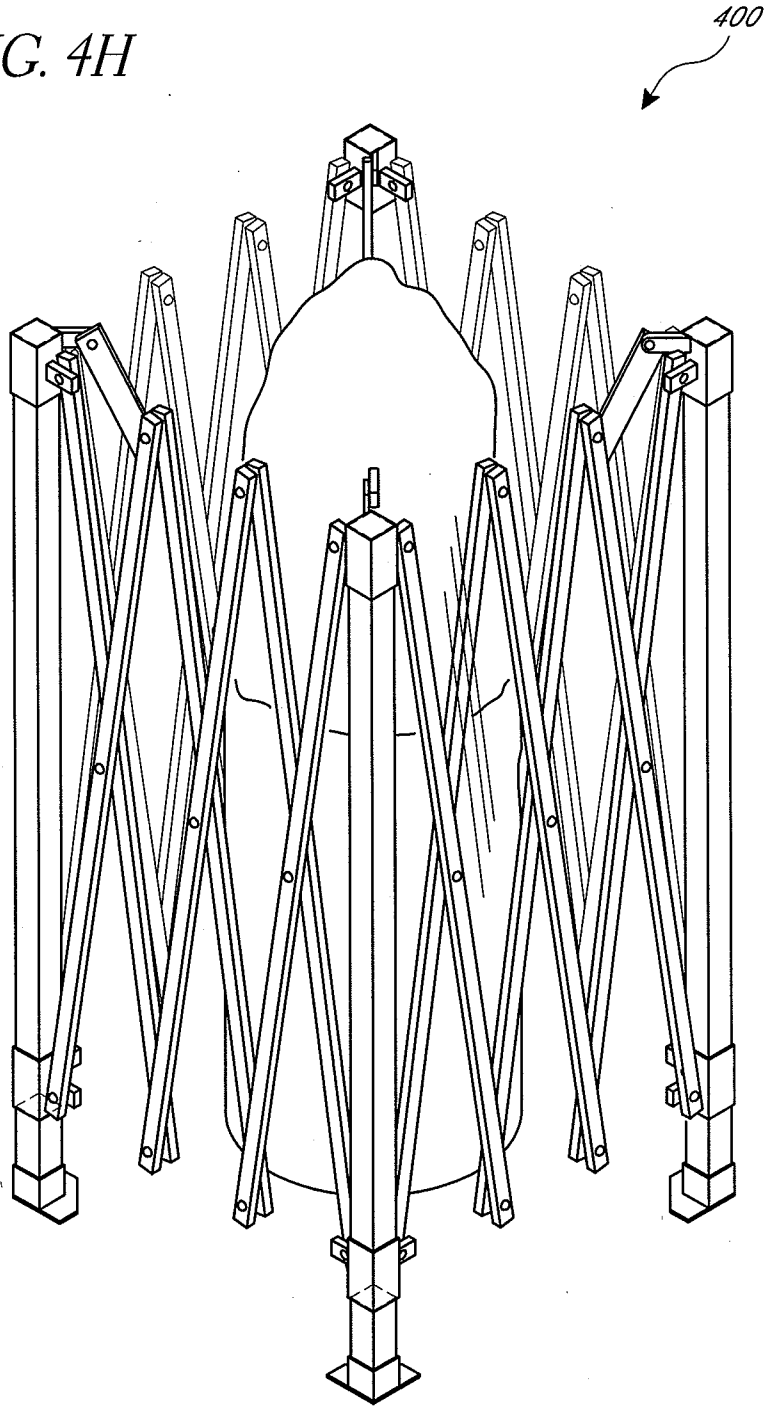


FIG. 4G

FIG. 4H



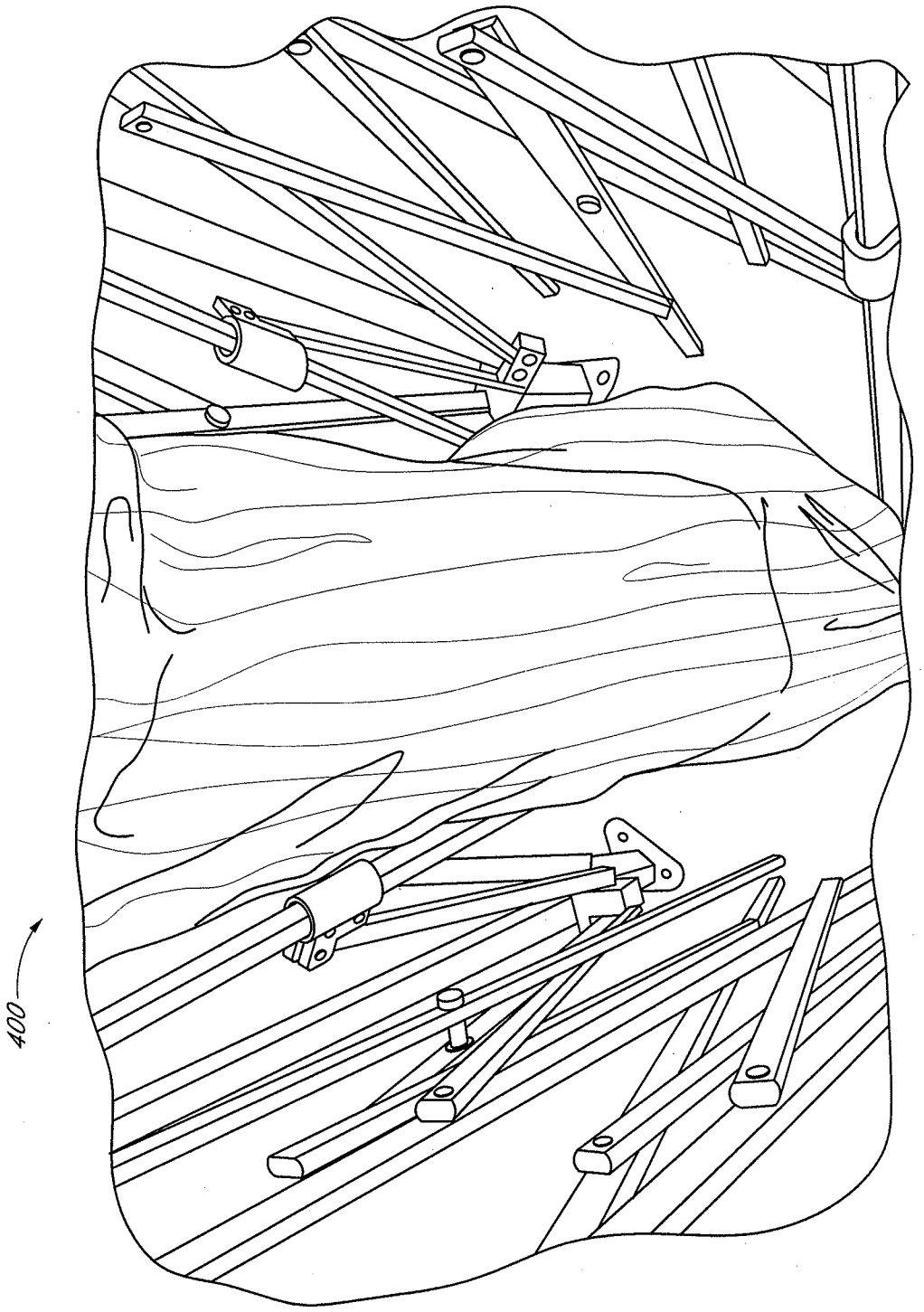


FIG. 4I

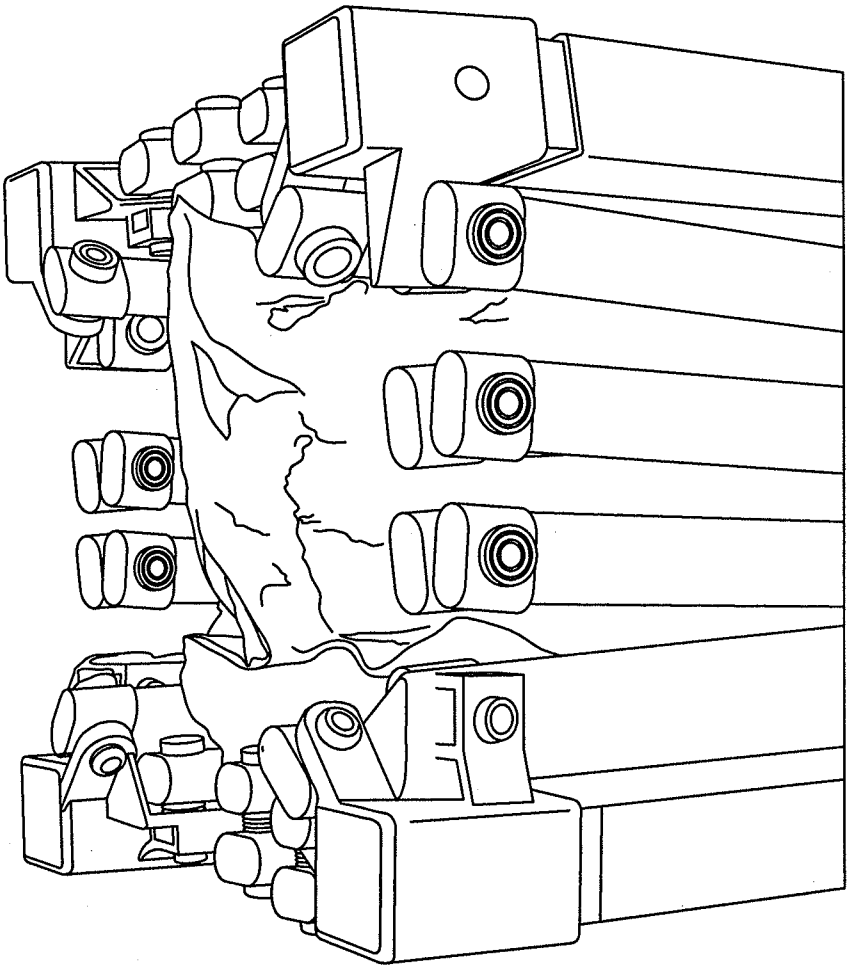


FIG. 4J

FIG. 5A

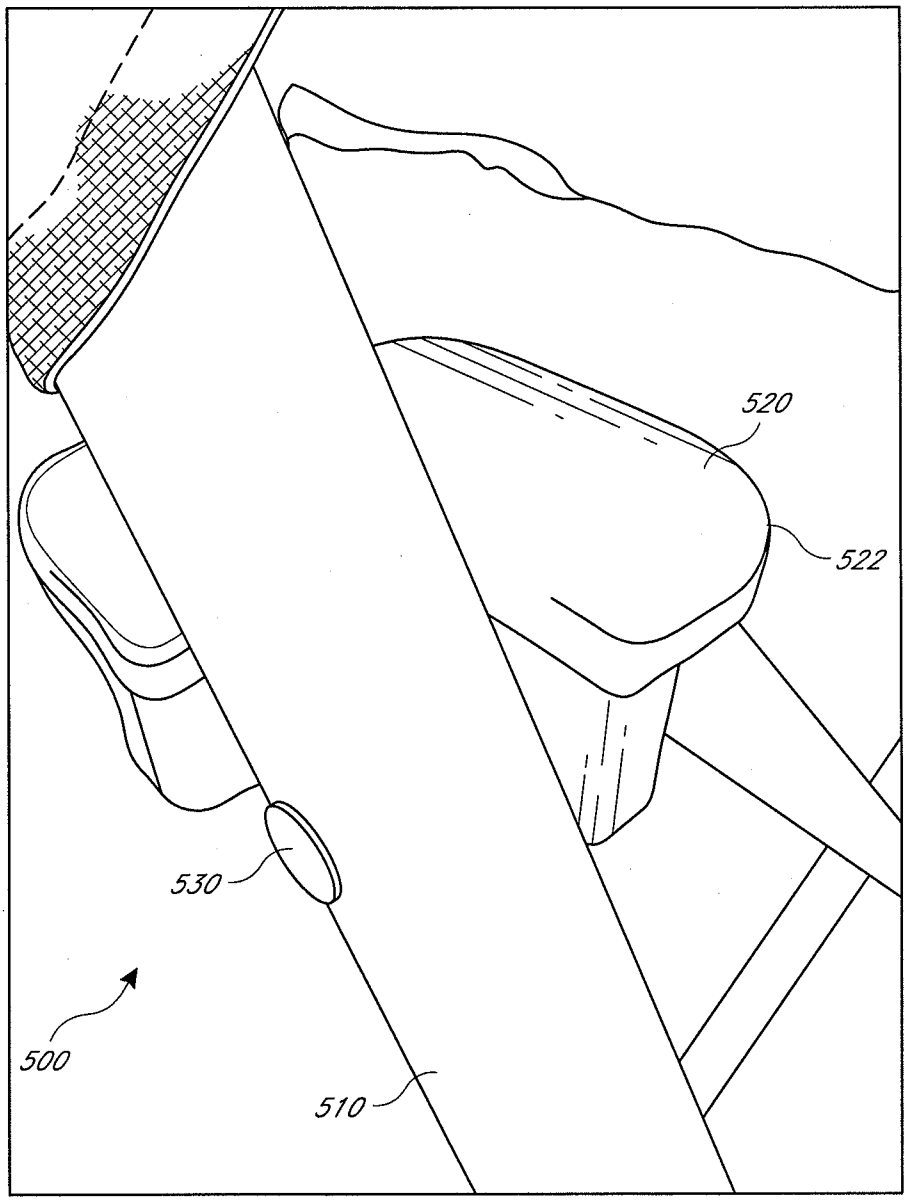


FIG. 5B

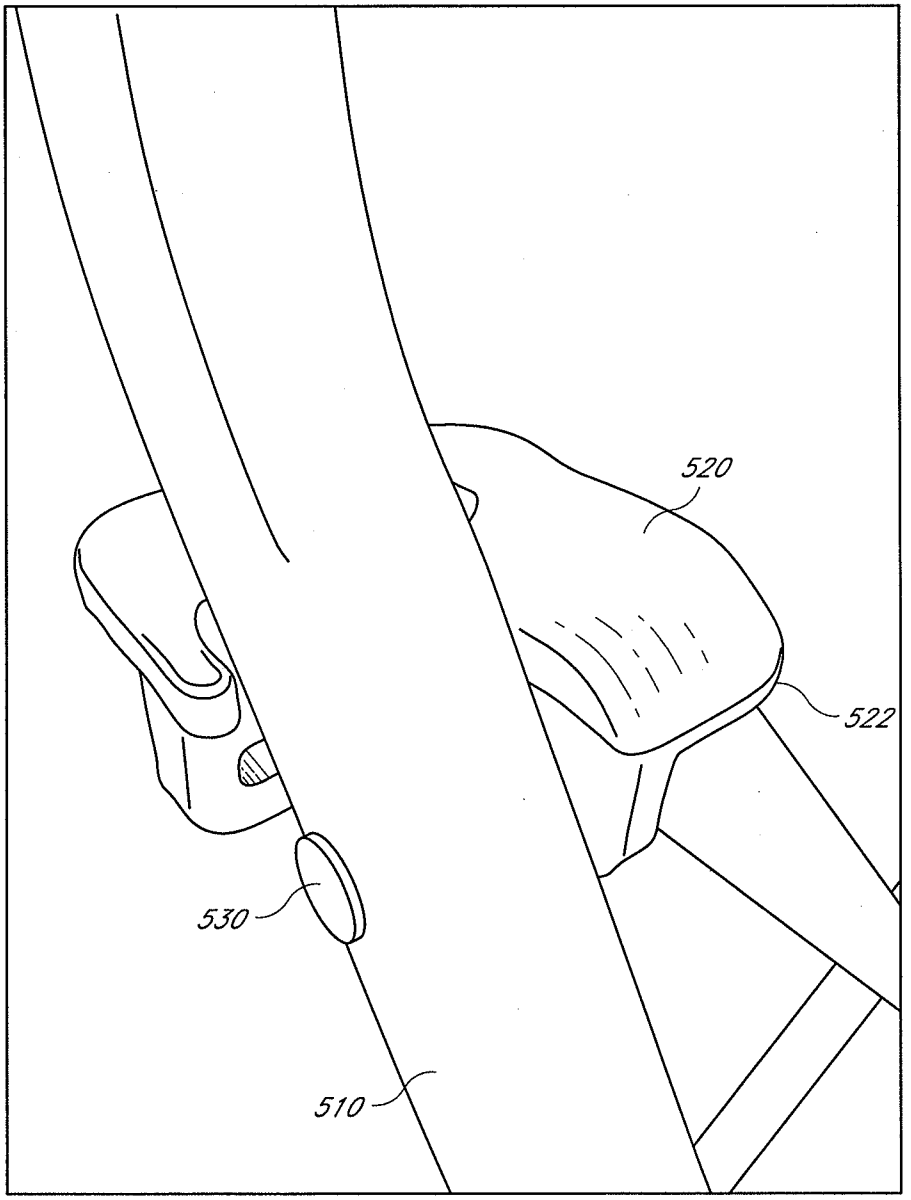


FIG. 5C

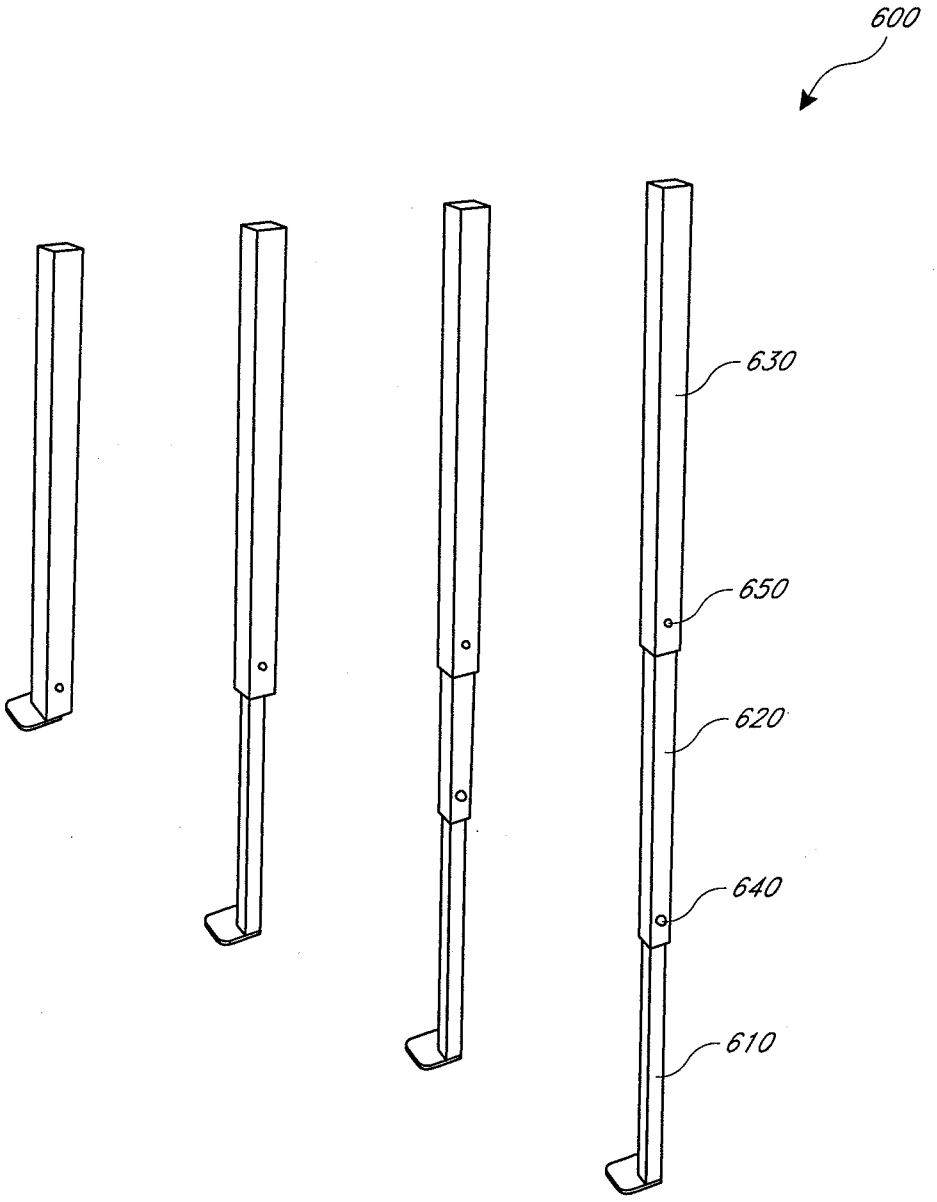


FIG. 6

CANOPY STRUCTURE

RELATED APPLICATIONS

[0001] This application is a continuation of International Application No. PCT/US2013/024186, filed Jan. 31, 2013, which claims the benefit of U.S. Provisional Patent Application Ser. No. 61/594,626, filed Feb. 3, 2012, the entire contents of which are incorporated herein by reference.

BACKGROUND

Field of the Invention

[0002] The inventions disclosed herein relates generally to canopy structures, including tent canopy structures, and collapsible support structures. The inventions disclosed herein also relate generally to collapsible chairs.

SUMMARY

[0003] In some embodiments, a canopy structure generally comprises a frame comprising a plurality of support members; and a top cover configured to cover the frame comprising a center mesh portion and a perimeter fabric portion. The center mesh portion can comprise a peak of the cover. The perimeter fabric portion can comprise a lower perimeter of the cover. The center mesh portion can comprise about 50 percent or more of a surface area of the cover. Alternatively, the center mesh portion can comprise about 80 percent or more of a surface area of the cover. The center mesh portion can be permeable to air but not to water.

[0004] In some embodiments, the canopy structure can further comprise a rain fly comprising a fabric not permeable to water, the rain fly configured to cover the center mesh portion. The canopy structure can further comprise a plurality of D rings configured to connect the rain fly to the canopy structure. The rain fly can be configured to be partially removable. Alternatively, the rain fly can be configured to be completely removable.

[0005] In some embodiments, a canopy structure generally comprises a plurality of vertical support members; a first plurality of horizontal support members, each of the first plurality of horizontal support members comprising a first and second end, wherein the first end of each of the first plurality of horizontal support members is configured to be supported by one of the plurality of vertical support members; a second plurality of horizontal support members, each of the second plurality of horizontal support members comprising a first and second end, wherein the first end of each of the second plurality of horizontal support members is configured to be supported by one of the plurality of vertical support members; and a plurality of connectors, one of the plurality of connectors between the second end of each of the first plurality of horizontal support members and the second end of each of the second plurality of horizontal support members; wherein each of the plurality of connectors can be configured in a first state in which one of the first plurality of horizontal support members and one of the second plurality of horizontal support members are joined in a substantially smooth and level line; and wherein each of the plurality of connectors can be configured in a second state in which one of the first plurality of horizontal support members and one of the second plurality of horizontal support members are rotatable with respect to each other. The canopy structure further can comprise drapes configured to be hung from the first and second plurality of horizontal support members. The drapes can be configured to slide smoothly from the first plurality of horizontal support members across one of the plurality of connectors to one of the second plurality of horizontal support members when the one of the plurality of connectors is in the first state.

[0006] In some embodiments, a canopy structure can comprise a plurality of vertical support members; a plurality of horizontal X-member supports, wherein each of the plurality of horizontal X-member supports can be configured in an unfolded state and a folded state; a cover configured to cover the plurality of vertical support members and plurality of horizontal X-member supports; and a first side vertical support bar supported by at least one of the plurality of horizontal X-member supports, wherein the first side vertical support bar is configured to support a first portion of the cover in a raised position. In some embodiments, the first side vertical support bar can be located in a center of a side of the canopy structure. The canopy structure can further comprise a second side vertical support bar supported by at least one of the plurality of horizontal X-member supports, wherein the second side vertical support bar is configured to support a second portion of the cover in a raised position.

[0007] In some embodiments, a canopy structure comprises a frame comprising a base portion and a top portion, the base portion comprising a first plurality of vertical frame support members, the top portion comprising a second plurality of frame support members, wherein each of the second plurality of frame support members comprises a first end portion and a second end portion, the first end portions of each of the second plurality of frame support members joined proximate to a peak of the frame; and a cover configured to cover the top portion of the frame comprising a center cover portion and one or more perimeter cover portions, wherein the center cover portion is configured to adjust between a first position configured to provide a first ventilation air flow and a second position configured to provide a second ventilation air flow, wherein the second ventilation air flow is greater than the first ventilation air flow. At least one of the one or more perimeter cover portions can be configured to adjust between a third position configured to provide a third ventilation air flow and a fourth position configured to provide a fourth ventilation air flow, wherein the fourth ventilation air flow is greater than the third ventilation air flow. Each of the one or more perimeter cover portions can be configured to adjust between a third position configured to provide a third ventilation air flow and a fourth position configured to provide a fourth ventilation air flow, wherein the fourth ventilation air flow is greater than the third ventilation air flow. The canopy structure can further comprise a plurality of cover support members configured to support the center cover portion in the second position. The center cover portion can comprise a fabric, wherein a tautness in the fabric supports the center cover portion in the second position. The canopy structure can further comprise a plurality of spring members configured to support the center cover portion in the second position. A bottom portion of the center cover portion can be configured to overlap with an upper portion of the one or more perimeter cover portions when the center cover portion is in the first position. The center cover portion can comprise an edge, wherein the edge of the center cover portion is configured to face in a substantially horizontal direction when the center cover portion is in the second position. The center cover portion can comprise an edge, wherein the edge of the center

cover portion is configured to face in a downward-sloping direction when the center cover portion is in the second position. The center cover portion additionally can be configured to adjust to a third position configured to provide a third ventilation air flow, wherein the third ventilation air flow is greater than the second ventilation air flow. The center cover portion can comprise an edge, wherein the edge of the center cover portion is configured to face in a substantially horizontal direction when the center cover portion is in the third position, and the edge of the center cover portion is configured to face in a downward-sloping direction when the center cover portion is in the second position. The first plurality of vertical frame support members can be configured to be adjustable between a first height in an extended state and a second height in a collapsed state, wherein the second height is less than the first height. The canopy structure can further comprise a first plurality of cover support members configured to support the center cover portion in the second position and a second plurality of cover support members configured to support the at least one of the one or more perimeter cover portions in the fourth position. The canopy structure can further comprise a first plurality of cover support members configured to support the center cover portion in the second position and a second plurality of cover support members configured to support each of the one or more perimeter cover portions in the fourth position. At least one of the one or more perimeter cover portions can comprise a fabric, wherein a tautness in the fabric supports the at least one of the one or more perimeter cover portions in the fourth position. Each of the one or more perimeter cover portions can comprise a fabric, wherein a tautness in the fabric supports each of the one or more perimeter cover portions in the fourth position. The canopy structure can further comprise a plurality of spring members configured to support the at least one of the one or more perimeter cover portions in the fourth position. The canopy structure can further comprise a plurality of spring members configured to support each of the one or more perimeter cover portions in the fourth position.

[0008] In some embodiments, a collapsible chair generally comprises a plurality of legs configured to be adjustable between a folded state and an unfolded state; a fabric seat portion configured to form a substantially horizontal surface when the plurality of legs are configured in the unfolded position; a plurality of fabric stops configured to support the fabric seat portion, each of the plurality of fabric stops connected to each of the plurality of legs, wherein each of the plurality of fabric stops comprises a chamfered edge configured to distribute force to the fabric seat portion.

[0009] In some embodiments, a telescoping canopy leg generally comprises a lower telescoping leg portion having a first cross-sectional area, an upper end of the lower telescoping leg portion comprising a first pin; a middle telescoping leg portion comprising a first hollow interior region having a second cross-sectional area, a lower end of the middle telescoping leg portion comprising a first hole and an upper end of the middle telescoping leg portion comprising a second pin; and an upper telescoping leg portion comprising a second hollow interior region having a third cross-sectional area, a lower end of the upper telescoping leg portion comprising a second hole; wherein the first cross-sectional area is less than the second cross-sectional area and the second cross-sectional area is less than the third cross-sectional area, the lower telescoping leg portion configured to slide within the middle telescoping leg portion, the middle telescoping leg portion configured to slide within the upper telescoping leg portion, the first pin configured to fit within the first hole, the second pin configured to fit within the second hole; and wherein the telescoping canopy leg is configured to be adjustable between an extended state and a collapsed state, the extended state being in which the first pin is positioned within the first hole and the second pin is positioned within the second hole, and a collapsed state being in which the lower telescoping leg portion is telescoped within the middle telescoping leg portion and the middle telescoping leg portion is telescoped within the upper telescoping leg portion.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] FIGS. **1**A-**1**B illustrate perspective views of embodiments of a canopy structure comprising a top mesh portion.

[0011] FIGS. **2**A-**2**F illustrate views of embodiments of a canopy structure comprising connectors configured for drapes to be hung.

[0012] FIGS. **3**A-**3**F illustrate views of embodiments of a canopy structure that comprise a side vertical support bar.

[0013] FIGS. **4**A-**4**J illustrate views of embodiments of a canopy structure that comprises canopy vents.

[0014] FIGS. **5**A-**5**C illustrate embodiments of a collapsible chair.

[0015] FIG. **6** illustrates an embodiment of telescoping canopy legs.

DETAILED DESCRIPTION

[0016] For the purpose of understanding particular embodiments, reference will be made to the drawings.

[0017] FIGS. **1**A-**1**B illustrate perspective views of embodiments of a canopy structure **100**. A canopy structure **100** that is configured to be placed on a substantially horizontal surface can include a canopy frame comprising a plurality of vertical members that support a top canopy cover. The top canopy cover can comprise a bottom fabric portion **110** and a top mesh portion **120**. The bottom fabric portion **110** can comprise a lower perimeter portion of the top canopy cover. The top mesh portion **120** can comprise a center portion of the top canopy cover. For example, the top mesh portion **120** can comprise a peak of the top canopy cover.

[0018] The bottom fabric portion **110** can comprise solid fabrics, including polyester and ballistic nylon, for example. The top mesh portion **120** can comprise any mesh materials and fabrics. For example, the top mesh portion **120** can comprise a mesh material that is permeable to air but not permeable to water. For example, the mesh can comprise nylon, polyester, and/or other super fine fiber material and include a relatively small pore size and a hydrophobic coating to achieve air permeability and water impermeability. In preferred embodiments, the top mesh portion **120** can comprise about 50% or more of the surface area of the canopy portion. In other embodiments, the top mesh portion **120** can comprise about 80% or more of the surface area of the canopy portion. In alternative embodiments, the top mesh portion **120** can comprise less than 50% of the surface area of the canopy portion.

[0019] Some canopy structures comprise canopy covers that are formed solely from solid fabrics. In such canopy structures, the top of the canopy cover can reach relatively high temperatures. For example, under certain weather conditions, the space near the top of the canopy cover can include

a temperature gradient with a peak temperature of 135° F. By replacing a top portion of the canopy cover with a mesh portion, as illustrated by the canopy embodiments in FIGS. **1**A-**1**B, the peak temperature at the top of the canopy cover can be reduced. For example, in some embodiments, the peak temperature at the top of the canopy cover can be reduced to about 90° F. The top mesh portion **120** advantageously can provide improved air flow.

[0020] In some embodiments, the canopy cover additionally can include a rain fly (not illustrated). The rain fly can comprise a solid fabric portion that covers the top mesh portion **120**. The rain fly can be tied down or otherwise affixed to the canopy structure **100** and/or canopy cover. For example, the rain fly can be connected using D-rings located at the corners of the canopy cover. The rain fly can provide a barrier that prevents rain, snow, and other elements from passing through the top mesh portion **120**. Optionally, the rain fly can be partially or completely removed to expose some or all of the mesh portion **120**.

[0021] FIGS. **2**A-**2**F illustrate views of embodiments of a canopy structure. The canopy structure **200** can include a plurality of vertical support members **205**, a first plurality of horizontal support members **210**, a second plurality of horizontal support members **218**, and a plurality of connectors **220**. The plurality of vertical support members **205** can provide support to the first and second pluralities of horizontal support members **210** and **218**.

[0022] Each of the first plurality of horizontal support members **210** can comprise a first and second end. Similarly, each of the second plurality of horizontal support members **218** can comprise a first and second end. The first end of each of the first plurality of horizontal support members **210** can be configured to be supported by one of the plurality of vertical support members **205**. Similarly, the first end of each of the second plurality of horizontal support members **218** can be configured to be supported by one of the plurality of vertical support members **205**.

[0023] The plurality of connectors **220** can be provided between the first plurality of horizontal support members **210** and the second plurality of horizontal support members **218**. For example, one of the plurality of connectors **220** can be between the second end of each of the first plurality of horizontal support members **210** and the second end of each of the second plurality of horizontal support members **218**. The first and second pluralities of horizontal support members **210** and **218** can comprise a structure that forms a perimeter of the canopy.

[0024] As illustrated in FIGS. **2**A-**2**F, the plurality of connectors **220** can be configured in a first state in which the plurality of connectors **220** join the first plurality of horizontal support members **210** and second plurality of horizontal support members **218** in a substantially smooth level line. In some embodiments, the plurality of connectors **220** can lock the first plurality of horizontal support members **210** and second plurality of horizontal support members **218** into place so as to form a single horizontal support member that can be configured to hang drapes **250**. For example, as illustrated in FIGS. **2**E-**2**F, drapes **250** can hang from the first and second pluralities of horizontal support members **210** and **218**. The connectors **220** can be configured so that an interface between the first plurality of horizontal support members **210**, the connectors **220**, and second plurality of horizontal support members **218** is substantially smooth and level. A smooth and level interface from the first plurality of horizontal support members **210** to the second plurality of horizontal support members **218** across the connectors **220** can allow the drapes **250** to slide smoothly from the first plurality of horizontal support members **210** to the second plurality of horizontal support members **218** across the plurality of connectors **220** without any points of substantially increased resistance at the connectors **220** that could substantially slow or stop the drapes **250** from sliding.

[0025] The plurality of connectors **220** can also be configured in a second state for transportation and storage. In the second state, the plurality of connectors **220** is configured to allow the first plurality of horizontal support members **210** and the second plurality of horizontal support members **218** to rotate with respect to each other. For example, when the plurality of connectors **220** is in the second state, the first plurality of horizontal support members **210** and the second plurality of support members **218** can be folded to be approximately parallel and adjacent to each other. Accordingly, when the plurality of connectors **220** is in the second state, the canopy structure **200** can be collapsed for transportation and storage.

[0026] FIG. **2**D illustrates one of the plurality of connectors **220** configured in the first state. The connector **220** comprises a left member **222**, a right member **224**, and connecting screws **226** and **228**. The left member **222** can be rotatable about screw **226**, and the right member **224** can be rotatable about screw **228**. When the left member **222** is rotated about screw **226**, and the right member **224** is rotated about screw **228**, the connector **220** can transition to a second state in which the first horizontal support member **210** is movable and/or rotatable with respect to the second horizontal support member **218**. Although screws are used in the illustrated embodiments, other suitable rotational supports could also be used, such as rivets, axles, shafts or any other rotational support member disclosed herein, for example.

[0027] The canopy structure **200** can comprise several roof support members that support the canopy. As illustrated in FIGS. **2**B and **2**C, the canopy structure **200** can comprise a first roof support member **230**, a second roof support member **232**, a third roof support member **236**, and a fourth roof support member **238**. Pivot **231** can be provided to connect the first roof support member **230** and the second roof support member **232**. Pivot **231** can allow the first roof support member **230** to be rotatable with respect to the second roof support member **232** to facilitate transition between an extended position and a collapsed position. Pivot **237** can be provided to connect the third roof support member **236** and the fourth roof support member **238**. Pivot **237** can allow the third roof support member **236** to be rotatable with respect to the fourth roof support member **238** to facilitate transition between an extended position and a collapsed position. Pivots **234** can be provided to connect the first roof support member **230** and the fourth roof support member **238** and to connect the second roof support member **232** and the third roof support member **236**.

[0028] As shown in FIGS. **2**B and **2**C, in an extended position, the first roof support member **230** and second roof support member **232** can form a crisscross pattern similar to the shape of an "X." Similarly, the third roof support member **236** and fourth roof support member **238** can form a crisscross pattern similar to the shape of an "X." Accordingly, the first roof support member **230** and second roof support member **232** can be referred to as "X-members."

[0029] The pivots used to connect X-members can comprise PTFE and/or Teflon bearings or bearings comprising other materials. For example, pivots **231** and **237** can comprise PTFE and/or Teflon bearings or bearings comprising other materials. By comprising PTFE and/or Teflon, the bearings can be tightened down while still allowing the X-members to slide with respect to each other. For example, if pivot **231** is comprised of a PTFE and/or Teflon bearing, the PTFE and/or Teflon bearing can be tightened down to securely connect the first roof member **230** and second roof member **232** while allowing the first roof member **230** and second roof member **232** to sufficiently slide with respect to each other so as to be rotatable. In other embodiments, pivots **231** and **237** can comprise non-PTFE or Teflon bearings.

[0030] In preferred embodiments, the canopy structure **200** can have four sides. Alternatively, the canopy structure **200** can have any other number of sides, including five sides to form a pentagon and eight sides to form an octagon. In addition, the canopy structure **200** can be configured as a gazebo.

[0031] FIGS. **3**A-**3**F illustrate views of embodiments of a canopy structure **300** that comprise a side vertical support bar. The canopy structure **300** comprises a plurality of vertical support members, support members **310** and **320**, pivots **312** and **332**, side vertical support bar **330**, and slider **322**. Sets of support members **310** and **320** can be connected at pivot **312** to form an X-member support. The support members **310** and **320** can be movable about the pivot **312** to facilitate transition between a folded position and an unfolded position. One end of support member **310** can be connected to the base of the vertical support bar **330** at the pivot **332**. One end of support member **320** can be connected to the vertical support bar **330** through a slider **322**. The slider **322** can be attached to the vertical support bar **330** and can comprise a hollow portion to facilitate movement of the slider **322** along the vertical support bar **330**.

[0032] In some embodiments, the side vertical support bar can be located in a center of sides of the canopy structure. In some embodiments, additional side vertical support bars can be supported by the plurality of horizontal X-member supports.

[0033] FIG. **3**A illustrates an embodiment of a canopy structure **300** that comprises a vertical support bar in an open, unfolded position. A peak in the side of the canopy structure can be provided. The peak can increase the slope of the canopy surface so as to facilitate runoff of rain and other condensation.

[0034] FIG. **3**B illustrates an embodiment of a canopy structure **300** that comprises a vertical support bar **330** in a partially folded position.

[0035] FIG. **3**C illustrates an embodiment of a canopy structure **300** that comprises a vertical support bar **330** in an open, unfolded position. Both support bars **310** connect at pivot **332** to the base of the vertical support bar **330**. Both support bars **310** provide vertical support to the vertical support bar **330**. The top end of the vertical support bar **330** can be connected to the socket **334**. The socket **334** can be sewn into the canopy top. The top end of the vertical support bar **330** can be permanently attached at the socket **334**. Alternatively, the top of the vertical support bar **330** can be removable from the socket **334**. When the X-members are in an unfolded opened position that provides support to the vertical support member **330**, the vertical support member **330** pushes upwards on the canopy surface to raise its height. For example, the vertical support member **330** can facilitate raising the slope of the canopy surface to facilitate runoff of rain and other condensation.

[0036] In some embodiments, one vertical support bar is provided for each side of the canopy structure and can be located approximately half way between vertical frame members. In other embodiments, two or more vertical support bars can be provided for each side of the canopy structure.

[0037] FIGS. **4**A-**4**J illustrate views of embodiments of a canopy structure that comprises canopy vents. The canopy structure **400** can include a base canopy portion **410**, a first canopy vent **420**, and a second canopy vent **430**. For example, the second canopy vent **430** can correspond to a center cover portion, the first canopy vent **420** can correspond to a first perimeter cover portion, and the base canopy portion **410** can correspond to a second perimeter cover portion.

[0038] The base canopy portion **410**, the first canopy vent **420**, and the second canopy vent **430** can be supported by a plurality of canopy frame members. For example, canopy frame members **440** and **450**, as well as two other canopy frame members, support the base canopy portion **410**, the first canopy vent **420**, and the second canopy vent **430**. Canopy frame members **440** and **450** each can comprise a first end portion and a second end portion. The first end portions of each of the canopy frame members **440** and **450** can be joined proximate to a peak of the canopy frame.

[0039] The canopy vents can be configured to be alterable between a first, closed position and a second, open position. In the closed position, the bottom surface of the canopy vents can be adjacent to the top surface of the nearest canopy portion below, whether another canopy vent or the base canopy portion. In the closed position, the canopy vents can block passage of wind similar to the performance of a unitary canopy top. In the closed position, the canopy vents can provide a reduced ventilation air flow.

[0040] In an open position, the canopy vents can be flipped up to provide ventilation to the canopy structure. For example, the canopy vents can comprise an edge configured to face in a substantially horizontal direction when the canopy vents are in an open position. In the open position, warm air underneath the canopy surfaces can rise relative to cooler surrounding air. When the canopy vents are in a closed position, the warm air remains underneath the canopy surfaces. When the canopy vents are in an open position, the warm air can escape out of the canopy structure. In the open position, the canopy vents can provide an increased ventilation air flow relative to the closed position.

[0041] FIG. **4**A illustrates an embodiment of the canopy structure **400** showing the first canopy vent **420** and second canopy vent **430** in an open position. Support member **442** connects the canopy frame member **440** with a corner of the first canopy vent **420**. Support member **442** is rotatable with respect to the canopy frame member **440**. When the first canopy vent **420** is in an open position, support member **442** props up a corner of the first canopy vent **420**. An end of the support member **442** may be sewn into a pocket in the corner of the first canopy vent **420**. In some embodiments, the tautness of the material comprising the first canopy vent **420** when the support member **442** props up a corner of the first canopy vent **420** helps to maintain the first canopy vent **420** in an open position. In other embodiments, a spring-loaded plastic cap may be used to prop up a corner of the first canopy vent **420** in an open position. Just as the support member **442** connects to the canopy frame member **440** to prop up one

corner of the first canopy vent **420** in an open position, other support members connect to the other canopy frame members to prop up the other corners of the first canopy vent **420** when in an open position. For example, support member **452** connects the canopy frame member **450** with another corner of the first canopy vent **420**. When the first canopy vent **420** is in an open position, support member **452** props up the other corner of the first canopy vent **420**. Raising each corner of the first canopy vent **420** can facilitate in creating the tautness in the material of the first canopy vent **420** that helps to maintain the first canopy vent **420** in an open position. Similarly, support members can connect to the plurality of canopy frame members to prop up the second canopy vent **430** in an open position.

[0042] In some embodiments, the canopy vents can be configured to be held open in other positions. For example, the canopy vents can be configured to be held open in a downward sloping position that prevents the canopy vents from holding water and reduces rain water from being carried into the canopy interior by wind. The downward-sloping position can provide a ventilation air flow between the closed position and the open position.

[0043] In some embodiments, the canopy vents can be opened and closed when the canopy structure is in a collapsed or partially-collapsed state. For example, one side of the canopy, comprising two supporting legs, can be lowered, and a user can open and close a canopy vent by hand. In other embodiments, the canopy structure can comprise a system of cables, levers, push-rods, or other mechanical means to allow a user to adjust the canopy vents between an opened and closed state when the canopy vents are out of reach when the canopy structure is fully assembled. For example, a push-rod can be used to push the canopy vents from a closed to an open state. In addition, the push rod can include a hook at one end that interfaces with a loop in the canopy vent to allow the user to pull the canopy vents from an open state to a closed state.

[0044] FIG. **4**B illustrates an embodiment of the canopy structure **400** showing the first canopy vent **420** in a closed position and the second canopy vent **430** in an open position.

[0045] FIG. **4**C illustrates an embodiment of the canopy structure **400** in which the first canopy vent **420** is in an open position.

[0046] FIG. **4**D illustrates an embodiment of the canopy structure **400** in which the first canopy vent **420** is in a closed position.

[0047] FIG. **4**E illustrates an embodiment of the canopy structure **400** showing the first canopy vent **420** and second canopy vent **430** in a closed position.

[0048] FIG. **4**F illustrates an embodiment of the canopy structure **400** showing a canopy vent in a partially collapsed state.

[0049] FIG. **4**G illustrates an embodiment of a canopy structure **400** comprising vents in a partially collapsed state.

[0050] FIGS. **4**H-**4**J illustrate embodiments of a canopy structure **400** comprising vents in a collapsed state.

[0051] In some embodiments, the canopy vents can be pre-attached to the frame members. In other embodiments, a user can attach the canopy vents to the frame members when setting up the canopy.

[0052] In some embodiments the canopy vents can be permanently attached to the canopy frame members. In other embodiments, the canopy vents can be removable with respect to the canopy frame members.

[0053] Although the Figures illustrate embodiments that include a first canopy vent and a second canopy vent, any number of canopy vents may be provided. For example, in some embodiments the canopy structure can comprise a base canopy portion and one canopy vent. Alternatively, the canopy structure can comprise a base canopy portion and three or more canopy vents.

[0054] Canopy vents, as described with respect to FIGS. **4**A-**4**J, and mesh fabric portions, as described with respect to FIGS. **1**A-**1**B, each can be used to facilitate air ventilation in a canopy structure. In other embodiments, canopy vents can additionally comprise mesh fabric portions for improved air ventilation.

[0055] FIG. **5**C illustrates a collapsible chair. FIGS. **5**A-**5**B illustrate a close-up view of a leg of a collapsible chair. A collapsible chair **500** can comprise a leg **510** and a fabric stop **520**. A screw **530** can help to attach the fabric stop **520** to the leg **510**. A fabric can be used to form a seat of the collapsible chair **500**. When the chair fabric is loaded with weight to support, the fabric stop **520** provides a supporting force to the chair fabric. To minimize stress on the fabric that can result in a fabric chair, the fabric stop **520** can comprise a chamfered edge **522**. The chamfered edge **522** can be rounded and sloped to distribute the supporting force more evenly so as not to tear the chair fabric.

[0056] FIG. **6** illustrates an embodiment of telescoping canopy legs. FIG. **6** illustrates the telescoping canopy legs in various views from a telescoped state to a fully extended state. For reference purposes, description of the telescoping canopy legs will be made with reference to the numerals that show the telescoping canopy legs in an extended state. The telescoping canopy legs can comprise a base telescoping leg portion **610**, a middle telescoping leg portion **620**, and a top telescoping leg portion **630**. The base telescoping leg portion **610**, middle telescoping leg portion **620**, and top telescoping leg portion **630** can comprise different cross-sectional areas and hollow interiors. For example, the top telescoping leg portion **630** can comprise a larger cross sectional area than the middle telescoping leg portion, and the middle telescoping leg portion **620** can comprise a larger cross sectional area than the base telescoping leg portion **610**. The different cross sectional areas and hollow interiors of the telescoping leg portions allow the telescoping leg portions to telescope with respect to each other. For example, the top telescoping leg portion **630** can slide down the exterior of the middle telescoping leg portion **620**. Similarly, both the top telescoping leg portion **630** and the middle telescoping leg portion **620** can slide down the base telescoping leg portion **610**.

[0057] The pins **640** and **650** can support the telescoping leg portions in an extended position. For example, the pin **640** can support the middle telescoping leg portion **620** on the base telescoping leg portion **610**. The pin **640** can be attached near the top of the base telescoping portion **610**. The middle telescoping leg portion **620** can include a hole near its bottom end that is configured to receive the pin **640**. When the bottom end of the middle telescoping leg portion **620** is slid over the location of pin **640**, the pin **640** can spring into the hole near the bottom end of the middle telescoping portion **620**, fixing its position and providing vertical support. Alternatively, a user can press the pin **640** in to allow the middle telescoping portion **620** to slide past the base telescoping portion **610**.

[0058] Similarly, the pin **650** can support the top telescoping leg portion **630** on the middle telescoping leg portion **620**. The pin **650** can be attached near the top of the middle tele-

scoping portion **620**. The top telescoping leg portion **630** can include a hole near its bottom end that is configured to receive the pin **650**. When the bottom end of the top telescoping leg portion **630** is slid over the location of the pin **650**, the pin **650** can sprint into the hole near the bottom end of the top telescoping portion **630**, fixing its position and providing vertical support. Alternatively, a user can press the pin **650** in to allow the top telescoping portion **630** to slide past the middle telescoping portion **620**.

[0059] If the pins **640** and **650** were the same size, it may be possible for the hole near the bottom of the top telescoping leg portion **630** to become attached to the pin **640** near the top of the base telescoping leg portion **610**. Advantageously, the pin **640** may be a larger size than the pin **650**. The smaller size of the pin **650** would not permit the hole near the bottom of the top telescoping leg portion **630** be able to inadvertently attach to the pin **640** near the top of the base telescoping portion **610**. So, varying the sizes of the pins **640** and **650**, and, in particular, making the size of pin **640** larger than the size of pin **650**, can prevent the wrong telescoping leg portion from inadvertently being attached to the wrong pin.

[0060] The features and attributes of the specific embodiments disclosed above may be combined in different ways to form additional embodiments, all of which fall within the scope of the present disclosure. Although this invention has been described in terms of certain preferred embodiments, other embodiments that are apparent to those of ordinary skill in the art, including embodiments which do not provide all of the benefits and features set forth herein, are also within the scope of this invention. Accordingly, the scope of the present invention is defined only by reference to the appended claims.

What is claimed is:

1. A collapsible canopy structure comprising:

a plurality of vertical support members;

a top portion comprising a first plurality of support members and a second plurality of support members, the first plurality and second plurality of support members configured to facilitate transition of the top portion between an extended position and a collapsed position; and

a low-friction bearing coupled to a first support member of the first plurality of support members and a second support member of the second plurality of support members so that the first support member and the second support member are rotatable relative to one another.

2. The collapsible canopy structure of claim **1**, wherein the low-friction bearing is configured to allow the first support member and the second support member to be rotatable relative to one another even when the low-friction bearing is tightened.

3. The collapsible canopy structure of claim **2**, wherein the low-friction bearing comprises PTFE.

4. The collapsible canopy structure of claim **1**, further comprising:

a first plurality of horizontal support members, a first horizontal support member of the first plurality of horizontal support members comprising a first and second end, the first end of the first horizontal support member coupled to a first vertical support member of the plurality of vertical support members;

a second plurality of horizontal support members, a second horizontal support member of the second plurality of horizontal support members comprising a first and second end, the first end of the second horizontal support member coupled to a second vertical support member of the plurality of vertical support members; and

a connector coupled to the second end of the first horizontal support member and the second end of the second horizontal support member.

5. The collapsible canopy structure of claim **4**, wherein the low-friction bearing comprises PTFE.

6. The collapsible canopy structure of claim **4**, wherein the connector is configured in a first state to couple the first horizontal support member to the second horizontal support member in a substantially level line.

7. The collapsible canopy structure of claim **4**, wherein the connector is configured in a second state to allow the first horizontal support member to move relative to the second horizontal support member.

8. The collapsible canopy structure of claim **6**, further comprising drapes hung from the first and second horizontal support members.

9. The collapsible canopy structure of claim **8**, wherein the connector is further configured to allow the drapes to slide substantially smoothly without snagging from the first horizontal support member to the second horizontal support member when the connector is in the first state.

10. The collapsible canopy structure of claim **9**, wherein the low-friction bearing comprises PTFE.

11. A collapsible canopy structure comprising:

a plurality of vertical support members;

a top portion comprising first, second, third, and fourth support members, each of the first, second, third, and fourth support members comprising first and second ends, the first end of the first support member coupled to a first vertical support member of the plurality of vertical support members, the first end of the second support member coupled to the first vertical support member, each of the first, second, third, and fourth support members configured to facilitate transition of the top portion between an extended position and a collapsed position;

a first low-friction bearing coupled to the first support member and the second support member so that the first and second support members are rotatable relative to one another;

a second low-friction bearing coupled to the third support member and the fourth support member so that the third and fourth support members are rotatable relative to one another;

a third low-friction bearing coupled to the second end of the first support member and the first end of the third support member;

a fourth low-friction bearing coupled to the second end of the second support member and the first end of the fourth support member.

12. The collapsible canopy structure of claim **11**, wherein the first low-friction bearing is configured to allow the first support member and the second support member to be rotatable relative to one another even when the first low-friction bearing is tightened, and second low-friction bearing is configured to allow the third support member and the fourth support member to be rotatable relative to one another even when the second low-friction bearing is tightened.

13. The collapsible canopy structure of claim **12**, wherein the first, second, third, and fourth low-friction bearing each comprise PTFE.

14. The collapsible canopy structure of claim **11**, further comprising:

a first plurality of horizontal support members, a first horizontal support member of the first plurality of horizontal support members comprising a first and second end, the first end of the first horizontal support member coupled to the first vertical support member;

a second plurality of horizontal support members, a second horizontal support member of the second plurality of horizontal support members comprising a first and second end, the first end of the second horizontal support member coupled to a second vertical support member of the plurality of vertical support members; and

a connector coupled to the second end of the first horizontal support member and the second end of the second horizontal support member.

15. The collapsible canopy structure of claim **14**, wherein the first, second, third, and fourth low-friction bearing each comprise PTFE.

16. The collapsible canopy structure of claim **14**, wherein the connector is configured in a first state to couple the first horizontal support member to the second horizontal support member in a substantially level line.

17. The collapsible canopy structure of claim **14**, wherein the connector is configured in a second state to allow the first horizontal support member to move relative to the second horizontal support member.

18. The collapsible canopy structure of claim **16**, further comprising drapes hung from the first and second horizontal support members.

19. The collapsible canopy structure of claim **18**, wherein the connector is further configured to allow the drapes to slide substantially smoothly without snagging from the first horizontal support member to the second horizontal support member when the connector is in the first state.

20. The collapsible canopy structure of claim **19**, wherein the first, second, third, and fourth low-friction bearing each comprise PTFE.

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