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Laundre

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(45) **Date of Patent: Aug. 19, 2025**

(54) **FLEXIBLE TOILET SEAT**

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(22) Filed: **Mar. 1, 2023**

(65) **Prior Publication Data**

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Related U.S. Application Data

(60) Provisional application No. 63/319,534, filed on Mar. 14, 2022.

(51) **Int. Cl.**
A47K 13/24 (2006.01)

(52) **U.S. Cl.**
CPC ***A47K 13/24*** (2013.01)

(58) **Field of Classification Search**
CPC A47K 13/24; A47K 13/02
See application file for complete search history.

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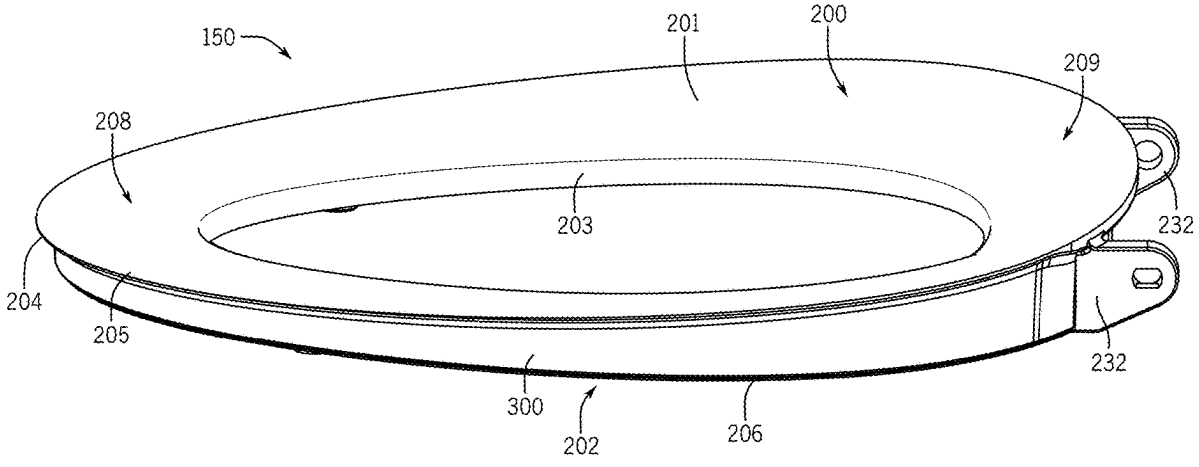
(57) **ABSTRACT**

A toilet seat includes a seat including a top surface, a bottom surface opposite the top surface, an inner edge where the top surface and the bottom surface meet, an outer surface connecting an outer perimeter of the top surface and an outer perimeter of the bottom surface, and a cavity in the outer surface extending toward the inner edge. The toilet seat further includes a cushion disposed in the cavity. The top surface and the cushion may be configured to deform elastically and vertically in response to a load applied to the top surface.

16 Claims, 33 Drawing Sheets



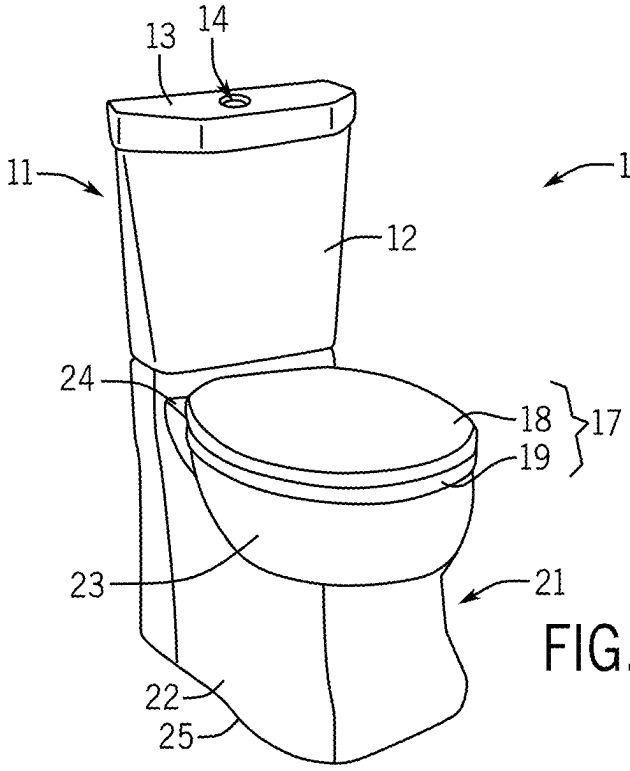


FIG. 1

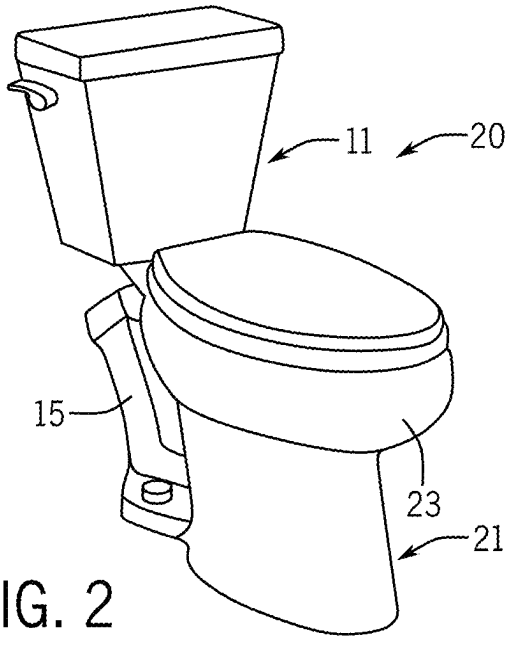


FIG. 2

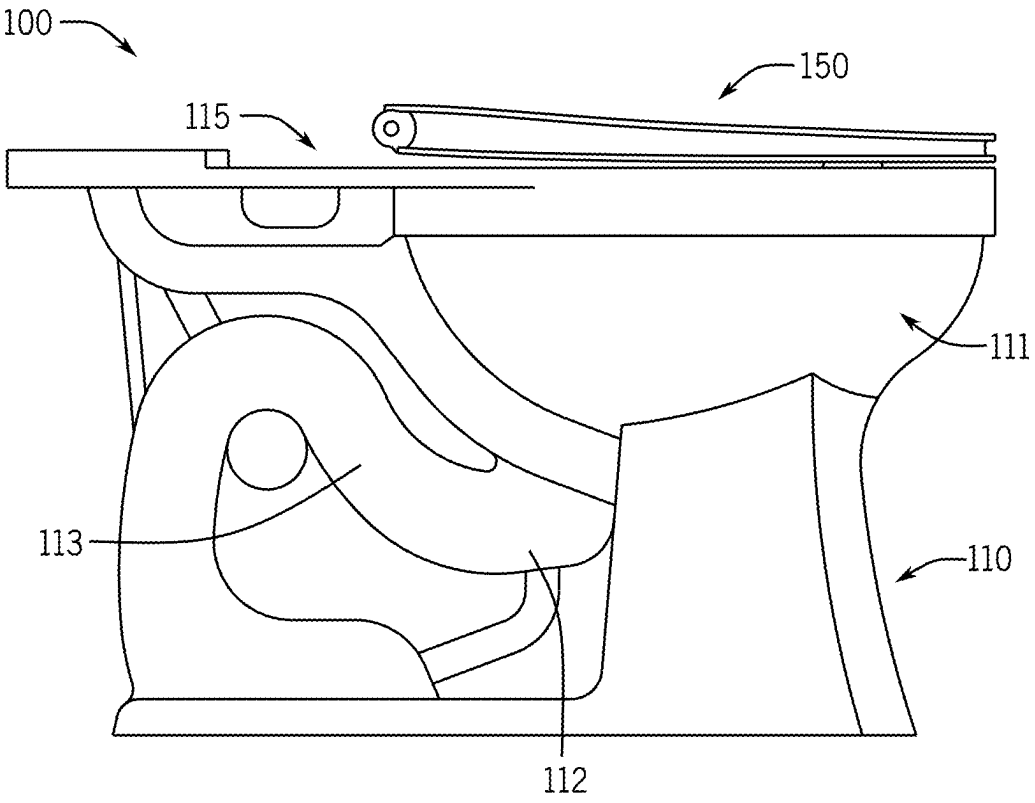


FIG. 3

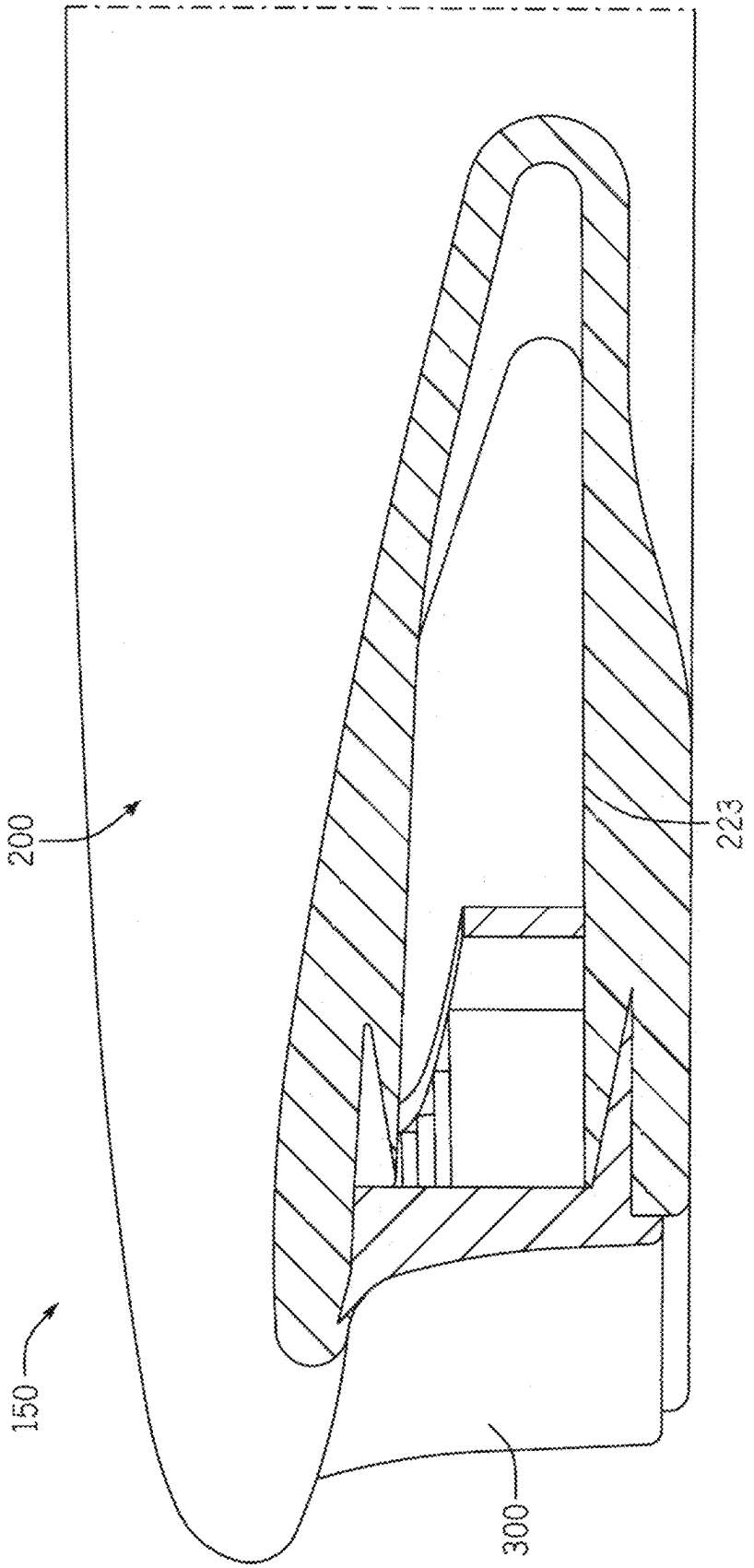


FIG. 4

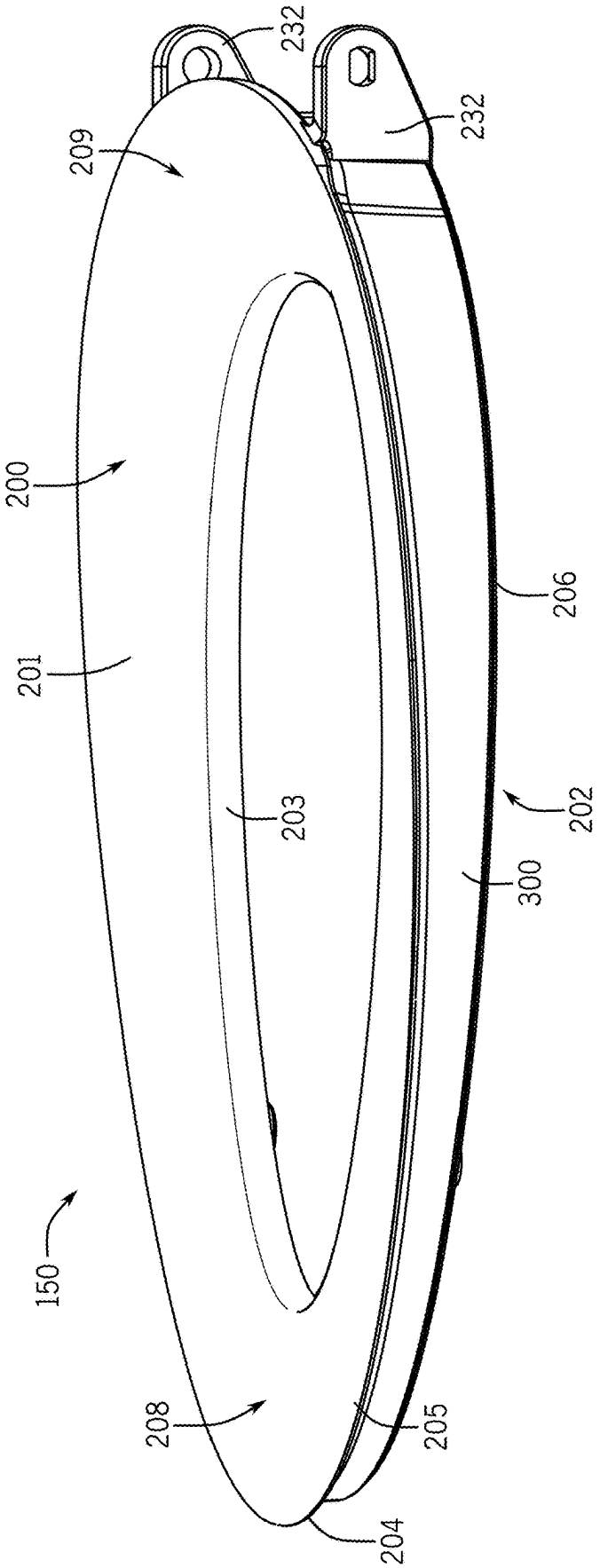


FIG. 5

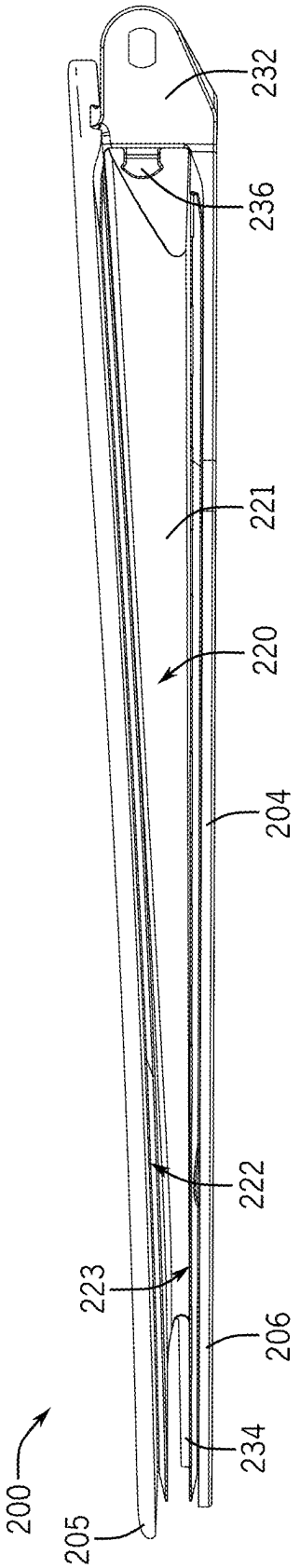


FIG. 6

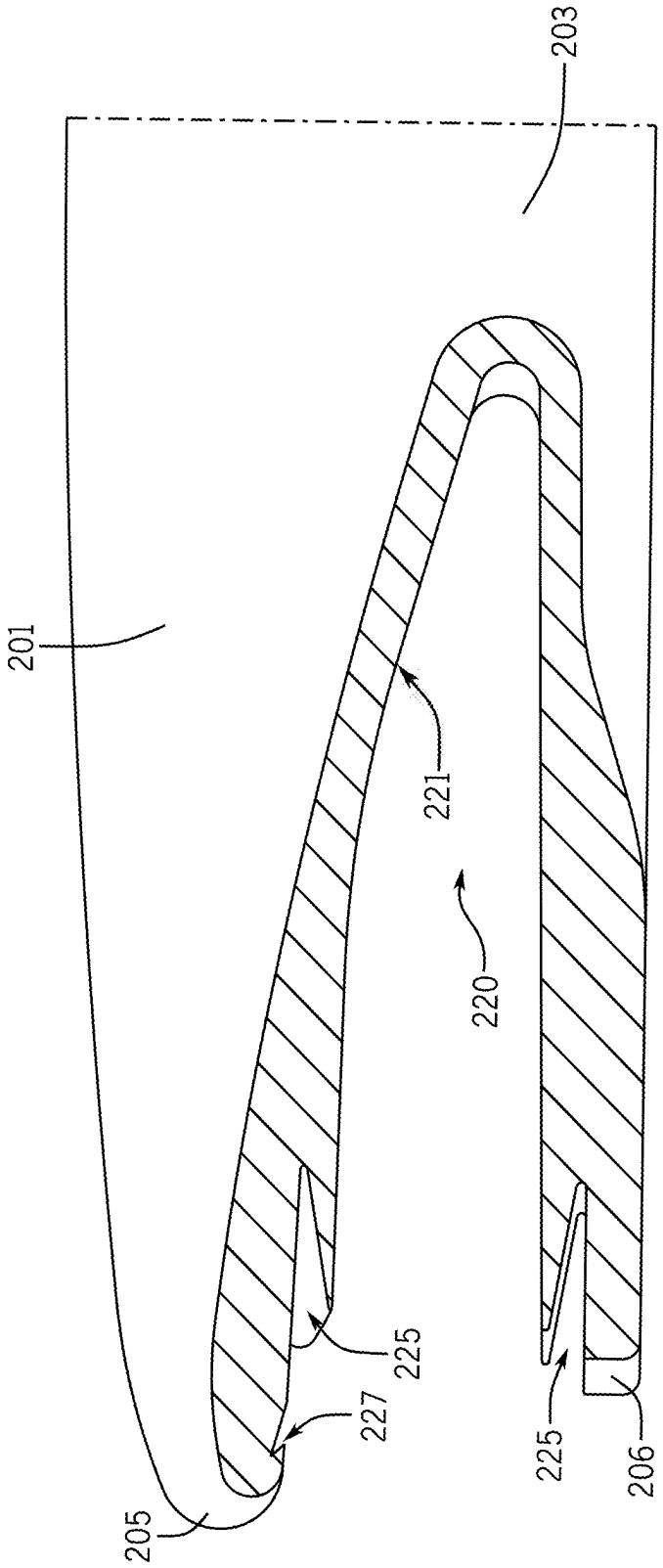


FIG. 7

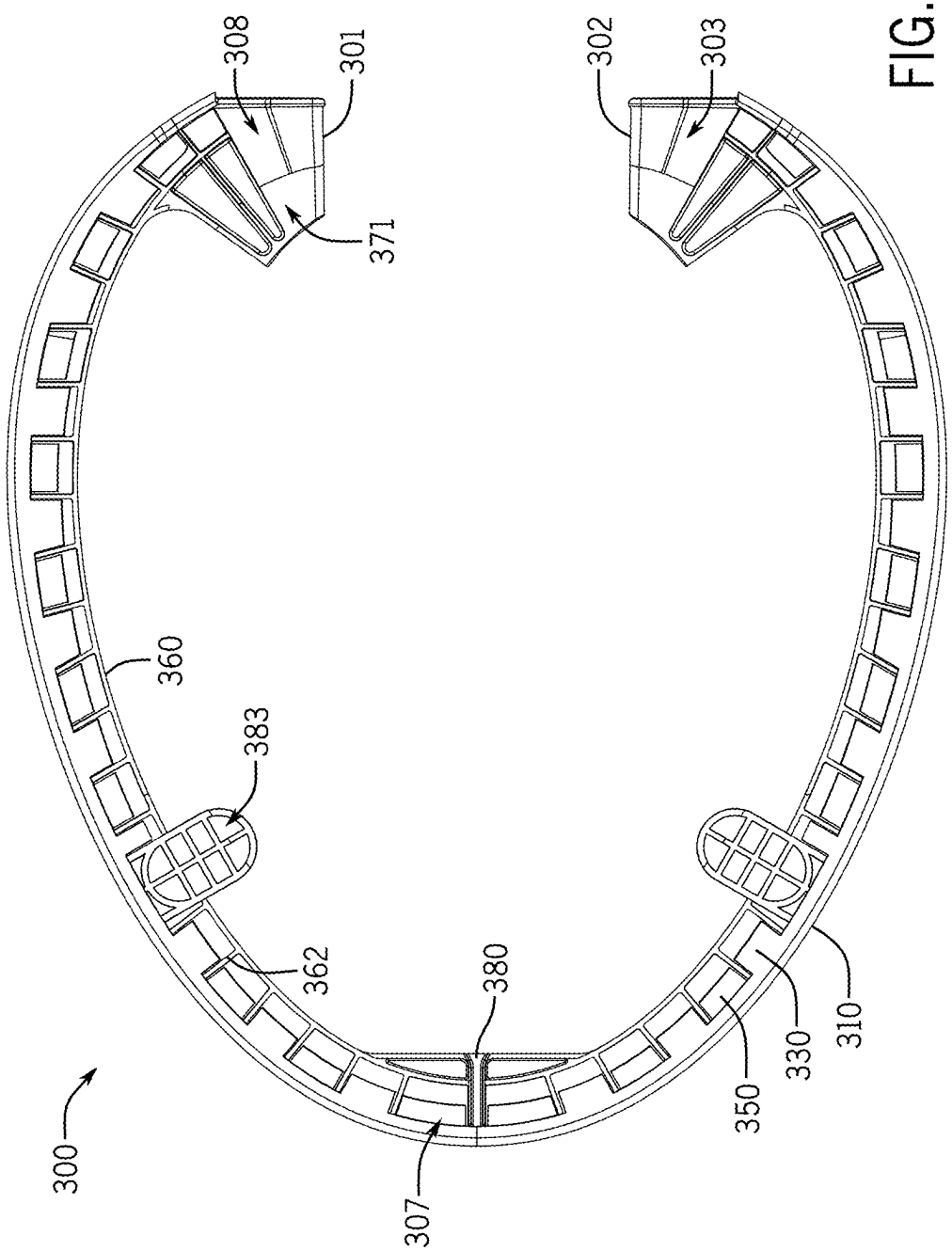


FIG. 8

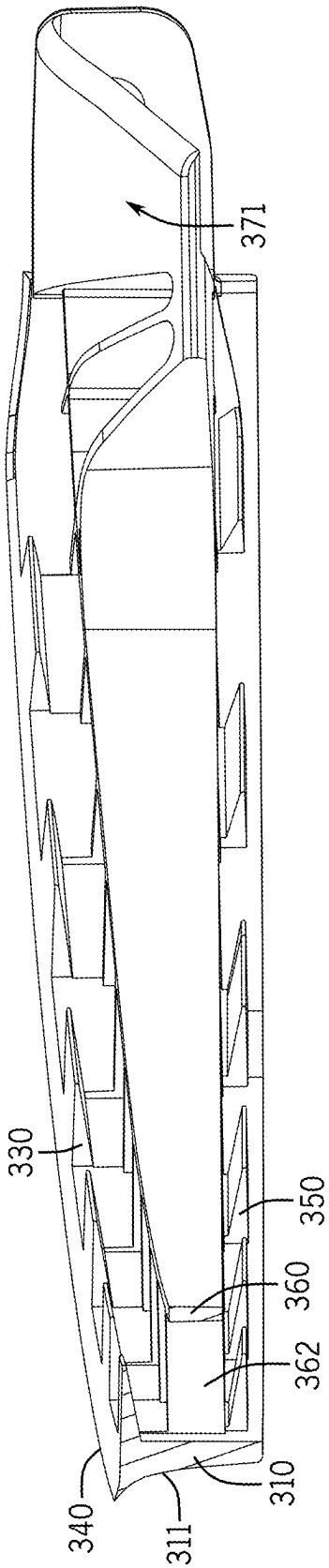


FIG. 9

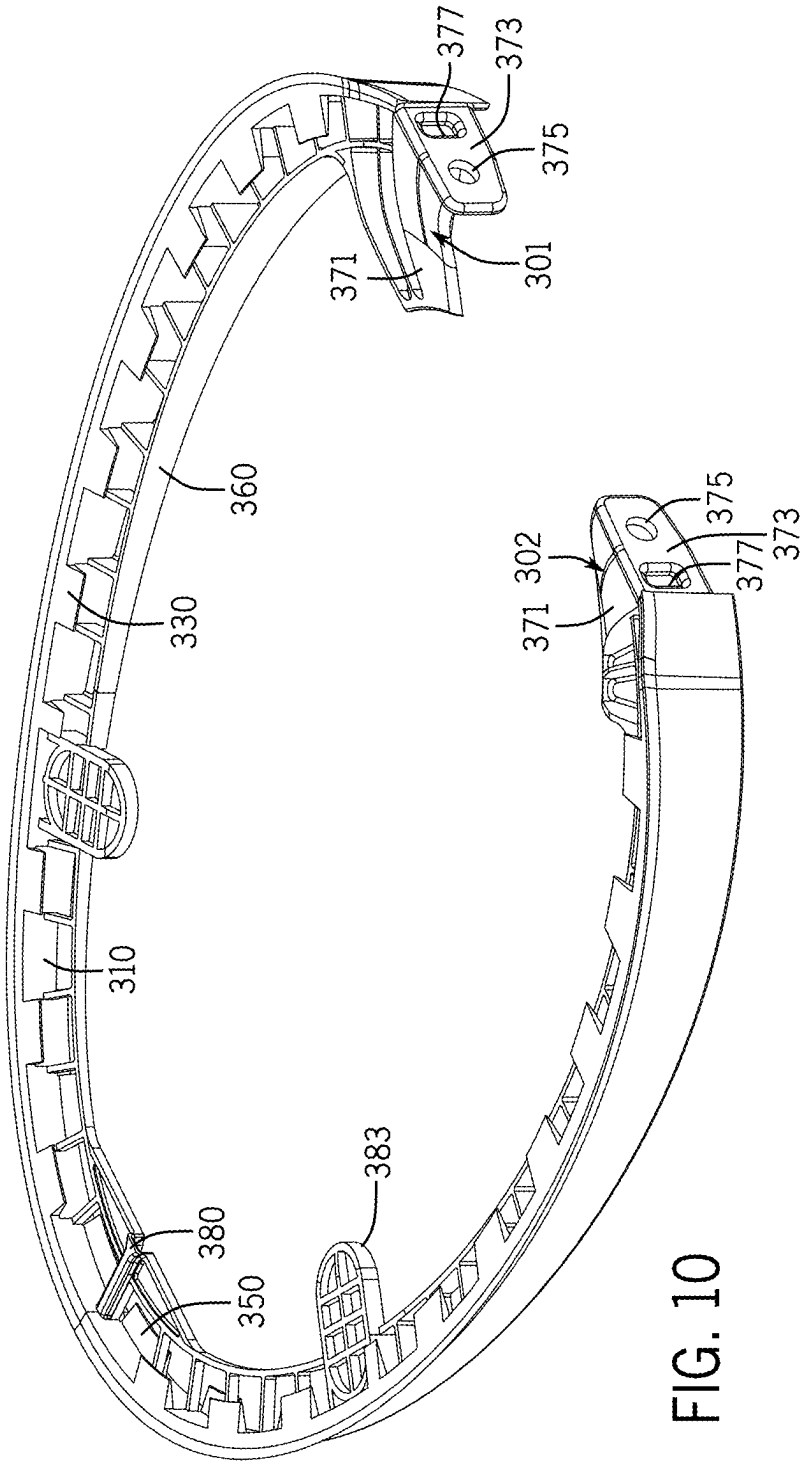
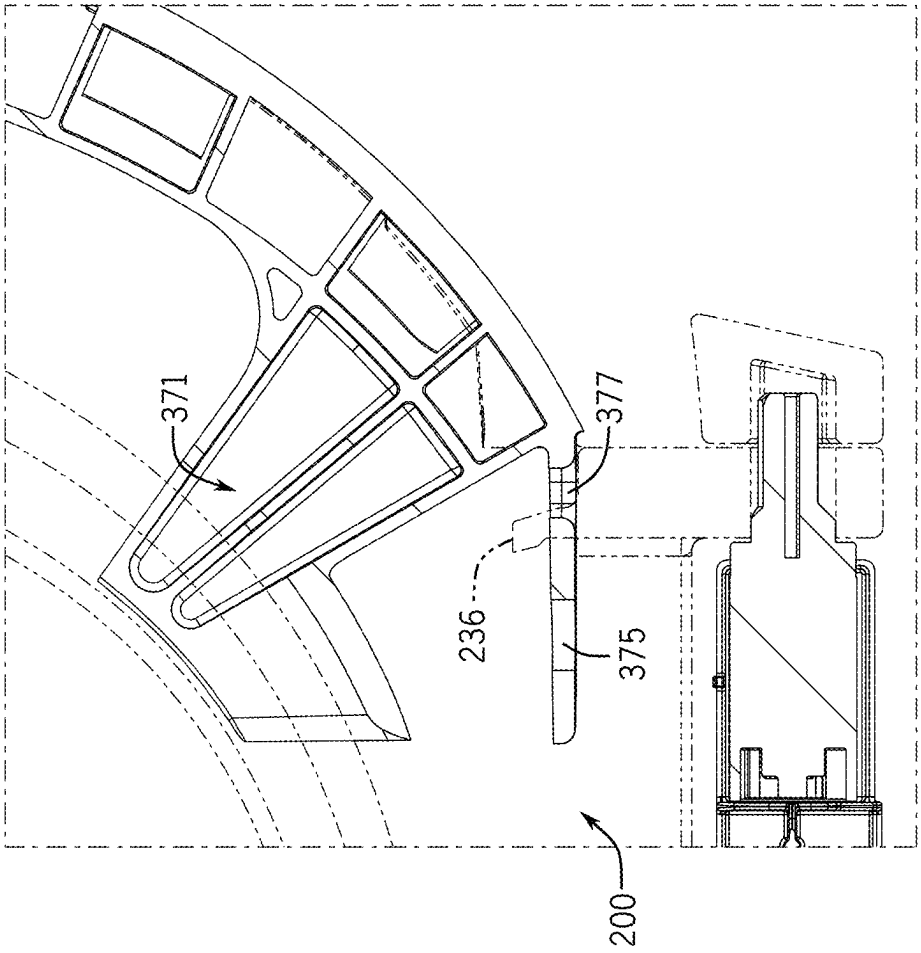


FIG. 10

FIG. 11



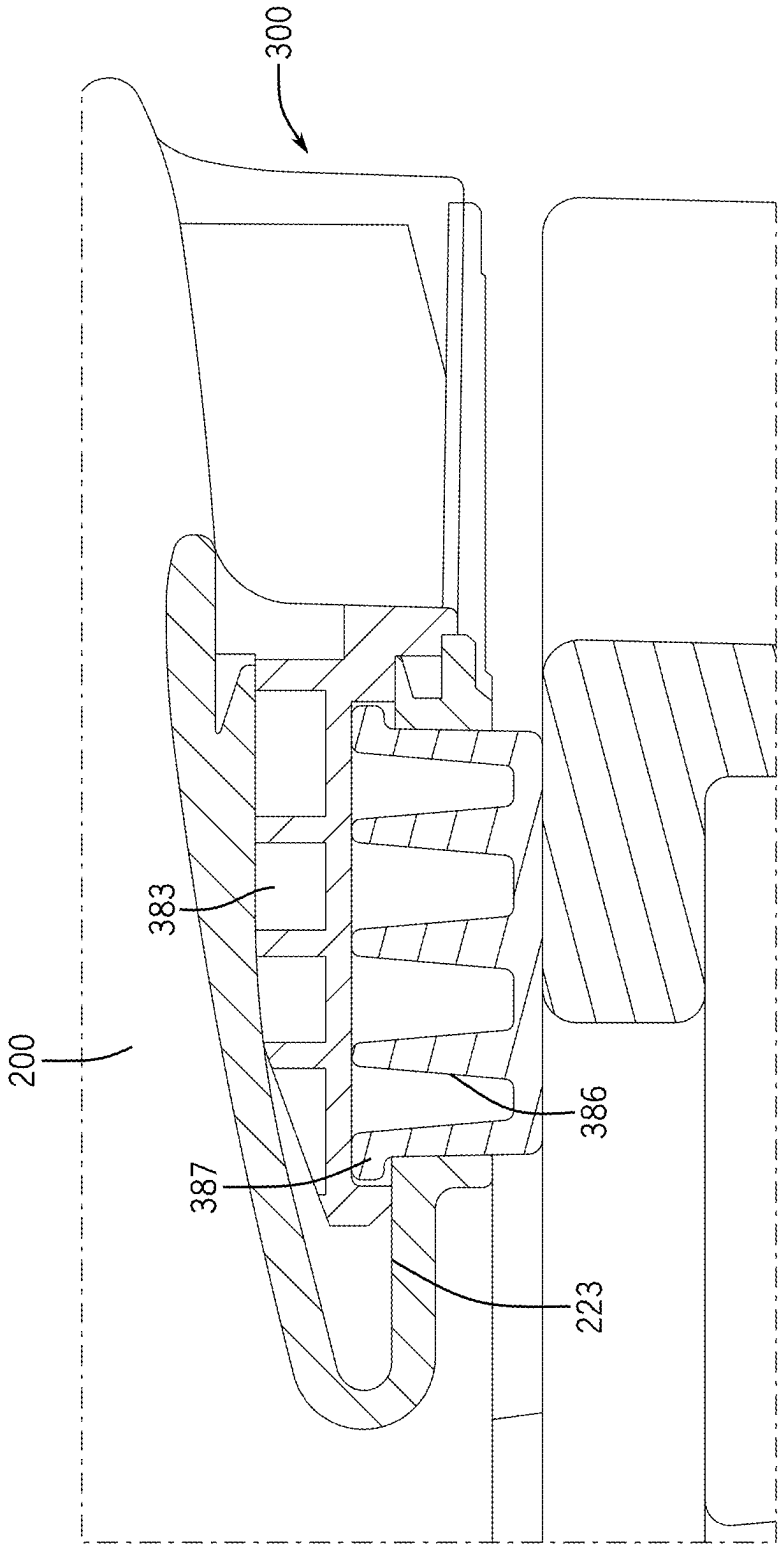


FIG. 12

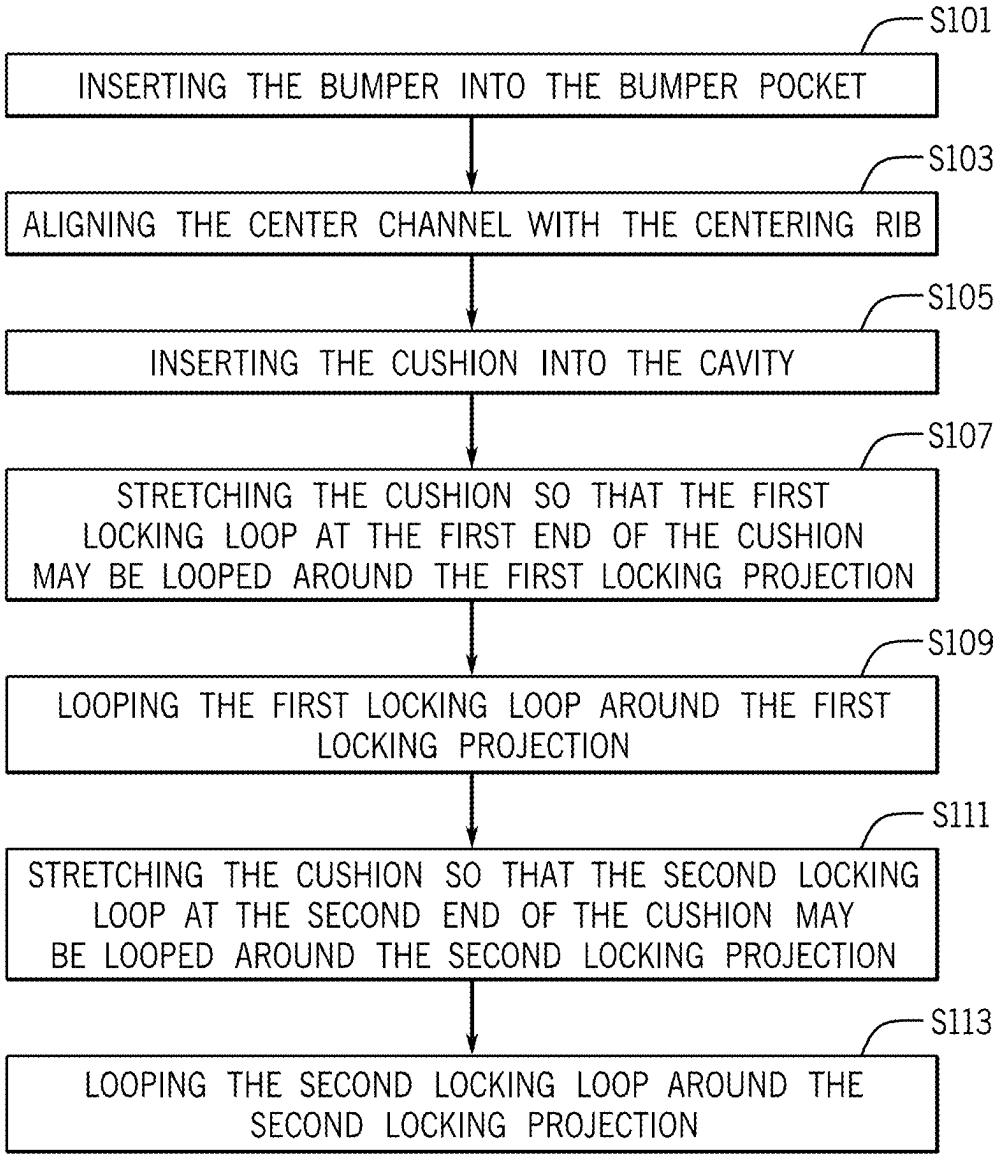

S101
INSERTING THE BUMPER INTO THE BUMPER POCKET
S103
ALIGNING THE CENTER CHANNEL WITH THE CENTERING RIB
S105
INSERTING THE CUSHION INTO THE CAVITY
S107
STRETCHING THE CUSHION SO THAT THE FIRST LOCKING LOOP AT THE FIRST END OF THE CUSHION MAY BE LOOPED AROUND THE FIRST LOCKING PROJECTION
S109
LOOPING THE FIRST LOCKING LOOP AROUND THE FIRST LOCKING PROJECTION
S111
STRETCHING THE CUSHION SO THAT THE SECOND LOCKING LOOP AT THE SECOND END OF THE CUSHION MAY BE LOOPED AROUND THE SECOND LOCKING PROJECTION
S113
LOOPING THE SECOND LOCKING LOOP AROUND THE SECOND LOCKING PROJECTION

FIG. 13

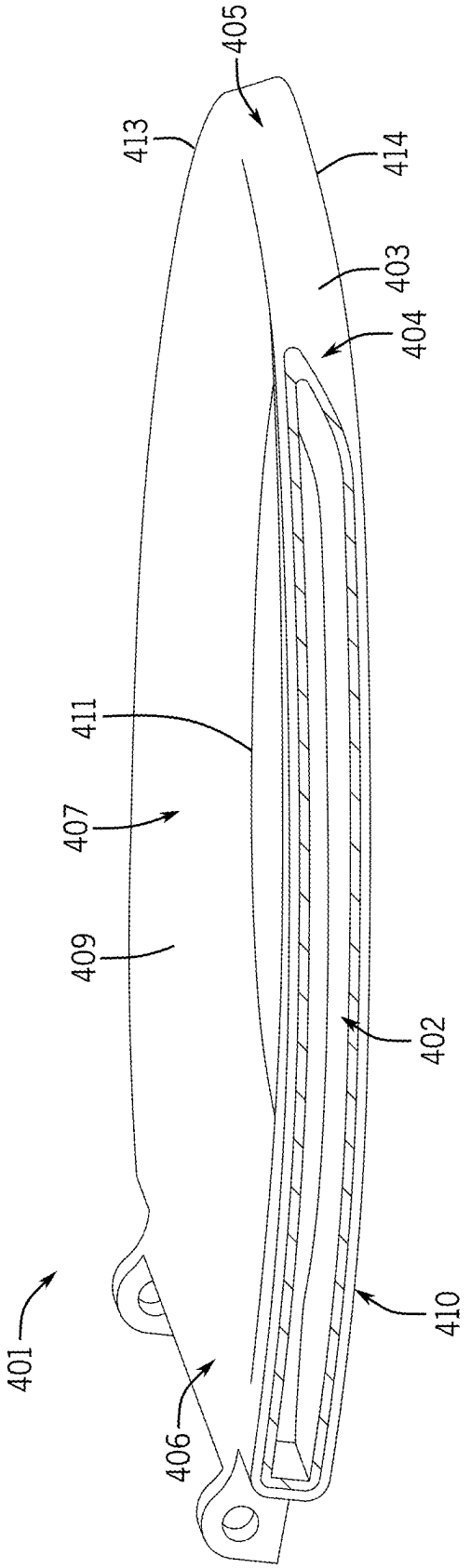


FIG. 14

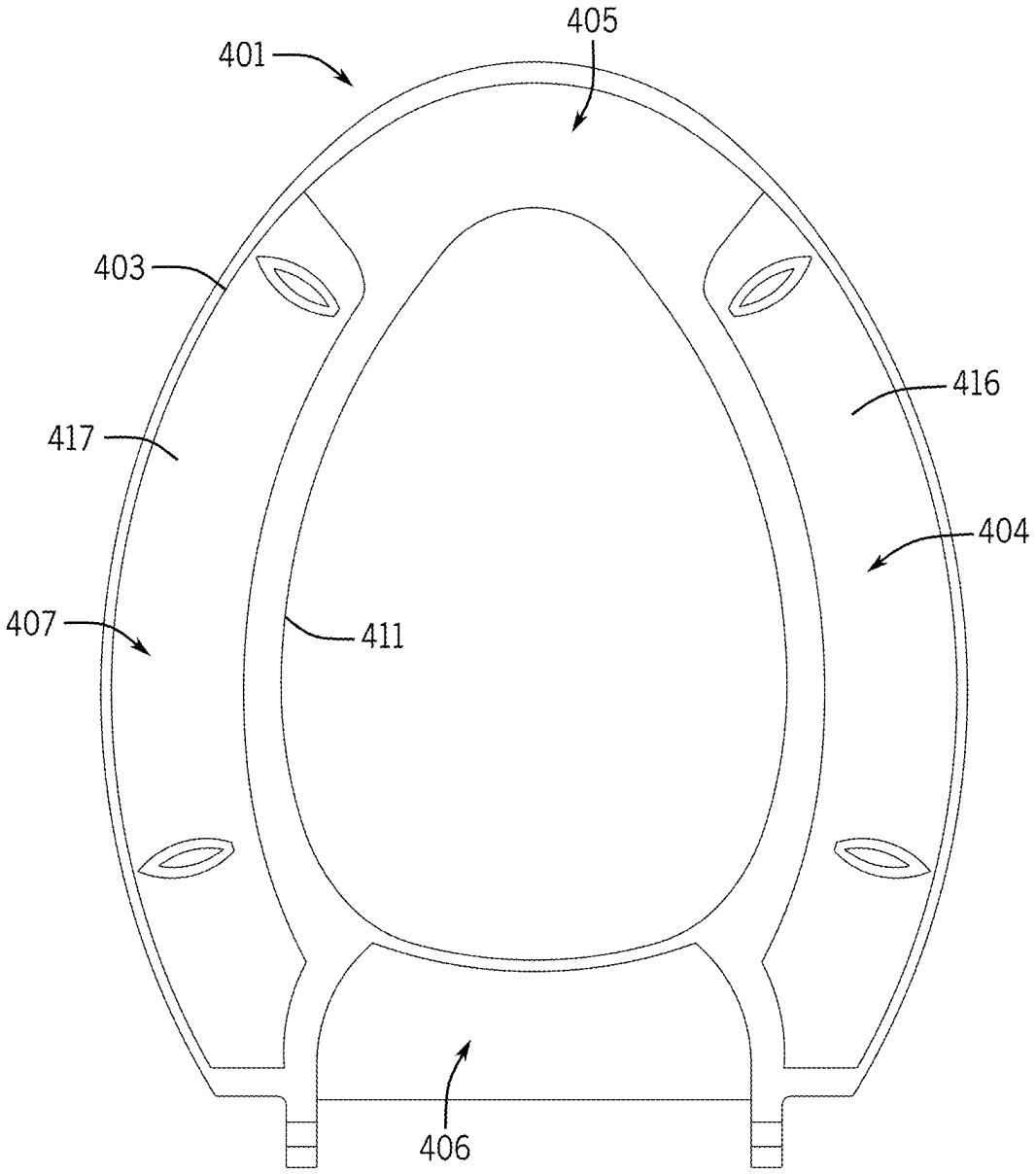


FIG. 15

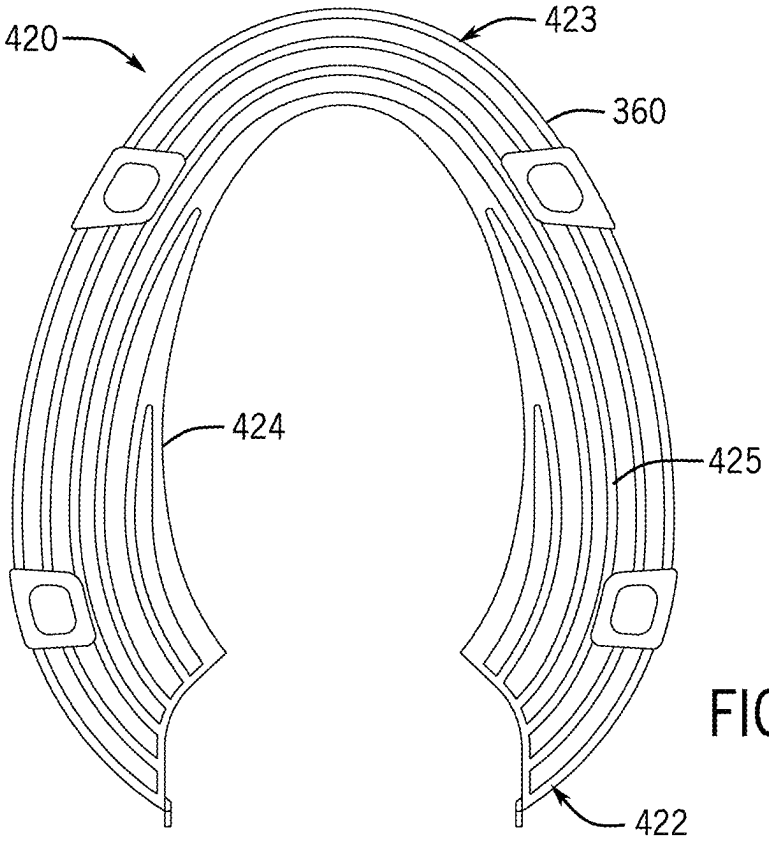


FIG. 16

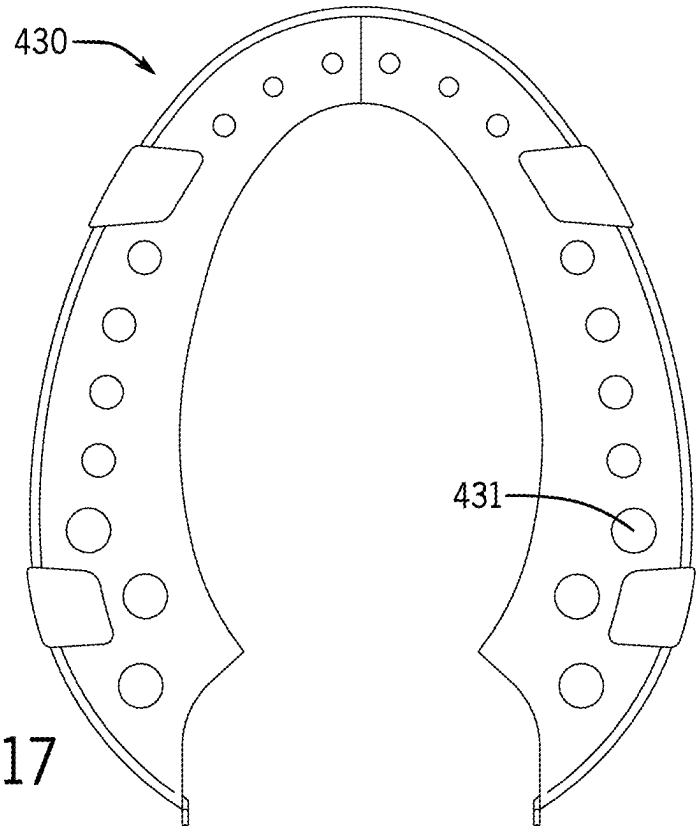


FIG. 17

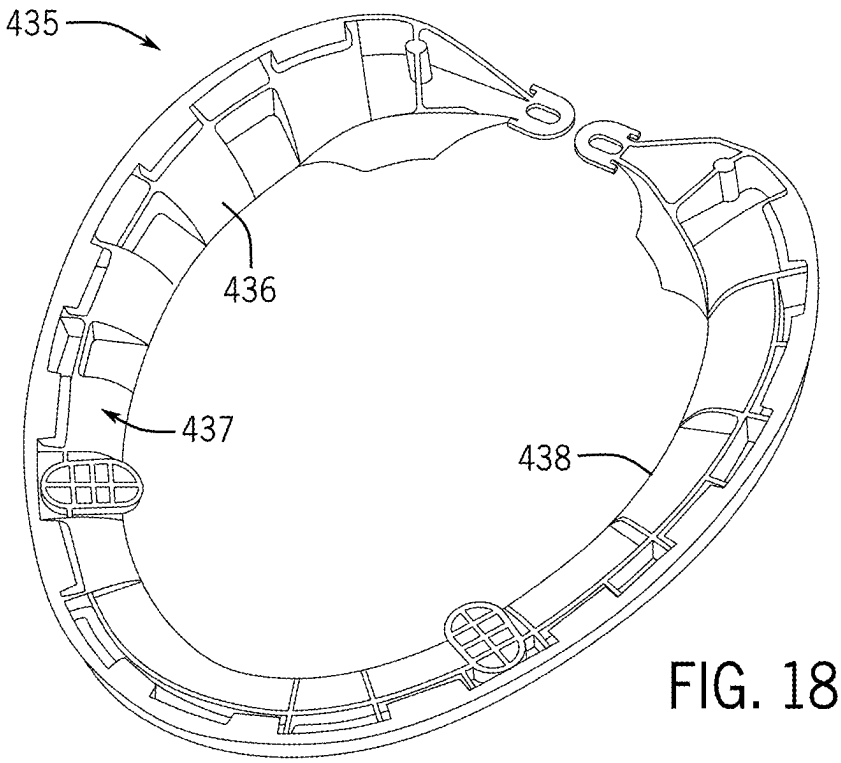


FIG. 18

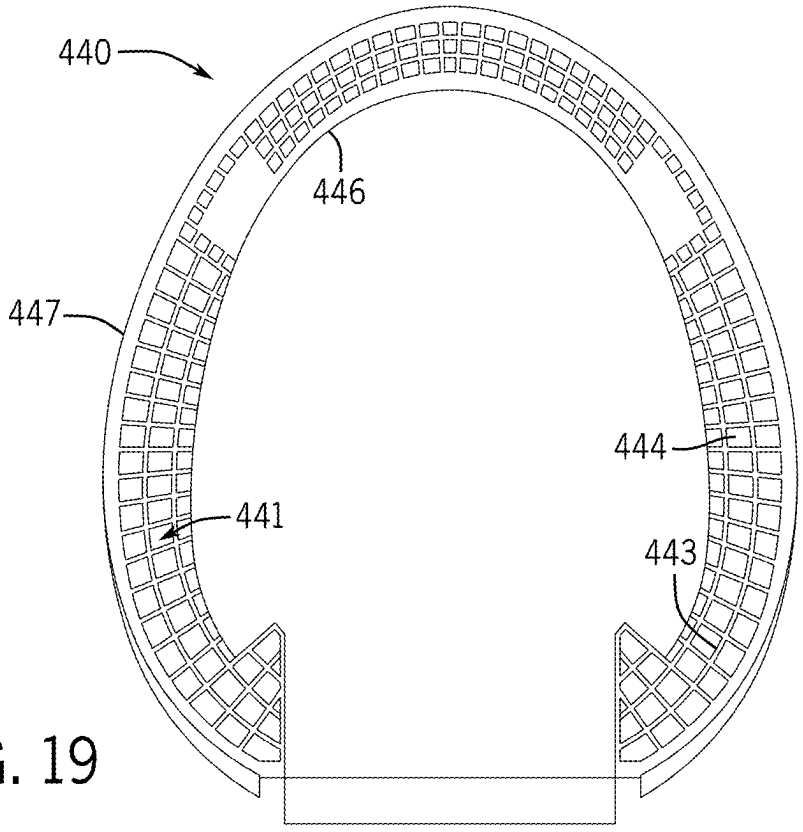
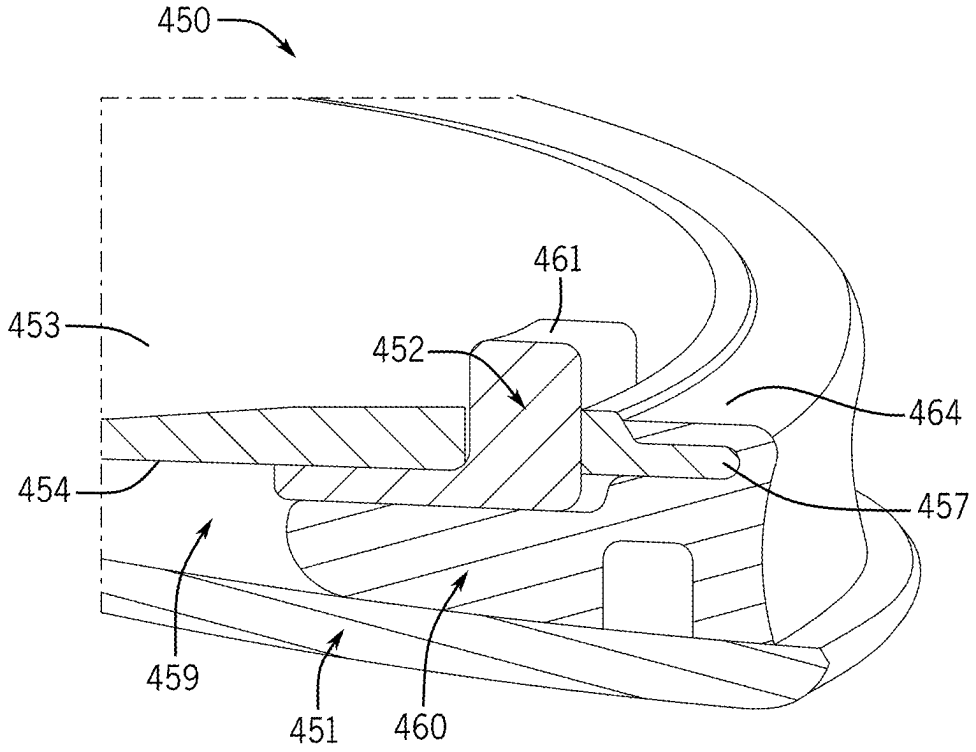


FIG. 19



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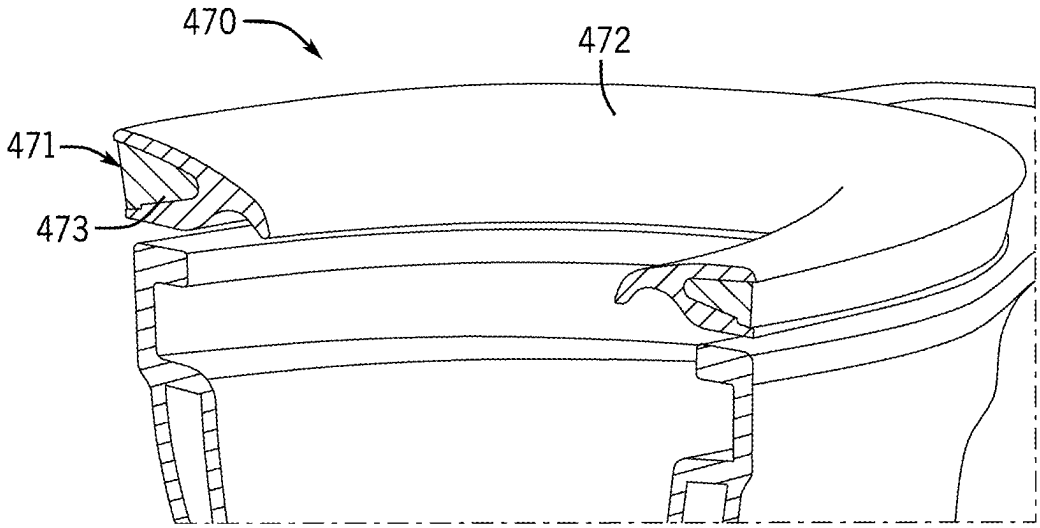

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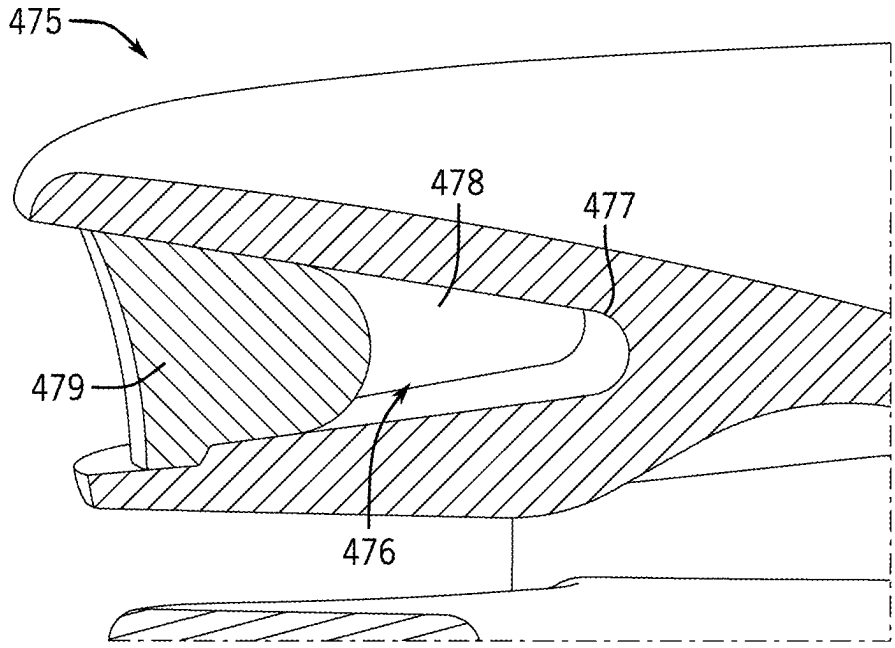

FIG. 22

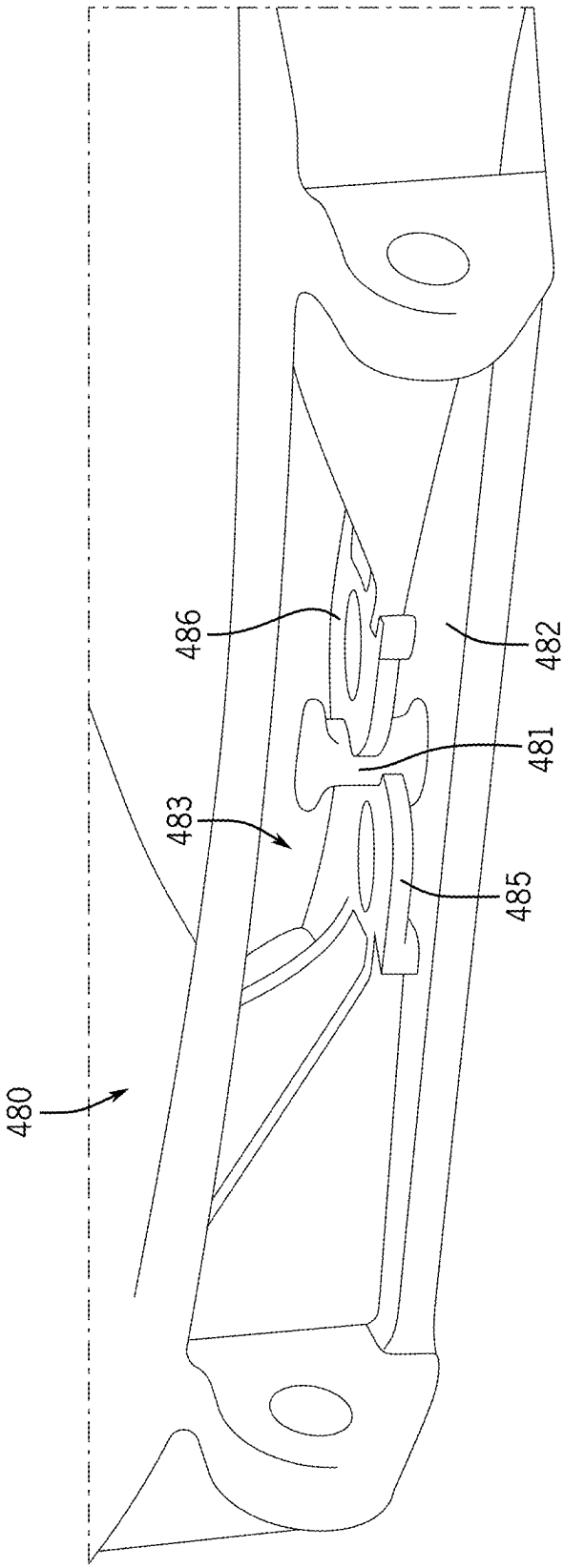

FIG. 23

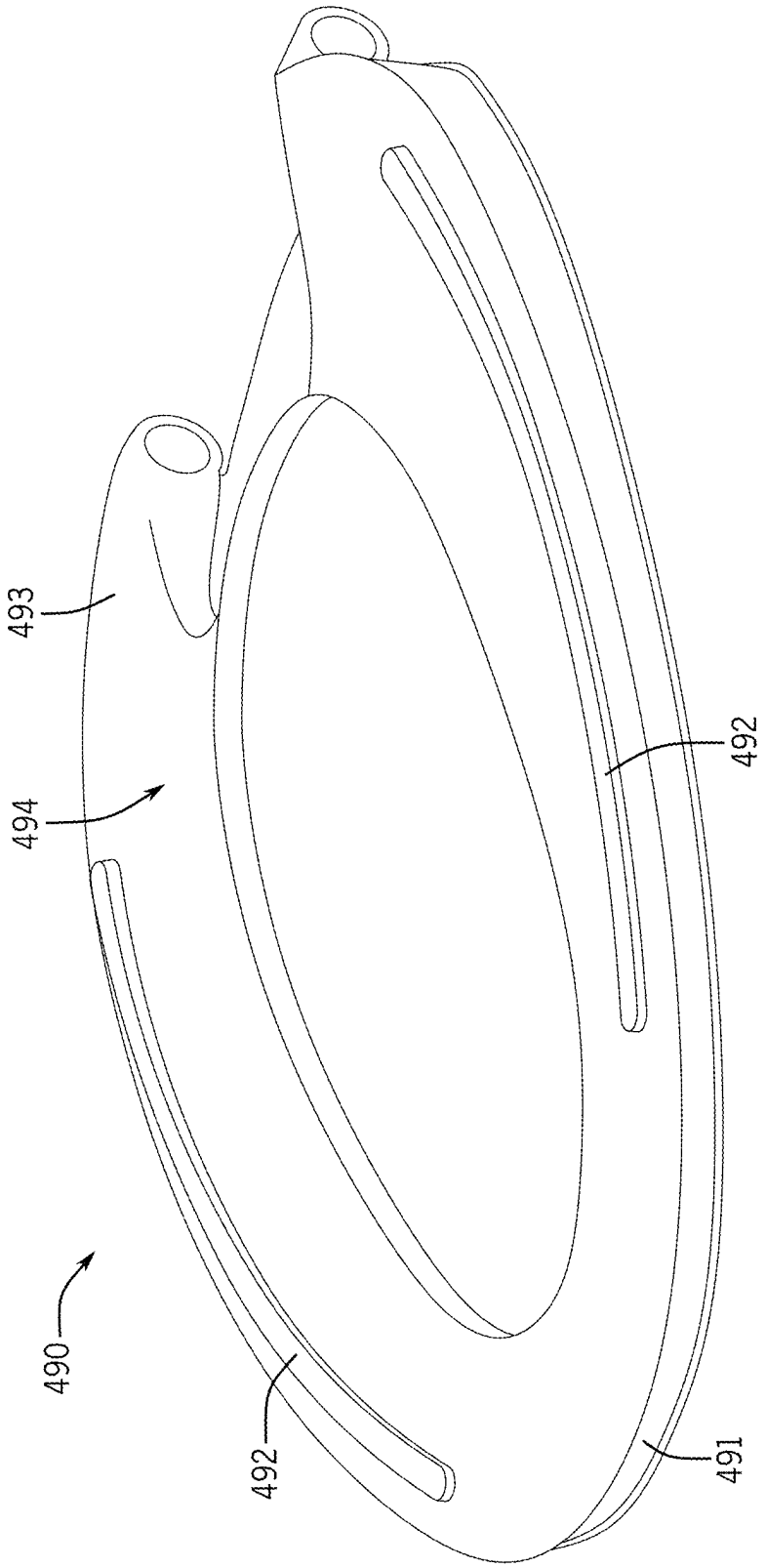

FIG. 24

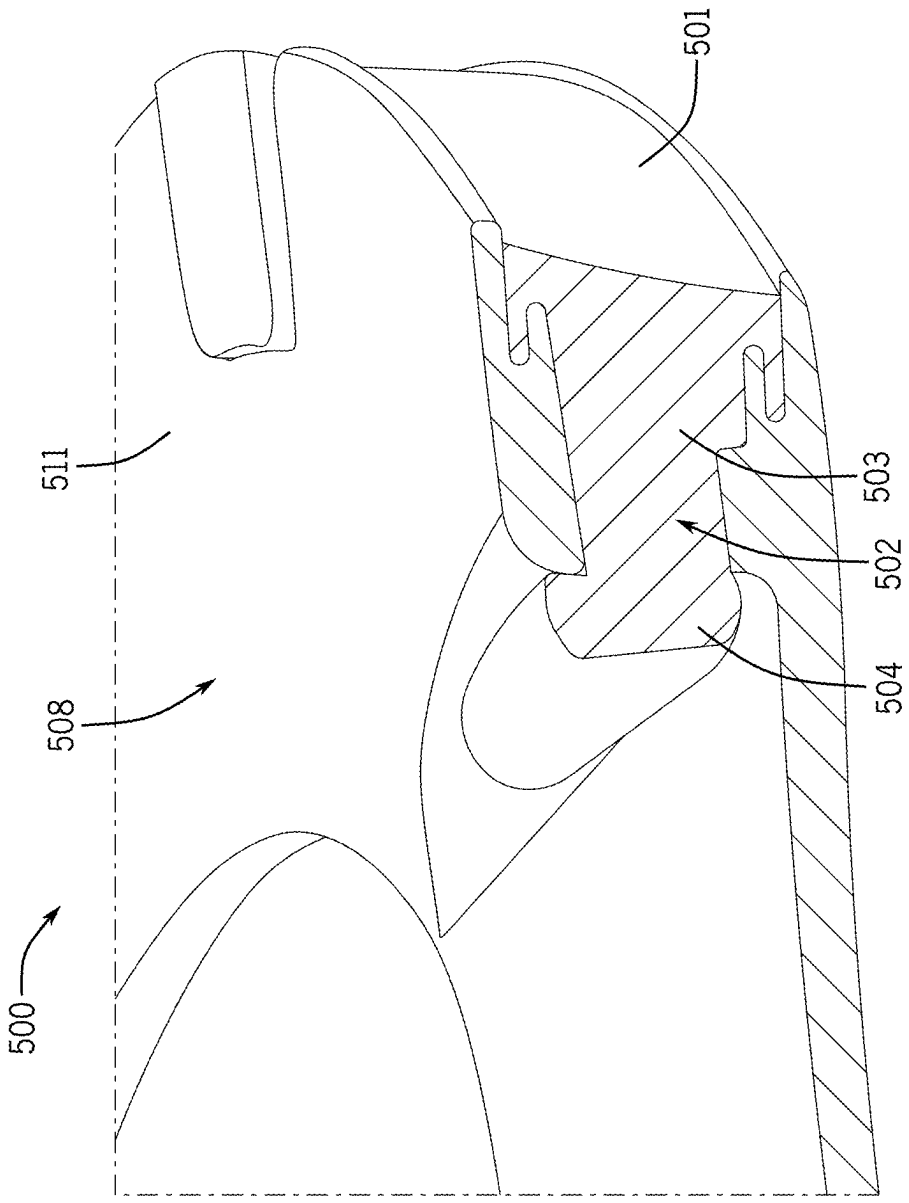

FIG. 25

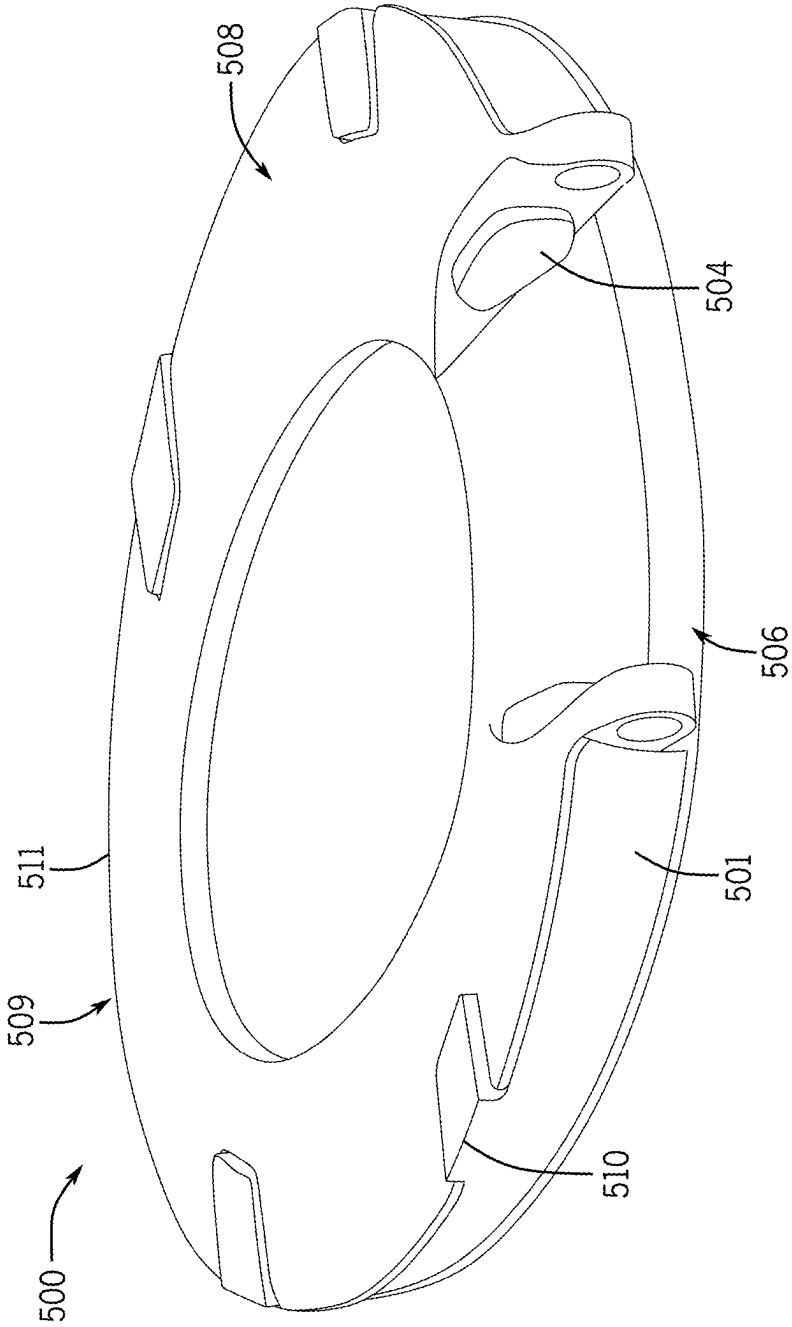

FIG. 26

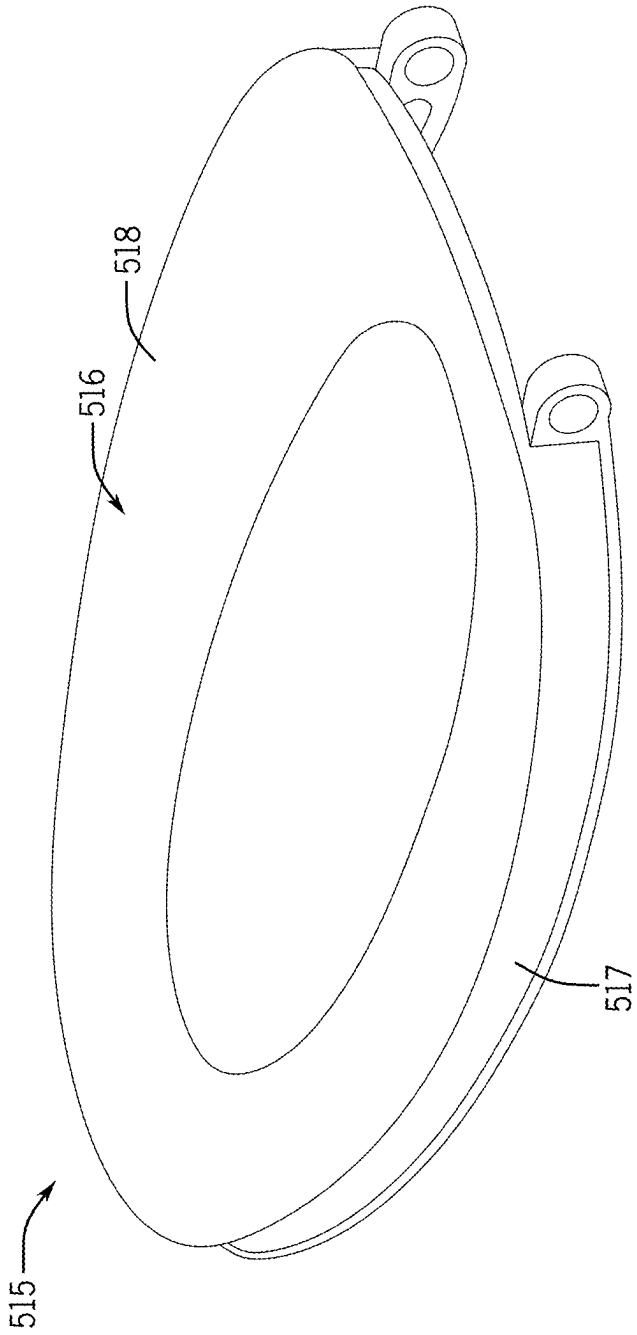

FIG. 27

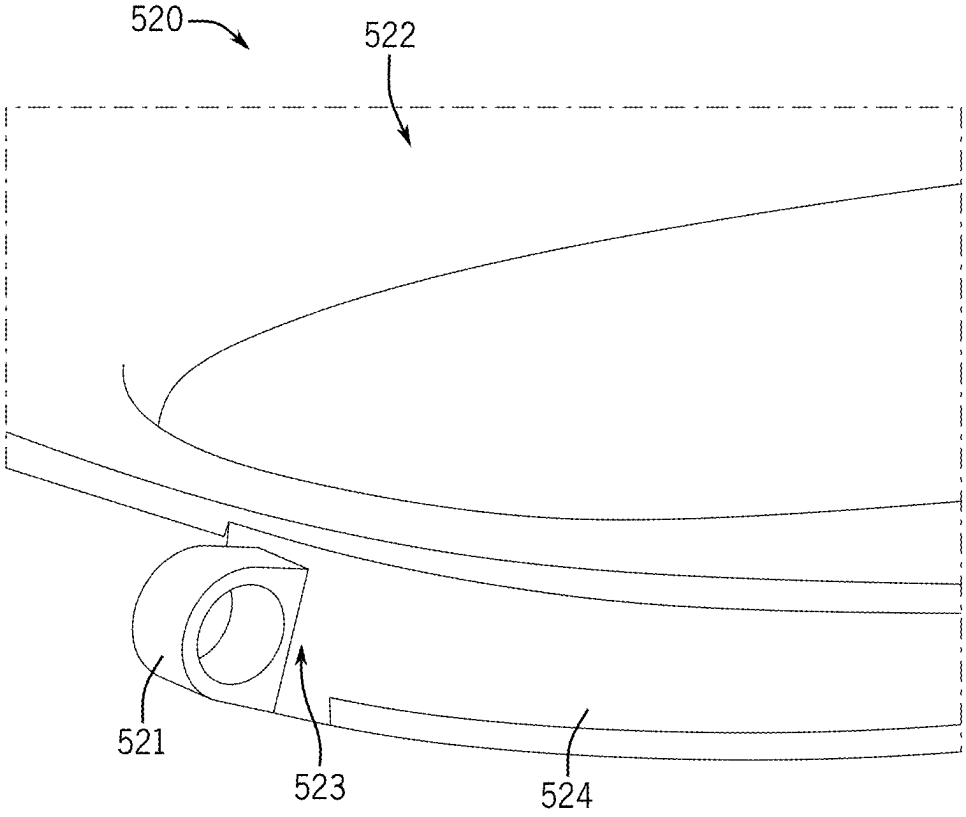

FIG. 28

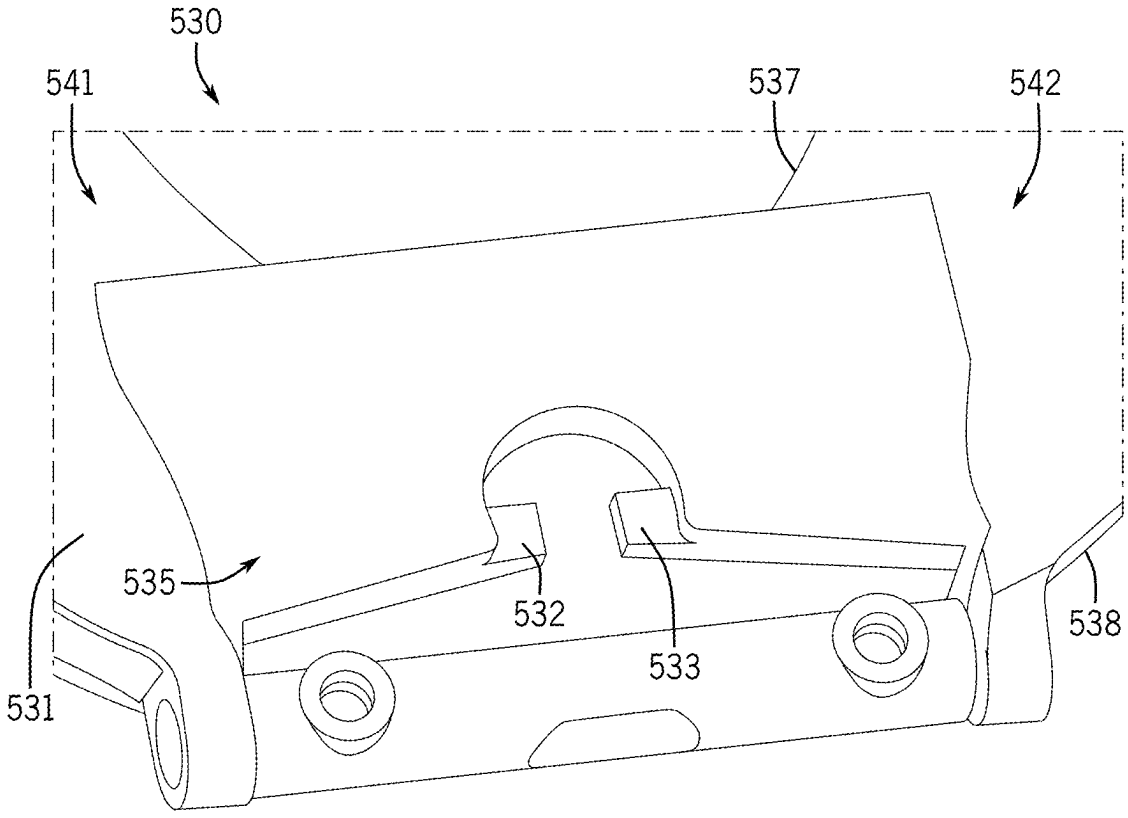

FIG. 29

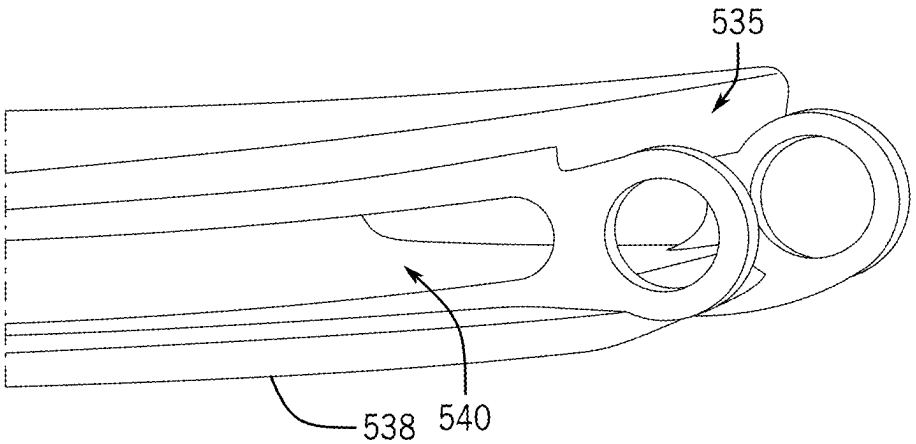

FIG. 30

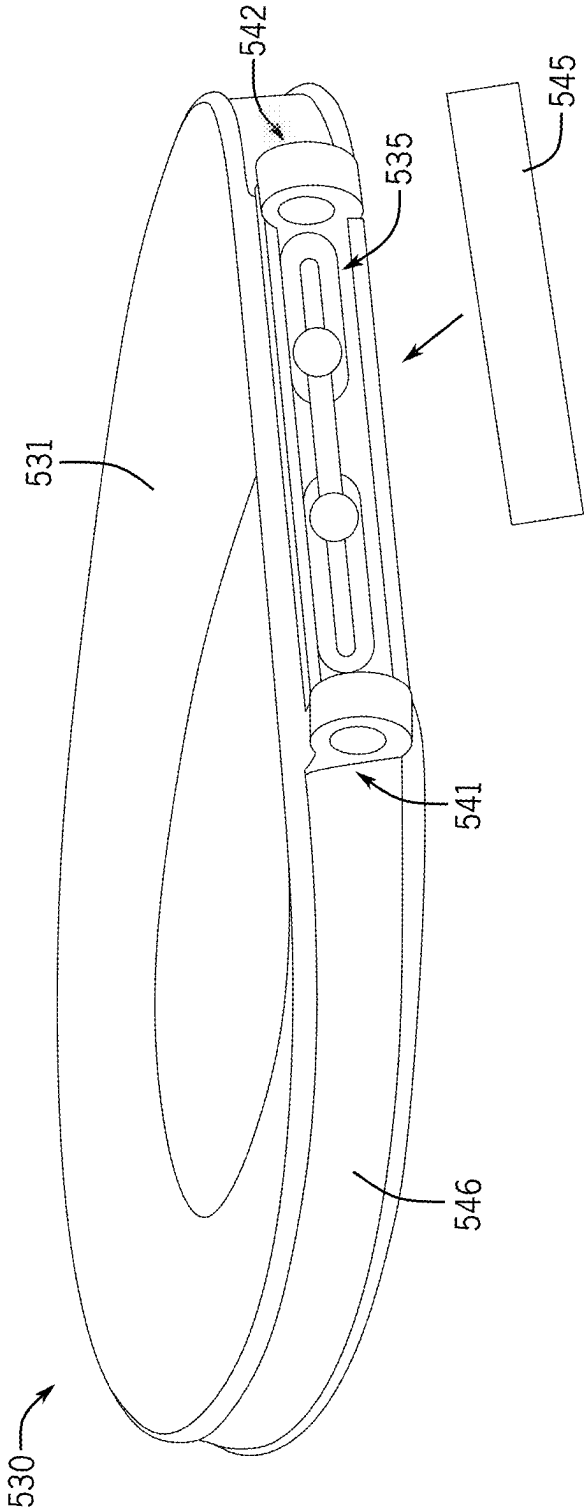

FIG. 31

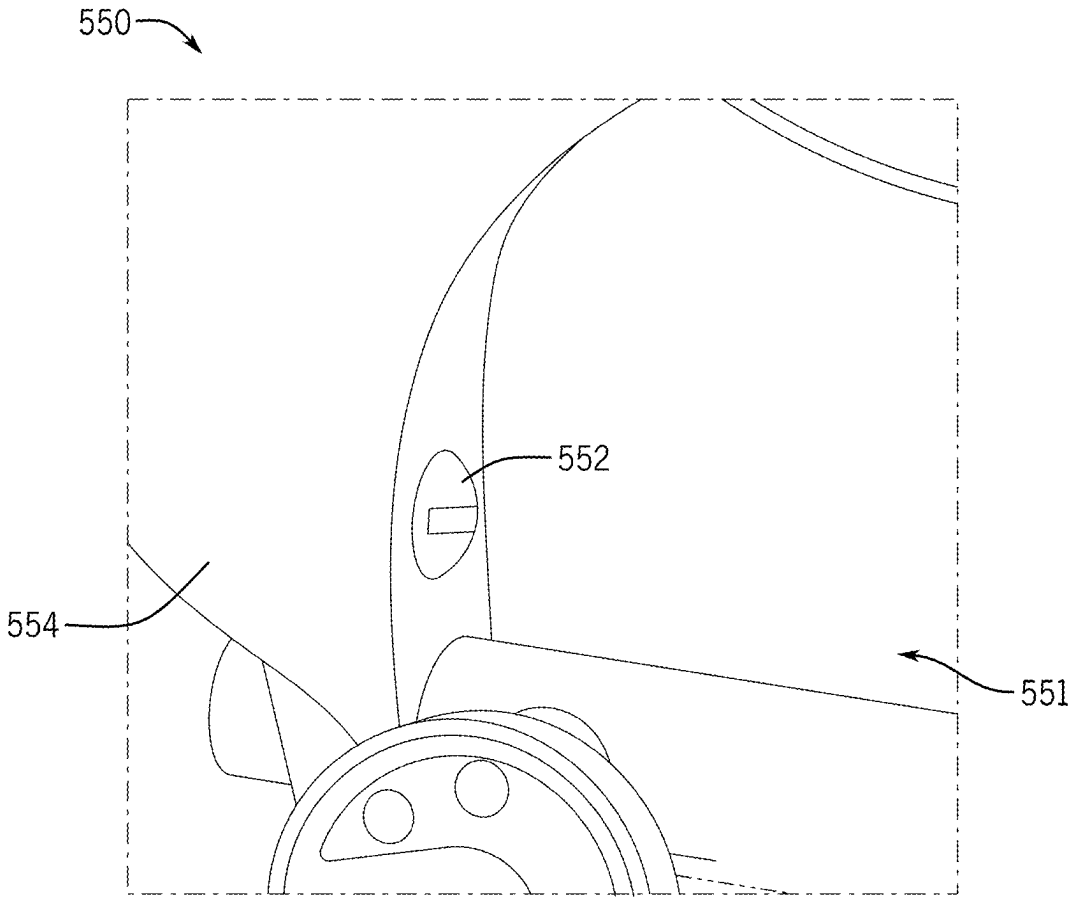

FIG. 32

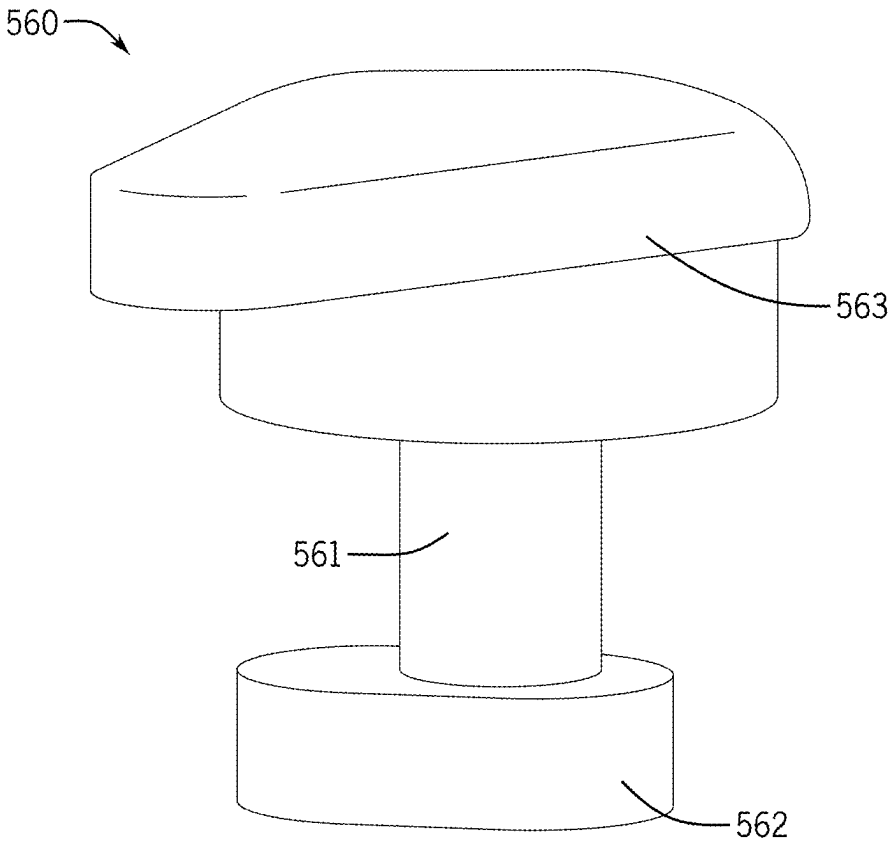

FIG. 33

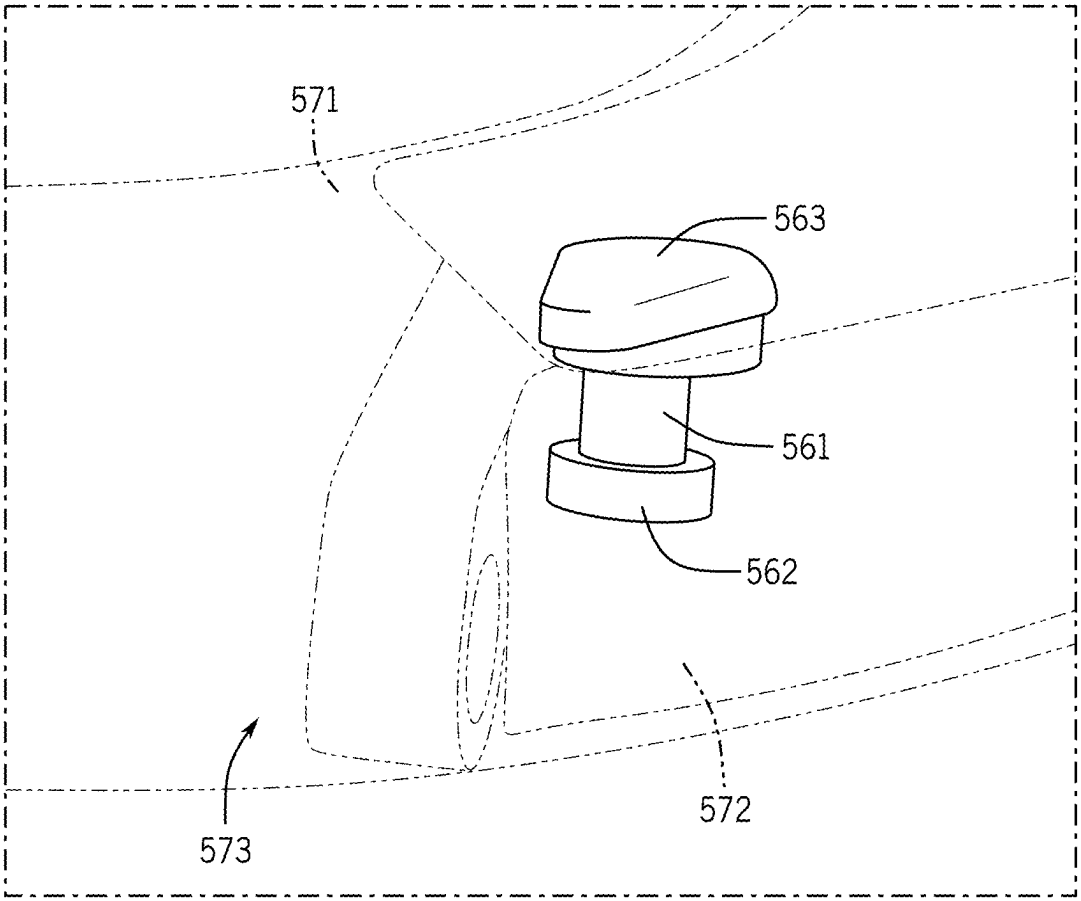

FIG. 34

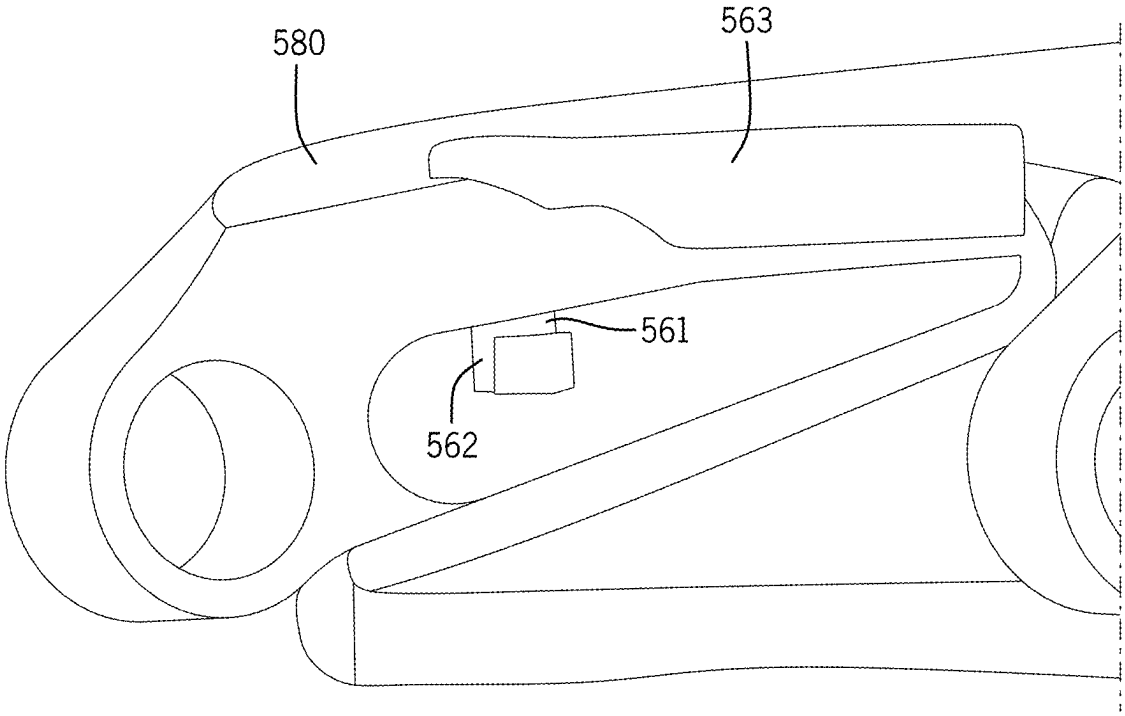

FIG. 35

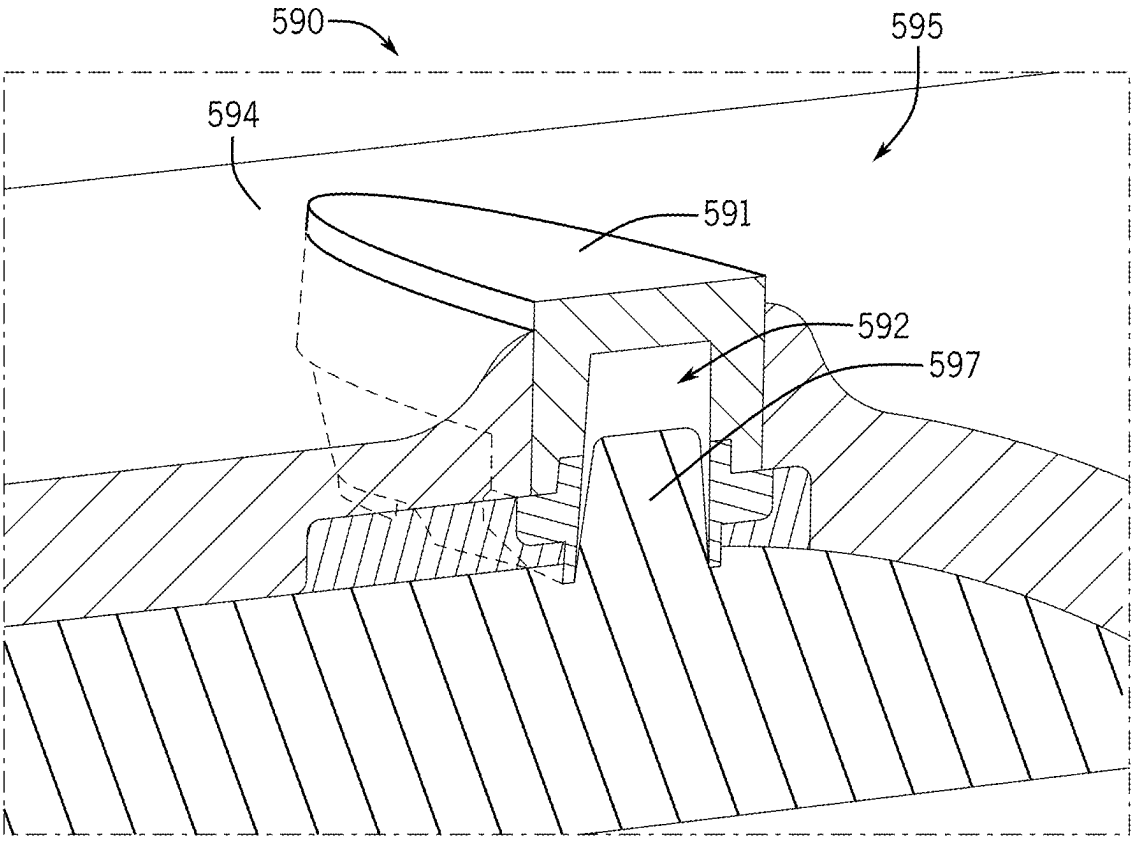

FIG. 36

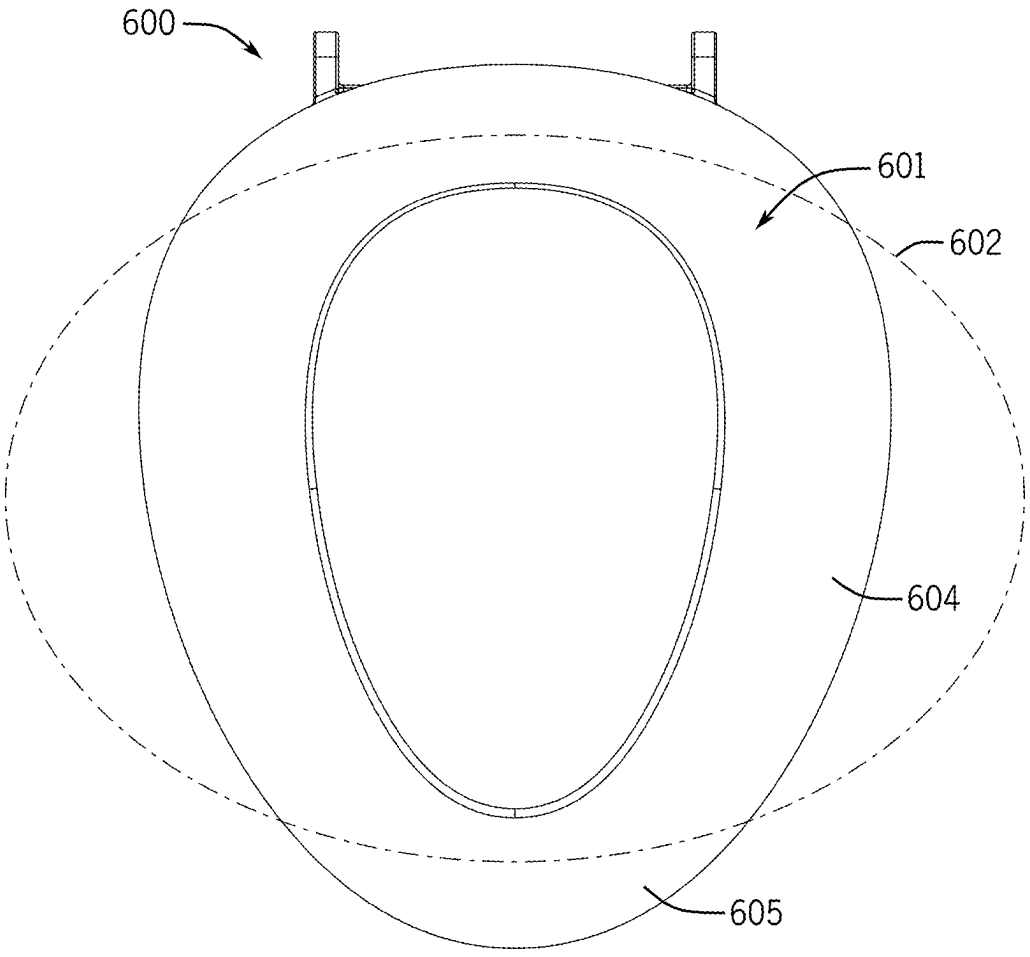

FIG. 37

FLEXIBLE TOILET SEAT

This application claims priority benefit of Provisional Application No. 63/319,534 filed Mar. 14, 2022, which is hereby incorporated by reference in its entirety.

FIELD

The present application relates generally to the field of seats for toilets. More specifically, the present disclosure relates to toilet seats including a cushion configured to deform user-specifically, thereby improving user comfort.

BACKGROUND

Toilet seats are often designed for high volume usage and to accommodate users of all shapes and sizes. User comfort is often sacrificed in favor of a high durability, universal toilet seat. Accordingly, there is a need for a more comfortable toilet seat that provides user customizability.

BRIEF DESCRIPTION OF THE DRAWINGS

Exemplary embodiments are described herein with reference to the following drawings, according to an exemplary embodiment.

FIGS. **1** and **2** illustrate perspective views of exemplary embodiments of toilets according to the present disclosure. Specifically, FIG. **1** illustrates a toilet including a tank and FIG. **2** illustrates a tankless toilet according to exemplary embodiments of the present disclosure.

FIG. **3** illustrates a toilet including a toilet seat assembly according to an exemplary embodiment of the present disclosure.

FIG. **4** illustrates a partial cross-section view of a toilet seat assembly according to an exemplary embodiment of the present disclosure.

FIG. **5** illustrates a perspective view of a toilet seat assembly according to an exemplary embodiment of the present disclosure.

FIG. **6** illustrates a side view of the seat of FIGS. **4** and **5** according to an exemplary embodiment of the present disclosure.

FIG. **7** illustrates a partial cross-section view of a seat according to an exemplary embodiment of the present disclosure.

FIG. **8** illustrates a top view of a cushion according to an exemplary embodiment of the present disclosure.

FIG. **9** illustrates a partial cross section view of a cushion according to an exemplary embodiment of the present disclosure.

FIG. **10** illustrates a perspective view of a cushion according to an exemplary embodiment of the present disclosure.

FIG. **11** illustrates a partial cross-section view of a toilet seat assembly according to an exemplary embodiment of the present disclosure.

FIG. **12** illustrates a partial cross-section view of a toilet seat assembly according to an exemplary embodiment of the present disclosure.

FIG. **13** illustrates a flowchart for coupling a cushion to a seat according to an exemplary embodiment of the present disclosure.

FIG. **14** illustrates a perspective view of a seat according to an exemplary embodiment of the present disclosure.

FIG. **15** illustrates a transparent bottom view of a seat according to an exemplary embodiment of the present disclosure.

FIG. **16** illustrates a bottom view of a cushion according to an exemplary embodiment of the present disclosure.

FIG. **17** illustrates a bottom view of a cushion according to an exemplary embodiment of the present disclosure.

FIG. **18** illustrates a perspective view of a cushion according to an exemplary embodiment of the present disclosure.

FIG. **19** illustrates a top view of a cushion according to an exemplary embodiment of the present disclosure.

FIG. **20** illustrates a partial cross-section view of a toilet seat assembly according to an exemplary embodiment of the present disclosure.

FIG. **21** illustrates a partial cross-section view of a toilet seat assembly according to an exemplary embodiment of the present disclosure.

FIG. **22** illustrates a partial cross-section view of a toilet seat assembly according to an exemplary embodiment of the present disclosure.

FIG. **23** illustrates a partial perspective view of a seat according to an exemplary embodiment of the present disclosure.

FIG. **24** illustrates a bottom perspective view of a toilet seat assembly according to an exemplary embodiment of the present disclosure.

FIG. **25** illustrates a partial cross-section view of a toilet seat assembly according to an exemplary embodiment of the present disclosure.

FIG. **26** illustrates a perspective view of a toilet seat assembly according to an exemplary embodiment of the present disclosure.

FIG. **27** illustrates a perspective view of a toilet seat assembly according to an exemplary embodiment of the present disclosure.

FIG. **28** illustrates a partial perspective view of toilet seat assembly according to an exemplary embodiment of the present disclosure.

FIG. **29** illustrates a partial bottom view of a seat according to an exemplary embodiment of the present disclosure.

FIG. **30** illustrates a partial perspective view of a seat according to an exemplary embodiment of the present disclosure.

FIG. **31** illustrates a perspective view of a toilet seat assembly according to an exemplary embodiment of the present disclosure.

FIG. **32** illustrates a partial bottom view of a seat according to an exemplary embodiment of the present disclosure.

FIG. **33** illustrates a cam lock according to an exemplary embodiment of the present disclosure.

FIG. **34** illustrates a partial perspective view of toilet seat assembly according to an exemplary embodiment of the present disclosure.

FIG. **35** illustrates a partial perspective view of a toilet seat assembly according to an exemplary embodiment of the present disclosure.

FIG. **36** illustrates a partial perspective view of a toilet seat assembly according to an exemplary embodiment of the present disclosure.

FIG. **37** illustrates a diagram for determining an area of a seat that may be in contact with a user during use of the seat according to an exemplary embodiment of the present disclosure.

The foregoing and other features of the present disclosure will become apparent from the following description and appended claims, taken in conjunction with the accompanying drawings. Understanding that these drawings depict only several embodiments in accordance with the disclosure and are therefore, not to be considered limiting of its scope,

the disclosure will be described with additional specificity and detail through use of the accompanying drawings.

DETAILED DESCRIPTION

Described herein are toilet seat assemblies (i.e., toilet seats) including a cushion disposed within a cavity in the seat. The toilet seat assembly (i.e., seat and cushion) are configured to deform elastically and vertically when a user sits on the toilet seat. The cushion may control deformation of the seat and be removably coupled to the seat. Accordingly, the cushions may be interchangeable allowing a user to select a cushion, and hence a deformation, based on their preference. In some examples, a cushion may provide multiple stage deformation providing a wide spectrum of deformation and improving comfort for users of various shapes, sizes, and weights. In some examples, the cushion **300** further includes a fastening and locking loop for easily coupling the cushion **300** to the seat **200**.

FIGS. **1** and **2** illustrate toilets according to an exemplary embodiment of the present disclosure. FIG. **1** illustrates an exemplary embodiment of a skirted toilet **10** that includes a tank **11**, a pedestal **21** (or base), a seat assembly **17** and a coupling or mounting assembly. The tank **11** may include a reservoir **12** for storing the water used during operational (or flushing) cycles, a lid (or cover) **13** for providing selective access into the reservoir **12**, and an actuator **14** that is configured to initiate an operational cycle when activated. The actuator **14** or flush mechanism may be a button configured to activate when depressed (or pulled) a predetermined distance or when touched, a lever configured to activate when rotated a predetermined angular travel, or any suitable device configured to activate based upon an input manipulation by a user.

It should be noted that the shapes and configurations of the tank, pedestal, seat assembly, and the internal components (including the trapway and other features) may vary from the embodiments shown and described herein, and that the embodiments disclosed herein are not intended as limitations. It should be noted that various components of the toilet may be made of vitreous china. It should be noted that various components of the toilet may be polymeric and/or over molded or otherwise fixed to the toilet. It should be noted, for example, that although the exemplary embodiment of the toilet **10** is shown configured with the tank **11** formed separately from the pedestal **21** and later coupled to the pedestal, the tank may be integrally formed with the pedestal as a one-piece design. In other words, the toilet may be a one-piece design, a two-piece design, or have any suitable configuration. The toilet disclosed herein may have a wide variety of skirted toilet configurations, and all such configurations are intended to be encompassed herein. The following description of various toilet features is therefore intended as illustration only of one possible embodiment, and it should be understood by those reviewing the present description that similar concepts or features may be included in various other embodiments.

The tank **11** may include an inlet opening configured to receive water from a coupled water supply, such as from a hose (e.g., line, tube). The tank **11** may also include an inlet valve assembly or other device configured to control the flow of water from the water supply into the tank through the inlet opening. Within the tank **11** may be provided a float device for controlling the inlet valve assembly, such as by opening the valve to refill the reservoir **12** of the tank **11** after an operational cycle and closing the valve when the water in the reservoir **12** reaches a preset volume or height. The tank **11** may also include an outlet opening configured to transfer (e.g., conduct) the water stored in the reservoir **12** of the tank to the pedestal **21** upon activation of the actuator **14**. The pedestal **21** may include toilet bowl **23**. The tank **11** may include an outlet valve assembly or other device configured to control the flow of water from the tank into the pedestal **21** through the outlet opening.

The pedestal **21** (or base) of the toilet **10** may include a wall **22** having any suitable shape that is configured to form a bowl **23** having an opening formed by an upper rim at the top of the opening. The pedestal **21** may also be configured to include a plurality of walls having varying shapes that together form a bowl having an opening formed by a rim. The wall **22** of the pedestal may extend downward and/or rearward from the bowl **23** to form a lower portion **25** configured to support the pedestal **21** and the toilet **10**. The lower portion **25** may be formed by the end (e.g., lower rim) of the wall **22**, or may include a member that extends generally in a horizontal plane from one or more than one end of the wall. The pedestal **21** may also include a top member **24** that extends between two sides of the wall **22** (or between two opposing walls) and is provided rearward (or behind) the bowl **23**, wherein the top member **24** forms a plateau for supporting the tank **11**, such as the bottom surface of the reservoir **12** of the tank **11**. The top member **24** may include an inlet opening that may be aligned with the outlet opening of the tank **11**, such as when the tank **11** is coupled to (or resting above) the pedestal **21**, wherein water is selectively transferred (e.g., conducted) from the tank **11** through the outlet opening of the tank to the pedestal **21** through the inlet opening of the pedestal **21**, when the toilet is activated through the actuator **14**. The outlet valve assembly may control the flow of water from the tank to the pedestal. The toilet may also include a gasket or seal that is provided between the tank **11** and the pedestal **21** to prohibit leaking. For example, a gasket may be provided between the outlet opening of the tank and the inlet opening of the pedestal to prohibit leaking between the tank and the pedestal.

The plateau formed by the top member **24** of the pedestal **21** may also provide for coupling of the seat assembly **17** to the pedestal **21** of the toilet **10**. For example, the top member **24** may include one or more than one opening, wherein each opening is configured to receive a fastening device (e.g., bolt, screw, etc.) to couple (e.g., attach) the seat assembly **17** to the top member **24** of the pedestal **21**. As another example, the top member **24** may include one or more than one fastening device (e.g., bolts, recessed nuts, etc.) integrally formed therein (i.e., already provided connected or coupled to the pedestal **21**), wherein the fastening device may be used to couple or secure at least a portion of the seat assembly **17** to the pedestal **21**.

The bowl **23** of the pedestal **21** may be configured to include a receptacle (e.g., sump) and an outlet opening, wherein the water and waste is collected in the receptacle until being removed through the outlet opening, such as upon activation of the actuator **14**. The pedestal **21** may also include a pedestal internal passageway, such as a trapway, that connects the outlet opening or discharge outlet of the bowl **23** to a drain or soil pipe. The passageway, or trapway, generally includes a first portion, a second portion, and a weir separating the first and second portions. The first portion of the passageway may extend from the outlet opening of the bowl **23** at an upwardly oblique angle to the weir. The second portion of the passageway may extend from the weir downwardly to the exiting device, such as the drain or soil pipe.

Between operational cycles (e.g., flush cycles) of the toilet **10**, the water (and waste) is collected in the first portion of the trapway (in addition to the receptacle of the bowl), such that the weir prohibits the water from passing past the weir and into the second portion of the trapway. A flushing cycle may begin upon activation of the actuator **14**. Upon activation of the actuator, additional water (e.g., fresh water and or grey water) may be discharged into the bowl **23** of the pedestal **21**, resulting in the flushing action and waste removal through the soil pipe. The flushing cycle may include generation of a siphon to assist the flushing action and waste removal.

The seat assembly **17** may include a cover member **18** (e.g., lid), a seat member **19** (e.g., ring member), and a hinge. The seat member **19** may be configured to include an annular member that encircles an opening, wherein the annular member provides a seating surface for the user of the toilet **10**. The seat member **19** may also be pivotally coupled (e.g., attached) to the hinge, wherein the seat member may rotate (or pivot) about the hinge, such as between a first lowered or seated position and a second raised or upright position. The cover member **18** may be configured to be round, oval, or any other suitable shape. Typically, the profile or shape of the outer surface of the cover member will be configured to match (i.e., to be substantially similar) to the profile of the outer surface of the seat member to improve the aesthetics of the seat assembly and toilet. The cover member **18** may also be coupled to the hinge, wherein the cover member may rotate (or pivot) about the hinge, such as between a first down lowered or down position and a second raised or upright position. The cover member **18** may be provided above the seat member in the down position to thereby cover the opening of the seat member **19**, as well as to conceal the inside of the bowl **23** of the pedestal **21**. The cover member **18** may be configured to rest against the outside surface of the tank **11**, when the cover member **18** is in the upright position, such that the cover member **18** remains in the upright position in order for a user to sit upon the seat member **19**.

FIG. **2** illustrates a non-skirted toilet **20** according to another exemplary embodiment of the present disclosure. The internal components, including the trapway **15**, are visible in the pedestal **21** of non-skirted toilet **20**. It should be noted that the devices, methods, and systems described herein may include and/or be used with both skirted and non-skirted toilets. It should further be noted that devices, methods, and systems described herein may include or be used with both toilets including tanks and tankless toilets. A waterline may supply a tankless toilet with water during a flush cycle.

FIG. **3** illustrates a toilet **100** including a toilet seat assembly **150** according to an exemplary embodiment of the present disclosure. Referring to FIG. **1**, the toilet **100** includes a base **110** (e.g., a pedestal, bowl). The base is configured to be attached to another object such as a drainpipe, floor, or other suitable object. The base **110** includes a bowl **111**, a sump **112** disposed below the bowl and a trapway **113** connecting fluidly connecting the bowl **111** to a drainpipe or sewer line. In some embodiments, the toilet **100** may include a tank. The tank may be supported by the base **110**, such as an upper surface of the rim **115**. In some embodiments, the tank may be integrally formed with the base **110**. In other embodiments, the tank may be formed separately from the base **110** and coupled (e.g., attached, secured, fastened, connected, etc.) to the base **110**. The toilet **100** may further include a tank lid covering an opening and an inner cavity in the tank. The toilet **100** may further include a toilet seat assembly **150** rotatably coupled to the base **110**. In some embodiments, the toilet **100** may be connected to a waterline that supplies the toilet with water. The toilet **100** of FIG. **1** is provided herein as a non-limiting example of a toilet that may be configured to utilize aspects of the present disclosure.

FIG. **4** illustrates a partial cross-sectional view of a toilet seat assembly **150** according to an exemplary embodiment of the present disclosure. The toilet seat assembly **150** includes a seat **200** and a cushion **300**. The cushion **300** may be disposed within the seat **200**. The cushion **300** may be removably coupled (e.g., attached, secured, fastened) to the seat **200**. In other examples, the cushion **300** may be permanently coupled to the seat **200**. The seat **200** and the cushion **300** may be configured to deform elastically and vertically in response to a load being applied to the seat **200**. For example, the seat **200** and the cushion **300** may be configured to deform elastically and vertically in response to the weight of a user sitting on the seat **200**. In some examples, the cushion **300** may be configured to control (e.g., substantially control) deformation of the seat **200**.

In some examples, as illustrated in FIG. **4**, the cushion **300** may extend below a bottom surface of a cavity formed in the seat (i.e., cavity bottom surface **223**) concealing or hiding a seam or interface between the cushion **300** and a bottom portion of the seat **200**. The portion of the cushion **300** extending below the cavity bottom surface may additionally improve the quality of the interface between the cushion **300** and the seat **200** during deformation of the toilet seat assembly **150**.

FIG. **5** illustrates a perspective view of a toilet seat assembly **150** according to an exemplary embodiment of the present disclosure. As illustrated in FIG. **2**, the seat **200** includes a seat top surface **201**, seat bottom surface **202** opposite the seat top surface **201**, and seat inner edge **203** where the seat top surface **201** and the seat bottom surface **202** meet. The seat top surface **201** and the seat bottom surface **202** may each have an oval or elliptic shape. The seat **200** further includes seat outer surface **204** extending from an outer perimeter of the seat top surface **205** to an outer perimeter of the seat bottom surface **206**. The seat **200** may further include a seat back end **209** and a seat front end **208**. The seat front end **208** may be narrower than the seat back end **209**.

The seat **200** further includes a cavity (see FIG. **6**) extending from the seat outer surface **204** toward the seat inner edge **203**. In the toilet seat assembly **150** as illustrated in FIG. **5**, the cushion **300** is disposed within the cavity. In some examples, the cavity may occupy a majority of the seat outer surface **204** extending between the outer perimeter of the seat top surface **205** and the outer perimeter of the seat bottom surface **206**. The cushion **300** may be compressed within the cavity **220** of the seat **200** when a user sits on the seat top surface **201**, controlling deformation of the seat **200**.

FIG. **6** illustrates a side view of the seat **200** of FIGS. **4** and **5** without the cushion **300**. As illustrated, the seat **200** includes cavity **220** in the outer surface **204** of the seat **200**. In some examples, as illustrated in FIG. **6**, the cavity **220** may occupy a majority of the vertical distance of the seat outer surface **204** between the seat top surface **201** and the seat bottom surface **202**. The height of the cavity **220** may vary. In other examples the height of the cavity **220** may be smaller or larger. A cavity inner surface **221** (i.e., cavity interior surface) may define (e.g., the shape of) the cavity **220** in the seat **200**. The cavity inner surface **221** may include a cavity top surface **222** and a cavity bottom surface **223**. The shape of the cavity **220** may vary.

In some examples, as illustrated in FIG. **6**, the cavity **220** extends around the entire seat outer surface **204** (i.e., the cavity **220** extends around the entire outer perimeter of the seat **200**). In other examples, the cavity **220** extends around a majority of the seat outer surface **204**. In still other examples, the cavity extends around less than half of the seat outer surface **204**. In some examples, the cavity **220** may have an arcuate or parabolic shape corresponding to a portion of the seat **200**, with the ends of the arcuate or parabolic shape disposed at or near the seat back end **209** and the center of the arcuate or parabolic shape at or near the seat front end **208**. The portion of the seat outer surface **204** along which the cavity extends may vary. In some examples, the portion of the seat outer surface **204** along which the cavity **220** extends may be longer or shorter. The depth to which the cavity **220** extends into the seat **200** may vary.

Referring to FIGS. **5** and **6**, in some examples, the toilet seat **200** further includes one or more hinge brackets **232** configured to attach or coupled the seat **200** to a hinge assembly. In some examples, as illustrated in FIGS. **5** and **6**, the seat **200** may include two hinge brackets **232**. The hinge brackets **232** may be disposed at or near the seat back end **209**. The hinge brackets **232** may extend between the cavity top surface **222** and the cavity bottom surface **223**. The hinge brackets **232** may be configured to receive a pin for rotatably coupling the seat **200** to the toilet.

In some examples, the seat **200** may include one or more locking projections **236**. For example, a locking projection **236** may extend radially inward from the hinge bracket **232**. In some examples, the locking projection **236** may extend into the cavity **220** of the seat **200**. In some examples, as illustrated in FIG. **5**, the seat **200** may include two hinge brackets **232** and a locking projection **236** extending from each hinge bracket **232**. Each of the hinge brackets **232** and thus each of the locking projections **236** may be disposed at or near the seat back end **209** and offset from a centerline of the seat **200** on opposite sides of the centerline of the seat **200**. The locking projection **236** may be configured to be circumscribed by the cushion **300** when the cushion **300** and the seat **200** are coupled to one another. For example, a locking loop of the cushion **300** may be stretched around the locking projection **236** coupling the cushion **300** and the seat **200** to one another.

Referring to FIG. **6**, the seat **200** may include a centering rib **234** extending upward from the bottom surface **223** of the cavity inner surface **221**. In some examples, the centering rib **234** may extend vertically upward from the bottom surface **223** of the cavity inner surface **221**. The centering rib **234** may be configured as a datum or reference point for attaching the cushion **300** to the seat **200**. In some examples, the centering rib **234** may extend from the bottom surface **223** of the cavity **220** along a central axis of the seat **200**. The centering rib **234** may be configured to center a cushion **300** when a cushion **300** is coupled to the seat **200**. A portion of the cushion **300** may surround the centering rib **234** when the cushion **300** is coupled to the seat **200**. A center channel formed in the cushion may be configured to receive the centering rib **234** when the cushion **300** and the seat **200** are coupled to one another. The centering rib **234** and center channel of the cushion **300** may control a position of the seat **200** and the cushion **300** relative to one another, when the seat **200** and the cushion **300** are coupled. Additionally, the centering rib **234** and the center channel of the cushion may control a position of the cushion **300** relative to the seat **200** such that there is an equal or substantially similar amount of deformation or stretch in the cushion **300** on both sides of the center channel when the seat **200** and cushion **300** are coupled.

FIG. **7** illustrates a partial cross sectional view of the seat **200** according to an exemplary embodiment of the present disclosure. In some examples, the seat **200** may further include one or more locking features comprising a **225** configured to receive a portion of the cushion **300**. Each of the slots **225** may be configured to secure the cushion **300** within the seat **200**. Additionally, each of the slots **225** may advantageously prevent contaminants (e.g., dirt, dust, odor causing bacteria) from entering the cavity **220**.

In some examples, as illustrated in FIG. **7**, the seat **200** may include two slots **225**. Each of the slots **225** may be disposed in the cavity **220** of the seat **200**. For example, a first slot **225** may be disposed in the top surface **222** of the cavity **220** and a second slot **225** may be disposed in the bottom surface **223** of the cavity **220**. In some examples, a slot **225** in the top surface **222** of the cavity may be disposed closer to the seat inner edge **203** than the slot formed in the bottom surface **223** of the cavity **220**. The location and/or number of slots **225** may vary. For example, the seat **200** may include a single slot **225**. The shape of the slots **225** may vary. For example, as illustrated in FIG. **7**, the seat **200** may include a triangular or substantially triangular slot **225**. In other examples, the slot may be rectangular, semi-circular, semi-spheroid or the like. In some examples, the locking feature(s) may extend along the entire length of the cavity **220**. In other examples, the locking features may be provided intermittently along the length of the cavity **220**.

The seat **200** may further include one or more grooves **227** disposed in the cavity inner surface **221**. For example, as illustrated in FIG. **7**, a single groove **227** may be disposed in the cavity inner surface **221** at or near a top of the cavity **220**. In some examples, the groove **227** may be disposed between a slot **225** (e.g., first slot) and the outer perimeter of the seat top surface **205**. The groove **227** may be configured to receive an exterior flange of the cushion **300** when the cushion **300** and the seat **200** are coupled to one another. In some examples, the groove **227** may have a triangular or a substantially triangular shape. In other examples, the groove may have a rectangular shape, a semi-circular, a semi-elliptic, or any other suitable shape. The shape of the groove **224** and a shape of the exterior flange of the cushion **300** may mirror one another. In some examples, the seat **200** may include two or more grooves **227**. For example, the seat **200** may include a first groove in the cavity inner surface **221** at or near a top of the cavity **220** and a second groove in the cavity inner surface **221** at or near a bottom of the cavity **220**. The groove(s) in the seat **200** may advantageously improve a seam between the seat **200** and the cushion **300** when the seat **200** and the cushion **300** are coupled to one another, securing, or locking a position of the seat **200** and cushion **300** relative to one another, and preventing contaminants from entering the cavity **220** of the seat.

In some examples, the seat **200** may be comprised of plastics, such as polypropylene (PP), polyethylene, polycarbonate, or other similar materials. In other examples, the seat may be comprised of another material. The seat **200** may be comprised of a different material than the cushion **300**. The material comprising the seat **200** may have a higher durometer than a material comprising the cushion **300**.

FIG. **8** illustrates a top view of the cushion **300** of FIG. **5**. In this example, the cushion **300** has an arcuate shape extending from a first end **301** to a second end **302**. The cushion **300** includes a cushion outer wall **310**. In some examples, a vertical height of the outer wall **310** may vary

along the length of the outer wall **310**. For example, the outer wall **310** may have a largest vertical height at or near the first end **301** and the second end **302** and a smallest vertical height at a front end **307** of the cushion **300**. A vertical height of the outer wall **310** may gradually increase from a front end **307** of the cushion **300** to each of the first end **301** and the second end **302**. The thickness of the cushion outer wall **310** may vary. The cushion outer wall **310** extends between a top surface **222** of the cavity **220** and a bottom surface **223** of the cavity **220** when the cushion **300** and the seat **200** are coupled to one another. The cushion outer wall **310** is configured to deform elastically when a user sits on the toilet seat assembly **150**.

The cushion outer wall **310** includes a cushion outer surface **311** defining an outer perimeter of the cushion **300**. The cushion outer surface **311** may be exposed to an exterior of the toilet seat assembly **150** when the cushion **300** is coupled to the seat **200**. In some examples, the cushion outer surface **311** may be the only surface of the cushion exposed to the exterior of the toilet seat assembly **150** when the cushion **300** is coupled to the seat **200**.

The cushion **300** further includes an upper flange **330** extending radially inward from the cushion outer wall **310**. The upper flange **330** may be disposed at or near a top of the cushion outer wall **310**. In some examples, as illustrated in FIGS. **8** and **9**, the cushion **300** may include a plurality of upper flanges **330** extending radially inward from the cushion outer wall **310**. In some examples, the plurality of upper flanges **330** may extend along the outer wall **310** at a regular interval. In other examples, the plurality of upper flanges **330** may extend along the outer wall **310** at an irregular interval. In some examples, a single upper flange **330** may extend along the entire length of the cushion outer wall **310**.

The upper flange(s) **330** may be configured to reside in a slot **225** disposed in a top surface **222** of the cavity **220** when the cushion **300** and the seat **200** are coupled to one another. The upper flange(s) **330** and the slot **225** may advantageously improve a seam or interface between the seat **200** and the cushion **300** when the seat **200** and the cushion are coupled to one another. The upper flange(s) **330** of the cushion may be maintained within the slot **225** of the seat **200** preventing the cushion **300** and the seat **200** from moving relative to one another.

A shape of the upper flange(s) **330** and a shape of the slot **225** may mirror one another. In some examples, as illustrated in FIGS. **7-9**, the upper flanges **330** and the slot **225** may have a triangular or substantially triangular shape. The shape of the upper flange(s) **330** and/or slot **225** may vary. For examples, the upper flange(s) **330** and/or slot may have a rectangular, semi-circular, or semi-elliptic shape. In some examples, the upper flange(s) **330** and the slot **225** may have different shapes.

The cushion **300** may further include an exterior flange **340** extending upward and/or radially outward from the cushion outer wall **310**. In some examples, as illustrated in FIG. **8**, a single exterior flange **340** may extend along the entire length of the cushion outer wall **310**. In some examples, a plurality of exterior flanges may extend from for the cushion outer wall at regular or irregular intervals. The exterior flange **340** may be configured to reside in the groove **227** when the cushion **300** and the seat are coupled to one another. Accordingly, a shape of the exterior flange **340** and a shape of the groove **227** may mirror one another. In some examples, the exterior flange **340** may have a triangular or a substantially triangular shape. In other examples, the exterior flange **340** may have a rectangular shape, a semi-circular, a semi-elliptic, or any other suitable shape.

The cushion **300** may further include a lower flange **350** extending radially inward from the cushion outer wall **310**. The lower flange **350** may be disposed below the upper flange **330**. The lower flange **350** may be disposed at or near a bottom of the cushion outer wall **310**. In some examples, as illustrated in FIGS. **8** and **9**, the cushion **300** may include a plurality of lower flanges **350** extending radially inward from the cushion outer wall **310**. In some examples, the plurality of lower flanges **350** may extend along the cushion outer wall **310** at a regular interval. In other examples, the plurality of lower flanges **350** may extend along the cushion outer wall **310** at irregular intervals. In some examples, a single lower flange **350** may extend along the entire length of the cushion outer wall **310**.

The lower flange(s) **350** may be configured to reside in a slot **225** disposed in the cavity bottom surface **223** when the cushion **300** and the seat **200** are coupled to one another. The lower flange(s) **350** and the slot **225** may advantageously improve a seam or interface between the seat **200** and the cushion **300** when the seat **200** and the cushion are coupled to one another. The lower flange(s) **350** of the cushion may be maintained within the slot **225** of the seat **200** preventing the cushion **300** and the seat **200** from moving relative to one another.

A shape of the lower flange(s) **350** and a shape of the slot **225** may mirror one another. In some examples, as illustrated in FIGS. **7-9**, the lower flanges **350** and the slot **225** may have a triangular or substantially triangular shape. The shape of the lower flange(s) **350** and/or slot **225** may vary. For examples, the upper flange(s) **330** and/or slot **225** may have a rectangular, semi-circular, or semi-elliptic shape. In some examples, the lower flange(s) **350** and the slot **225** may have different shapes.

In some examples, as illustrated in FIG. **8**, the plurality of upper flanges **330** and the plurality of lower flanges **350** may be staggered such that upper flanges **330** and lower flanges **350** alternate along the outer wall **310**. For example, the outer wall **310** may include only an upper flange **330** for a length along the outer wall and then only a lower flange **350** for a length along the wall. This pattern may repeat along the outer wall **310**. In some examples, there may be gap or space without an upper flange **330** or a lower flange **350** between the upper flange **330** and the lower flange **350**. In some examples, the length of an upper flange along the outer wall **310** may be longer than the length of a lower flange along the outer wall **310**. In some examples, the length of upper flange(s) **330** and the lower flange(s) **350** may be the same. In some examples, a total length of all of the upper flange(s) **330** may be the same as a total length of all the lower flange(s) **350**. In other examples, the total length of all the upper flanges(s) **330** may be shorter or longer than the total length of all the lower flange(s) **350**.

In some examples, the cushion **300** may include a cushion inner wall **360** disposed radially inward from the cushion outer wall **310**. A height and/or thickness of the cushion inner wall **360** may vary. In some examples, a height of the cushion inner wall **360** may vary along the length of the cushion inner wall **360**. The cushion inner wall **360** may be configured to deform elastically when a user sits on the toilet seat assembly **150**. In some examples, as illustrated in FIG. **9**, the inner wall **360** may have a smaller vertical height than the outer wall **310**. In other examples, the inner wall **360** and the outer wall **310** may have the same vertical height.

A plurality of bridges **362** may extend radially inward from the cushion outer wall **310** connecting the cushion outer wall **310** and the cushion inner wall **360**. A thickness of the plurality of bridges **362** may vary. A height of the

plurality of bridges **362** may vary. For example, the plurality of bridges **362** may have the same vertical height as the cushion inner wall **360**. In some examples, the height of the plurality of bridges **362** may vary along the length of the plurality of bridges **362**. For example, a height of the bridge may gradually decrease from a height of the outer wall **310** at the outer wall **310** to a height of the inner wall **360** at the inner wall **360**. In some examples, a bridge **362** may be disposed between adjacent flanges (e.g., upper flange **330**, lower flange **350**) of the cushion **300**.

FIG. **10** illustrates a perspective view of the cushion **300** of FIGS. **5**, **8**, and **9**. In some examples, as illustrated in FIG. **10**, the cushion **300** includes a locking rib **371** at each of the first end **301** and the second end **302** of the cushion **300**. The locking rib **371** is configured to extend radially inward from the outer wall **310** and/or the inner wall **360**. The locking rib **371** is disposed in the cavity **220** of the seat **200** when the cushion **300** and the seat **200** are coupled to one another. The locking rib **371** may contact the bottom surface **223** of the cavity **220** when the cushion **300** is coupled to the seat **200**. The locking rib **371** may contact the top surface **222** of the cavity **220** when the cushion **300** is coupled to the seat **200**. The locking rib **371** may help maintain a position of the cushion **300** relative to the seat **200** when the cushion **300** and seat are coupled to one another. The locking rib **371** may advantageously prevent the cushion **300** from uncoupling with the seat **200** during deformation of the cushion **300**.

In some examples, the cushion **300** may include a center channel **380**. The center channel **380** may be a datum or reference point for coupling the cushion **300** to the seat **200**. For example, the center channel **380** may be aligned with a centering rib **234** of the seat **200** when coupling the cushion **300** to the seat **200**. The centering channel **380** may receive the centering rib **234** when the cushion **300** is slid or positioned into the center channel **380**. The center channel **380** may secure or maintain a position of the centering rib **234** when the cushion **300** is coupled to the seat **200**.

Collectively, the center channel **380** and the centering rib **234** may control a position of the cushion **300** relative to the seat **200** when the cushion **300** is coupled to the seat **200**. Additionally, the center channel **380** and the centering rib **234** may control deformation or stretch of the cushion **300** when the cushion **300** is stretched to be coupled to the seat **200**. The center channel **380** and the centering rib **234** may also control deformation or stretch of the cushion **300** when the cushion **300** is in a stretched state of being coupled to the seat **200**. For example, the center channel **380** and the centering rib **234** may ensure that there is an equal or substantially similar amount of deformation or stretch in the cushion **300** on both side of the center channel **380**.

In some examples, as illustrated in FIG. **10**, the cushion **300** includes a locking tab **373** at each of the first end **301** and the second end **302**. The locking tabs may be configured to engage with the seat **200** when the cushion **300** is in a stretched state, coupling the cushion **300** to the seat **200**. Each of the locking tabs **373** (and the cushion **300** generally) may be configured to be stretched around the seat to couple the cushion **300** to the seat **200**. For example, each locking tab **373** may include a fastening loop **375** and a locking loop **377**. The fastening loop **375** may be configured to be clasped by a user and/or a tool to stretch the cushion **300** around the seat **200**. The locking loop **377** may be configured to be stretched to engage or circumscribe a portion of the seat **200** coupling the cushion **300** to the seat **200**. For example, the locking loop **377** may be stretched to circumscribe a locking projection **236** of the seat **200**, coupling the cushion **300** to the seat **200**. FIG. **11** illustrates a locking loop **377** engaged with or circumscribing a locking projection **236** according to an exemplary embodiment of the present disclosure.

FIG. **12** illustrates a partial cross section of the toilet seat assembly **150** according to an exemplary embodiment of the present disclosure. As illustrated in FIG. **12**, a bumper pocket **237** may extend through the seat **200** from the cavity bottom surface **223** to the seat bottom surface **202**. The shape of the bumper pocket **237** may vary. For example, the bumper pocket **237** may have an oval shape when viewed from below the seat **200**. In other examples, the bumper pocket **237** may have an oblong, rectangular, circular, or another shape. The bumper pocket **237** may be configured to receive a bumper **386**. The bumper pocket **237** and the bumper **386** may have the same shape. For example, both the bumper pocket **237** and the bumper **386** may have an oval shape when viewed from below the seat **200**. The bumper **386** may include a bumper flange **387** protruding from the bumper **386**. The bumper flange **387** may contact the cavity bottom surface **223**, preventing the bumper **386** from translating through the bumper pocket **237**.

The bumper **386** may be comprised of a rubber or a rubber like resin. For example, the bumper **386** may be comprised of a thermoplastic elastomer (TPE) such as thermoplastic vulcanizate (TPV), styrenic block copolymers (TPE-S), thermoplastic polyolefins (TPE-O), thermoplastic polyurethanes (TPE-U), thermoplastic copolyesters (TPE-E), melt processable rubber (MPR), thermoplastic polyether block amides (TPE-A), ethylene vinyl acetate (EVA) or a combination thereof. In this embodiment, the bumper **386** may be formed of a different material than the cushion **300**. In some embodiments, the bumper **386** may be comprised of two or more materials. In one example, the bumper **386** may include a polypropylene (PP) shell and over molded with a rubber or rubber like resin. Accordingly, the grip performance of the bumper may be maximized.

Further, referring to FIG. **12**, in some examples, the cushion **300** may include a bumper pad **383**. The bumper pad **383** may be configured to secure or maintain a position of the bumper **386**. When the cushion **300** is coupled to the seat **200**, the bumper pad **383** may align with the bumper **386** such that the bumper pad **383** contacts the bumper **386**. In some examples, the bumper pad **383** may extend between the cavity top surface **222** and bumper pad **383**. In some examples, the bumper pad **383** may further include a locking edge **388** extending downward from the bumper pad **383**. The locking edge **388** may be configured to engage or contact the bumper **386**, for example, the bumper flange **387**, securing or locking the position of the bumper **386** and the cushion **300** when the cushion **300** is coupled to the seat **200**. In some examples, the seat **200** may include two or more bumper pockets **237** each configured to receive a bumper **386** and the cushion **300** may include a bumper pad **383** for each bumper **386**.

Referring to FIGS. **3-11**, the toilet seat assembly **150** may be configured to deform elastically and vertically when a force is applied to a top surface **201** of the seat **200**. Specifically, the seat **200** and the cushion **300** may be configured to deform elastically and vertically when the weight of a user is applied to the seat top surface **201**. More specifically, the seat inner edge **203**, the outer perimeter of the seat top surface **205**, and the cushion **300** may be configured to deform elastically and vertically. The shape of the seat **200** and cushion **300** and the materials comprising the seat **200** and cushion **300** may be specifically selected to provide a desired deformation of the toilet seat assembly **150** when a user sits on the seat. The deformation or flex of the toilet assembly may be controlled to improve the comfort of

a user when they sit on the toilet seat assembly **150**. In one example, the cushion **300** may be configured to maximize deformation at the outer perimeter of the seat top surface **205**, thereby improving comfort for large users.

Further, the toilet seat assembly **150** may be configured to deform differently for different users. For example, the toilet seat assembly may deform differently for a small user than for a large user. In another, the toilet seat assembly **150** may deform differently for a lighter user than a heavier user. The toilet seat assembly may deform differently depending on a magnitude and/or a location(s) where a load is applied. In another example, the inner edge **203** of the seat **200** may be configured to deform elastically and vertically downward in response to a smaller user (because the user is only occupying that portion of the seat). Conversely, an outer perimeter of the seat top surface **205** may be configured to deform elastically and vertically in response to a larger user (because this is the location occupied by a user and where a majority of the load is applied by the user.

Deformation or flex of the toilet seat assembly **150** may be controlled by the materials comprising the seat **200** and/or the cushion **300**. Deformation of the toilet seat assembly may be controlled by a shape of the seat **200** and/or cushion **300**. For example, deformation may be controller by a thickness of the seat **200** and/or cushion **300**. Deformation of the toilet seat assembly **150** may further be controlled by a varying cross-sectional profile or bending profile of the seat **200** and/or cushion **300**.

In some embodiments, the cushion **300** may be configured to determine or control deformation of the seat. Accordingly, deformation of the toilet seat assembly **150** may be changed by changing the cushion **300**. A material comprising the cushion **300** may determine or control deformation of the toilet seat assembly **150** In some embodiments, the cushion **300** may be comprised of two or more materials. The material or materials comprising the cushion may be selected for their physical properties. For example, the material or materials comprising the cushion may be selected based on their durometer. The cushion **300** may be comprised of a rubber or rubber like resin. For example, the cushion **300** may be comprised of a thermoplastic elastomer (TPE) such as thermoplastic vulcanizate (TPV), styrenic block copolymers (TPE-S), thermoplastic polyolefins (TPE-O), thermoplastic polyurethanes (TPE-U), thermoplastic copolyesters (TPE-E), melt processable rubber (MPR), thermoplastic polyether block amides (TPE-A), ethylene vinyl acetate (EVA) or a combination thereof. In another example, the cushion **300** may be comprised of silicone rubber or flexible PVC.

During use of the toilet seat assembly **150**, the seat bottom surface **202** may be supported by an upper or top surface of the rim **115** and a force (e.g., weight) may be applied to the seat top surface **201**. The seat **200** and the cushion **300** may be configured to deform elastically and vertically in response to a compressive force between the user and an upper surface of the rim of the toilet. The cushion **300** may be compressed within the cavity **220** of the of the seat **200**.

Specifically, the cushion outer wall **310** may be compressed between the cavity top surface **222** and the cavity bottom surface **223** as the seat **200** deforms. In some examples, a spring constant or amount of force required to compress the cushion outer wall **310** a specific distance may control or substantially control deformation of the seat **200**. The spring constant of the cushion outer wall **310** may vary. The spring constant of the outer wall **310** may vary based on the material comprising the cushion outer wall **310**, a thickness of the cushion outer wall **310**, and a shape of the cushion outer wall **310**.

In some examples, as described above, the cushion **300** may further include a cushion inner wall **360**. The cushion outer wall **310** and the cushion inner wall **360** may provide two-stage deformation of the toilet seat assembly **150** when a force is applied to the seat top surface **201**. During an initial or primary deformation of the toilet seat assembly **150** only the cushion outer wall **310** may be compressed between the cavity top surface **222** and the cavity bottom surface **223**. During a secondary deformation of the toilet seat assembly **150**, both the cushion outer wall **310** and the cushion inner wall **360** may be compressed between the cavity top surface **222** and the cavity bottom surface **223**.

In some examples, the cushion outer wall **310** may be taller than the cushion inner wall **360**. Accordingly, during an initial deformation of the seat **200**, only the cushion outer wall **310** may be compressed between the cavity top surface **222** and the cavity bottom surface **223**. After the initial deformation, the seat **200** may be displaced such that the cavity top surface **222** is in contact with the cushion inner wall **360**. Accordingly, during a secondary deformation of the toilet seat assembly **150**, the both the cushion outer wall **310** and the cushion inner wall **360** may be compressed between the cavity top surface **222** and the cavity bottom surface **223**. During the initial deformation, the spring constant of the cushion outer wall **310** may control or dictate deformation of the seat **200**. During secondary deformation, a combined or total spring constant of both the cushion outer wall **310** and the cushion inner wall **360** may control or dictate deformation of the seat **200**.

In some examples, the height of the one or more bridges **362** may decrease from a height of the cushion outer wall **310** at the cushion outer wall **310** to a height of the cushion inner wall **360** at the cushion inner wall **360**. In these examples, the cushion **300** may provide a continuously increasing spring constant during the initial deformation, as the portion of the bridge **362** compressed between cavity top surface **222** and the cavity bottom surface **223** increases as the toilet seat assembly **150** deforms.

FIG. **13** illustrates a flow chart for coupling a cushion to a seat according to an exemplary embodiment of the present disclosure. The flow chart may be used to couple various toilet seat assemblies (e.g., cushions and seats) described herein. For ease of explanation, the flow chart of FIG. **13** is described below with respect to the toilet seat assembly **150** including cushion **300** and seat **200**. Additional, different, or fewer acts may be provided.

At act **S101**, the bumper **386** is inserted into the bumper pocket **237** of the seat **200**. The bumper **386** may be inserted into the bumper pocket **237** through the cavity **220** of the seat. The bumper **386** may be inserted into the bumper pocket **237** so as to extend through the bumper pocket **237**. When the bumper **386** is inserted in the bumper pocket **237**, the bumper flange **387** may contact the cavity bottom surface **223**. In some examples, two or more bumpers **386** may each be inserted into different bumper pockets **237** at act **S101**. In some examples, more than two bumpers **386** may each be inserted into different bumper pockets **237** at act **S101**.

At act **S103**, the center channel **380** of the cushion **300** is aligned with the centering rib **234** of the seat **200**. The center channel **380** may be aligned with the centering rib **234** so as to receive the centering rib **234** when the cushion **300** is inserted into the cavity **220** of the seat **200**. The center channel **380** and the centering rib **234** may be aligned to

control a position of the cushion **300** relative to the seat **200** when the cushion **300** is coupled to the seat **200**. In some examples, the center channel **380** and the centering rib **234** may control an amount of deformation or stretch in the cushion **300** when the cushion **300** is stretched to be coupled to the seat **200**. The center channel **380** and the centering rib **234** may control deformation or stretch of the cushion **300** such that there is the same or a substantially similar amount of stretch in the cushion **300** on both sides of the center channel **380** when the cushion **300** is coupled to the seat **200**.

At act S**105**, the cushion **300** is inserted into to cavity **220** of the seat **200**. The cushion **300** may be inserted into the cavity **220** such that the centering rib **234** is received in the center channel **380** of the cushion **300**. In some examples, at act S**105**, only a portion of the cushion **300** is inserted into the cavity **220**.

At act S**107**, the cushion **300** is stretched so that a first locking loop **377** disposed at a first end **301** of the cushion **300** may be looped around a first locking projection **236** of the seat **200**. At act S**107**, the center channel **380** and the centering rib may fix or maintain a position of the cushion **300** at the center channel **380** such that the first end **301** of the cushion **300** may be stretched. The first locking loop **377** may be located on a first locking tab **373** disposed at or near the cushion **300** first end **301**. The first locking projection **236** may extend from a hinge bracket **232** disposed at or near a back end of the seat **200**. In some examples, at act **107**, a fastening loop **375** disposed at or near the cushion **300** first end **301** may be grabbed by a user to stretch the cushion **300**. In other examples, a tool including a hook may be inserted into the fastening loop **375** to stretch the cushion **300**.

At act S**109**, the first locking loop **377** is looped around the first locking projection **236**. The first locking loop **377** may be looped around the first locking projection **236** so as to circumscribe the first locking projection **236**. When the first locking loop **377** circumscribes the first locking projection **236**, the cushion **300** may be stretched between the center channel **380** and the first locking loop **377** so as to be disposed within the cavity **220** and coupled to the seat **200**.

At act S**111**, the cushion **300** is stretched so that a second locking loop **377** disposed at a second end **302** of the cushion **300** may be looped around a second locking projection **236** of the seat **200**. At act S**111**, the center channel **380** and the centering rib may fix or maintain a position of the cushion **300** at the center channel **380** such that the second end **302** of the cushion **300** may be stretched. The second locking loop **377** may be located on a second locking tab **373** disposed at or near the cushion **300** second end **302**. The second locking projection **236** may extend from a hinge bracket **232** disposed at or near a back end of the seat **200**. In some examples, at act S**111**, a fastening loop **375** disposed at or near the cushion **300** second end **302** may be grabbed by a user to stretch the cushion **300**. In other examples, a tool including a hook may be inserted into the fastening loop **375** to stretch the cushion **300**.

At act S**109**, the second locking loop **377** is looped around the second locking projection **236**. The second locking loop **377** may be looped around the second locking projection **236** so as to circumscribe the second locking projection **236**. When the second locking loop **377** circumscribes the second locking projection **236**, the cushion **300** may be stretched between the center channel **380** and the second locking loop **377** so as to be disposed within the cavity **220** and coupled to the seat **200**.

When both the first and second locking loops **377** have been looped around the first and second locking projections **236**, the cushion **300** may be stretched around the seat **200** between the first and second locking loops **377** coupling the cushion **300** to the seat **200**. In some examples, a cover may be attached to a back side of the seat **200** between the first and second locking projections **236** to hide or conceal the locking tabs **373** disposed at the cushion **300** first end **301** and second end **302**, respectively.

Referring generally to FIG. **14**, in some examples, the seat **401** may include two or more seat cavities **402**. Each of the two or more seat cavities **402** may be disposed in the seat outer surface **403**. In some examples, a first cavity **402** may be formed in seat first side **404** between a seat front end **405** and a seat back end **406** and a second cavity **402** may be formed in the seat second side **407**. The height and or portion of the seat outer surface **403** along which the cavities extend may vary. Each of the cavities **402** may be configured to receive a cushion.

Specifically, FIG. **14** illustrates a perspective view of a toilet seat **401** according to another embodiment of the present disclosure. Like the toilet seat **200**, the toilet seat **401** includes annular seat top surface **409**, annular seat bottom surface **410** opposite the seat top surface **409**, and seat inner edge **411** where the seat top surface **409** and seat bottom surface **410** meet. Additionally, the seat **401** includes seat outer surface **403** extending from an outer perimeter of the seat top surface **413** to an outer perimeter of the seat bottom surface **414**. The seat **401** further includes a seat front end **405** and a seat back end **406**. The seat **401** may further include a seat first side (e.g., left side) **404** extending between the seat front end **405** and the seat back end **406** and a seat second side (e.g., right side) **407** opposite the seat first side and extending from the seat front end **405** to the seat back end **406**.

FIG. **15** illustrates a transparent bottom view of the seat **401** of FIG. **5**. As illustrated in FIG. **15**, the seat **401** incudes a first cavity **416** formed in a portion of the seat outer surface **403** on the first side **404** of the seat **401** and a second cavity **417** formed in a portion of the seat outer surface **403** on the second side **407** of the seat **401**. The first cavity **416** and the second cavity **417** are disposed in the seat outer surface **403** and extend toward the inner edge **411** of the seat **401**. The size and shape of the first cavity **416** and the second cavity **417** may vary. For example, a vertical height of the cavity between the top surface **409** and the bottom surface **410** may be larger or smaller. In another example, a length around the seat outer surface **403** in which the first cavity **416** and the second cavity **417** extend may be larger or smaller. In yet another example, the depth and shape of an interior surface of the cavity may vary. The first cavity **416** and second cavity **417** may each be configured to receive a cushion therein. In some embodiments, the seat may have more than two cavities.

Referring generally to FIGS. **16** and **17**, in some embodiments, deformation, or flex of the cushion may be controlled or configured using a pattern formed within the cushion. The pattern formed in the cushion may include variations in shape (i.e., a varying profile) and/or variations in material. The pattern may include localized compression zones wherein the profile of a cushion formed of a single material is varied such that a specific region of the profile extends or protrudes vertically away from the rest of the profile. For example, localized pressure zones may include ribs, crush blades, and crush pads formed in a cushion comprised of one material. The pattern may also include variable compression zones, wherein a portion of a profile of a cushion is comprised of a different material than the rest (or a at least a different portion) of the profile. In some examples, variable compression zones may be formed in the profile of the

cushion so as not to extend or protrude from the profile. In other embodiments, variable compression may include ribs, crush blades, and crush pads formed of a different material than the rest of the profile. In one example, a variable compression zone in the cushion may include a soft gel or air interior enclosed in a durable soft-shell exterior. Additionally, variable compression zones may take the form of one or more inserts comprising a material different than the cushion, inserted into the cushion. The location of one or more inserts in the cushion **300** may vary. In one example, the one or more inserts may be inserted at a location in the cushion corresponding to a location where a bumper on the bottom surface of the seat contacts an upper rim of a toilet. In some embodiments, two inserts may be installed proximate to the cushion front end and two inserts may be installed proximate to the cushion back end.

FIG. **16** illustrates a cushion **420** according to an exemplary embodiment of the present disclosure. As illustrated, the cushion **420** includes a plurality of ribs **421**. The ribs **421** may create a localized compression zone in the cushion **420**. Accordingly, each rib **421** is a region along the profile of the cushion **420** that extends vertically away from the rest of the profile. The vertical distance by which the ribs **421** extend away from the rest of the profile of the cushion may vary. The location and size of the ribs **421** may vary. As illustrated in FIG. **16**, the ribs **421** generally extend from the cushion back end **422** to the cushion front end **423** and around the cushion front end **423**. In other embodiments, the ribs may extend from the cushion inner edge **424** to the cushion outer surface **425**.

FIG. **17** illustrates a cushion **430** according to another exemplary embodiment of the present disclosure. The cushion **430** as illustrated in FIG. **17** includes crush pads (i.e., crush zones) **431**. Crush pads **431** formed of the same material as the rest of the cushion **430** may create localized compression zones in the cushion **430**. Crush pads **431** formed of a material different than the material comprising the rest of the cushion **430** may create variable crush zones in the cushion **430**. The vertical distance by which the crush pads **431** extend away from the rest of the profile of the cushion **430** may vary. The number of, size, and shape of the crush pads **431** may vary. As illustrated in FIG. **17**, the crush pads **431** are circular. In other embodiments, the crush pads may be any other shape such as rectangular, trapezoidal, and the like.

Referring to FIG. **18**, a cushion **435** including a plurality of compression pads **436** is illustrated. As illustrated in FIG. **18**, a plurality of compression pads **436** may be disposed along an interior portion **437** of the cushion **435** disposed adjacent to the interior perimeter **438** of the cushion **435**. Each of the plurality of compression pads **436** may be compressed within a cavity of a seat, in response to a force applied to a top surface of the seat. The quantity, size, and material comprising the compression pads **436** may control deformation of a toilet seat assembly including the cushion **435**. As illustrated in FIG. **18**, the compression pads **436** may be intermittently provide around the insertion portion of the cushion **435**.

Referring to FIG. **19**, a cushion **440** including a compression web **441** is illustrated. As illustrated in FIG. **19**, the compression web **441** is comprised of a plurality of partitions **443**. The plurality of partitions **443** may intersect forming relatively thin pockets **444** between the plurality of partitions **443**. A thickness of the partitions **443** may vary across the cushion **440**. For example, the partitions **443** may be relatively thin at a cushion inner edge **446** and may gradually increase in thickness toward a cushion outer edge **447**. The cushion **440** may be configured to be disposed within a cavity in a seat. When a load is applied to a top surface of the seat, the plurality of partitions may be configured to be compressed between a cavity top surface and a cavity bottom surface. The cushion may have a spring constant or amount of force required to compress the cushion a predetermined distance between the cavity top surface and the cavity bottom surface. The cushion spring constant may be determined by a material comprising the cushion, a number of partitions **443**, a height of the partitions **443**, and/or a width of the partitions **443**. For example, a spring constant of the cushion **440** may be increased by increasing a durometer of the material comprising the cushion, increasing a quantity of partitions **443** and/or increasing a width of the partitions **443**. Conversely, a spring constant of the cushion **440** may be reduced by decreasing a durometer of the material comprising the cushion **440**, decreasing a quantity of partitions **443** and/or decreasing a width of the partitions **443**.

Referring to FIG. **20** a cross section of a toilet seat assembly **450** including a seat **451** and a cushion **460** according to an exemplary embodiment of the present disclosure is illustrated. As illustrated in FIG. **20**, in some examples, the cushion **460** may include an integrated bumper **461** configured to extend through a bumper pocket **452** extending between a seat bottom surface **453** and a cavity bottom surface **454**. The integrated bumper **461** and the bumper pocket **452** may couple the cushion **460** to the seat **451** and prevent movement of the cushion **460** relative to the seat **451** at the integrated bumper **461**. The bumper pocket **452** and the integrated bumper **461** may have the same shape. The shape of the bumper pocket **452** and the integrated bumper **461** may vary. For example, the bumper pocket **452** and the bumper **461** may have a rectangular shape.

Still referring to FIG. **20**, in some examples, the cushion **460** may further include a retaining feature **464**. The retaining feature **464** may be configured to extend out of the cavity **459** of the seat **451** and around an outer perimeter **457** of the seat bottom surface **453**. In some examples, the integrated bumper **461** and the retaining feature **464** may collectively couple the cushion **460** to the seat **451**. Specifically, a portion of the seat **451** may be disposed between the integrated cushion **460** and the retaining feature **464**. The integrated bumper **461** and the retaining feature **464** may be used alone or in combination with any other structure for coupling the cushion **460** to the seat **451**.

FIGS. **21** and **22** illustrate cross-section views of toilet seat assemblies according to exemplary embodiments of the present disclosure. Specifically, FIG. **21** illustrates a cross-section view of a toilet seat assembly **470** in which a cavity **471** in a seat **472** is entirely filled by a cushion **473**.

In other examples, as illustrated in FIG. **22**, a toilet seat assembly **475** may include an air pocket **476** disposed between an interior surface **477** of the cavity **478** and the cushion **479**. In some examples, an air pocket **476** may be disposed between an interior surface of the cavity **478** and the cushion **479** to facilitate deformation of the cushion **479**. As the cushion **479** is deformed vertically, the cushion may expand horizontally or radially. Providing an air pocket **476** between an interior surface **477** of the cavity **478** may allow the cushion **479** to deform horizontally or radially both inward and outward (i.e., both toward and away from a seat inner edge). The portion of the cavity **478** occupied by the cushion **479** may vary. Additionally, a cross sectional shape of the cushion may vary.

Referring generally to FIGS. **23-37**, a plurality of structures for coupling a cushion to a seat are illustrated. Any of the structures illustrated in FIGS. **23-37** and described herein after may be used alone or in combination to couple a cushion to a seat.

Referring to FIG. **23**, a seat **480** including a central locking projection **481** is illustrated. The central locking projection **481** may extend vertically from a cavity bottom surface **482** of a cavity **483** disposed in the seat **480**. The central locking projection **481** may extend vertically from the cavity bottom surface **482** at a point along a central axis of the seat **480**. The central locking projection **481** may be configured to engage with a locking loop (e.g., locking loop **377**) disposed on each end (e.g., **301**, **302**) of a cushion. Specifically, the central locking projection **481** may be circumscribed by a locking loop disposed on each end of a cushion. The seat **480** may further include a first guide **485** and a second guide **486**.

The central locking projection **481** may be configured to be looped or circumscribed by the locking loops one at a time. Specifically, a first locking loop may be looped around the central locking projection **481**. When the first locking loop is looped around the central locking projection **481**, the first locking loop may be in contact with a top surface of the first guide **485**. Next, a second locking loop may be looped around the central locking projection **481**. When the second locking loop is looped around the central locking projection **481**, the second locking loop may be in contact with a top surface of the second guide **486**.

Referring to FIG. **24**, a bottom perspective view of a toilet seat assembly **490** according to an embodiment of the present disclosure is illustrated. In this example, the cushion **491** includes two bumpers **492** (i.e., bumper portions) protruding or extending from a bottom surface of the cushion **491**. Each of the bumpers **492** may extend through a bumper pocket extending between the seat bottom surface **493** and a bottom surface of a cavity (e.g., cavity bottom surface) in the seat **494**. The bumpers **492** and the bumper pockets may be configured couple the cushion **491** to the seat **494**. The number of bumper portions disposed on the cushion **491** bottom surface may vary. In one example, a singular bumper portion **492** may extend or protrude from the cushion **491** bottom surface. In another example, three bumper portions **492** may be disposed on the cushion **491** bottom surface.

Still referring to FIG. **24**, the bumpers **492** extend through bumper pocket in the seat **494** between a cavity in the seat and the seat bottom surface **493**. The bumper pockets may have a shape corresponding to the bumper portion **492** of the cushion **491** such that the entire bumper pocket is filled when the cushion **491** is disposed in the seat **494**. In some embodiments, a single bumper pocket may be formed in the seat **200**. In other embodiments, the more than two bumper pockets may be formed in the seat **494**. The number of bumper pockets may correspond to a number of bumper portions **492** disposed on the cushion **491** bottom surface. As shown in FIG. **24**, when the bumper portions **492** extend through the bumper pockets formed in the seat **494**, the cushion **491** may be coupled (e.g., secured) to the seat **494**.

Referring generally to FIGS. **25** and **26**, a toilet seat assembly **500** including a slot lock feature is illustrated. FIG. **25** illustrates a partial cross-section view of a toilet seat assembly **500** including a slot lock feature. In this example, the cushion **501** may have an arcuate shape extending from a cushion first end to a cushion second end. As illustrated in FIG. **25**, the cushion **501** includes a hook **502** at each of the cushion first end and the cushion second end. The hook **502** includes a hook narrow portion **503** extending from an end of the cushion **501** between the end of the cushion **501** and the hook flared portion **504**. The hook flared portion may have a larger cross-sectional area than the hook narrow portion **503**.

As illustrated in FIG. **26**, the hook flared portion **504** at a first end of the cushion **501** may be configured to be deformed (e.g., compressed) and inserted through a first slot formed in or near the seat back end **506** and the hook flared portion **504** of the hook at a second end of the cushion **501** may configured to be deformed (e.g., compressed) and inserted through a second slot formed in or near the seat back end **506**. The first and second slot formed in the seat may have a shape corresponding to the hook narrow portion **503** and have a cross sectional area smaller than that of the hook flared portions **504**. Accordingly, after the hook flared portions have been inserted through their respective openings, the hook flared portions **504** may return to their non-deformed states. The non-deformed states of the hook flared portions may have a larger cross-sectional area than the first and second slots in the seat **508**. Accordingly, the cushion **501** may be coupled or secured to the seat **508**. In other embodiments, the first slot and the second slot may be disposed at various locations. For example, the first and second slot may be disposed at or near a seat front end **509**

Further, in the embodiment of FIGS. **25** and **26**, the cushion **501** includes bumper portions **510** that extend through openings formed in the seat **508**. As shown, the bumper portions **510** extend from the cavity through the seat bottom surface **511**. The seat **508** includes openings corresponding to the shape of the bumpers **510**. When the toilet seat assembly of FIGS. **25** and **26** is attached to a toilet, the bumper portions **510** may contact the upper rim of the toilet and prevent the toilet seat assembly from moving (e.g., sliding) relative to the toilet when a user sits on the toilet seat assembly. The bumper portions **510** and their corresponding openings formed in the seat **508** may couple or secure the cushion **501** and the seat **508** to one another.

Referring to FIG. **27**, a perspective view of a toilet seat assembly **515** according to an exemplary embodiment of the present disclosure is illustrated. In this example, a cavity formed in the seat **516** extends around the entire outer perimeter of the seat **516**. Accordingly, the cushion **517** has an oval shape corresponding to the oval shape of the seat top surface **518** and the seat bottom surface. In this example, the vertical height of the cavity and the cushion **517** varies at different locations around the seat **516** and cushion **517**. The cushion **517** may elastically and radially deform (e.g., stretch) from a natural state such that the cushion may be pulled around an outer perimeter of the seat top surface **518** or an outer perimeter of the seat bottom surface and into the cavity securing the cushion **517** within the cavity and coupling the cushion **517** to the seat **516**.

Referring generally to FIGS. **28-31**, a cushion may include a loop (e.g., a locking loop **377**) at each of a first end and a second end of the cushion. The cushion may be configured to elastically deform (e.g., stretch) from a natural state in which no forces are applied to the cushion such that a loop (e.g., locking loop **377**) on each of the first end and second end of the cushion loop or circumscribe a first projection (e.g., locking projection **236**) and a second projection (e.g., locking projection **236**), respectively. In these embodiments, the cushion may be held in tension between the first projection and the second projection.

Referring to FIG. **28**, a partial perspective view of a toilet seat assembly **520** according to an exemplary embodiment of the present disclosure is illustrated. In this example, the first projection **521** may extend or protrude from an outer

surface of the seat **522**. The first projection **521** may be disposed at or near a back end of the seat **522**. The first projection **521** may be offset to first side of a central axis of the seat **522** between a front end and a back end of the seat **522**. The seat **522** may include a second projection offset to a second side, opposite the first side of the central axis of the seat **522**. In some examples, the first projection **521** and second projection my each include a hole for coupling the toilet seat assembly **150** to a hinge assembly (e.g., a pin of a hinge assembly). The shape and location of the first projection **521** and the second projection may vary.

As illustrated in FIG. **28**, a loop (e.g., locking loop **377**) in a first end **523** of the cushion **524** may be configured to circumscribe the first projection **521**. The loop in the second end of the cushion may be configured to circumscribe a second projection extending from the seat **522**. Accordingly, when the loop in the first end **523** of the cushion **524** and the loop in the second end of the cushion **524** circumscribed the first projection **521** and the second projection respectively, the cushion **524** may be coupled or secured to the seat **522**.

Referring generally to FIGS. **29-31**, a toilet seat assembly **530** according to an exemplary embodiment of the present disclosure is illustrated. Specifically, FIG. **298** illustrates a partial perspective view of the seat **531**. In this example, the first projection **532** and the second projection **533** are disposed at or near the seat back end **535**. In some examples, as illustrated in FIG. **29**, the first projection **532** and the second projection **533** may face one another. In some examples, the first projection **532** and the second projection **533** may be disposed between the seat inner edge **537** and the seat outer surface **538**. The size and location of the first projection **532** and the second projection **533** may vary.

Referring to FIG. **30**, channels **540** may be formed in the seat back end **535** extending from the seat outer surface **538** to the first projection **532** and the second projection **533**, respectively. Referring to FIGS. **29** and **30**, a first channel may be formed in the seat outer surface **538** in the seat first side **541** near the seat back end **535** and a second channel may be formed in the seat outer surface **538** in the seat second side **542** near the seat back end **535**. The number, size, and location of the channels may vary. Accordingly, when the loop in the cushion first end and the loop in the cushion second end circumscribe the first projection **532** and the second projection **533** respectively, a portion of the cushion proximate to the cushion first end and a portion of the cushion proximate to the cushion second end may be disposed in the first channel and the second channel, respectively.

FIG. **31** illustrates a perspective view of the toilet seat assembly of FIGS. **29** and **30**. In this embodiment, the seat **531** may further include a cover **545** that may be removably coupled to the seat back end **535**. The cover **545** may be configured to cover a region of the seat **531** between the channel **540** in the seat first side **541** and the channel **540** in the seat second side **542**. The cover **545** may be configured to conceal the first projection **532** and the second projection **533** and/or a portion of the cushion **546**. In some embodiments, the cover **545** may be comprised of the same material as the seat **531**.

Referring to FIG. **32**, a partial perspective view of a toilet seat **550** according to an exemplary embodiment of the present disclosure is illustrated. In this example, the seat **550** further includes a fastener hole in the seat back end **551** and a fastener **552**. The fastener **552** may be a nail, screw, bolt, anchor, or the like. The location and number of the fastener holes may vary. For example, the seat **550** may include a fastener hole located in a seat first side and/or the seat second side near the seat back end **551**. In another example, four fastener holes may be disposed in the seat bottom surface **554**. The fastener **552** may be configured to extend through the fastener hole and into the cushion. The fastener **552** may be configured to couple or secure a cushion to the seat **550**.

Referring generally to FIGS. **33-35**, a toilet seat assembly may include a cam lock for coupling the cushion to the seat. FIG. **33** illustrates a perspective view of a cam lock **560** according to an exemplary embodiment of the present disclosure. The cam lock **560** may have a cylindrical body **561** extending between a cam portion **562** and a lever portion **563**. The cam portion **562** and the lever portion **563** may both have an oblong shape. In some examples, the cam portion **562** may be pear shaped. In some examples, the cam lock **560** may be comprised of polypropylene (PP). In other embodiments, the cam lock **560** may be comprised of another material.

FIG. **34** illustrates a toilet seat assembly **570** according to an embodiment of the present disclosure. In this embodiment, the cam lock **560** is inserted through an opening formed in the seat bottom surface **571**. When inserted into the opening formed in the seat bottom surface **571** the cam lock **560** may extend into an opening formed in the cushion **572**. The shape of the opening in the cushion may vary. For example, in some embodiments, the opening in the cushion **572** may have a circular shape. In another example, the opening may have a rectangular shape. The opening in the cushion **572** may have a circular shape. In some embodiments, a portion of the cylindrical body **561** and the cam portion **562** may extend into the opening formed in the cushion. When disposed in the seat **573** and cushion **572**, the cam lock **560** may be configured to rotates about the axis of the cylindrical body **561**. The cam lock **560** may be configured such that a user can rotate the cam lock **560** by moving (e.g., rotating, pushing, pulling) the lever portion **563** causing the cam lock **560** to rotate about the axis of the cylindrical body **561**. When the cam lock **560** is rotated, the cam portion **562** may impinge on an inner surface of the opening in the cushion such that cushion **572** is held in contact with the seat **573**, coupling or securing the cushion **572** to the seat **573**.

In some embodiments, the seat assembly **570** may include two or more cam locks **560**. The location of the openings in the seat **573** and cushion **572** may vary. In one example, the seat assembly may include two cam locks **560**. The seat **573** may include an opening in the seat first side **291** near the seat back end **209** and another opening in the seat second side **296** near the seat back end **209**. The location of the openings in the seat **573** may corresponded to the location of openings in the cushion **572**, when the cushion **572** is disposed in the seat **573**. In another example, the seat assembly **570** may include four cam locks **560**.

FIG. **35** illustrates a partial perspective view of a seat **580** according to an embodiment of the present disclosure. In this embodiment, the seat **580** is configured to have a recess formed therein configured to accommodate the lever portion **563** of the cam lock **560**. In this embodiment, the cam lock **560** is configured such that when the lever portion **563** of the cam lock is moved to a position in which the cam portion **562** impinges on the cushion **572** such that it is held in contact with the seat **580** (i.e., a locked position), the lever portion **563** is held within the recess formed in the seat **580** by a lip formed on a top surface of the cushion. In other examples, the seat may include one or more detents configured to hold the lever portion such that the cam lock **560** is held in a locked position.

FIG. **36** illustrates a partial cross section view of a toilet seat assembly **590** according to an exemplary embodiment of the present disclosure. In this embodiment, the toilet seat assembly **590** includes a bumper **591** having an internal cavity **592**. The bumper **591** is configured to extend through a hole or bumper pocket formed in the bottom surface **594** of the seat **595** such that the internal cavity **592** engages a protrusion **597** formed on the cushion **599**, securing the cushion **599** within the internal cavity of the seat **595**.

Generally, when a user sits on a toilet seat, the user only contacts a portion of the top surface of the seat. Specifically, due to the shape of the human body, a user may not contact a portion of the seat at a front and/or at a back of the seat. Referring to FIG. **37**, a diagram illustrating a surface area of a seat top surface **601** on which a user typically sits is illustrated. Referring to FIG. **37**, an oval **602** corresponding to a general shape of a user may be overlayed onto of a top view of the seat **600** to determine an area of the seat that is likely to contact a user during use of the seat **600**. Specifically, an area **604** of the seat within the oval **602** is likely to contact a user during use and an area **605** of the seat outside the oval **602** is not likely to contact a user.

According to the present disclosure, deformation of the various toilet seat assemblies described herein may provide for an increase in surface area of the seat **600** in contact with a user during use of the seat. Increased surface area in contact with a user may improve weight distribution between the user and the seat and thus improve user comfort during use of the seat **600**.

When a component, device, element, or the like of the present disclosure is described as having a purpose or performing an operation, function, or the like, the component, device, or element should be considered herein as being "configured to" meet that purpose or perform that operation or function.

The phrases "coupled with" or "coupled to" include directly connected to or indirectly connected through one or more intermediate components. Additional, different, or fewer components may be provided. Additional, different, or fewer components may be included.

The illustrations of the embodiments described herein are intended to provide a general understanding of the structure of the various embodiments. The illustrations are not intended to serve as a complete description of all of the elements and features of apparatus and systems that utilize the structures or methods described herein. Many other embodiments may be apparent to those of skill in the art upon reviewing the disclosure. Other embodiments may be utilized and derived from the disclosure, such that structural and logical substitutions and changes may be made without departing from the scope of the disclosure. Additionally, the illustrations are merely representational and may not be drawn to scale. Certain proportions within the illustrations may be exaggerated, while other proportions may be minimized. Accordingly, the disclosure and the figures are to be regarded as illustrative rather than restrictive.

While this specification contains many specifics, these should not be construed as limitations on the scope of the invention or of what may be claimed, but rather as descriptions of features specific to particular embodiments of the invention. Certain features that are described in this specification in the context of separate embodiments can also be implemented in combination in a single embodiment. Conversely, various features that are described in the context of a single embodiment can also be implemented in multiple embodiments separately or in any suitable sub-combination. Moreover, although features may be described above as acting in certain combinations and even initially claimed as such, one or more features from a claimed combination can in some cases be excised from the combination, and the claimed combination may be directed to a sub-combination or variation of a sub-combination.

One or more embodiments of the disclosure may be referred to herein, individually and/or collectively, by the term "invention" merely for convenience and without intending to voluntarily limit the scope of this application to any particular invention or inventive concept. Moreover, although specific embodiments have been illustrated and described herein, it should be appreciated that any subsequent arrangement designed to achieve the same or similar purpose may be substituted for the specific embodiments shown. This disclosure is intended to cover any and all subsequent adaptations or variations of various embodiments. Combinations of the above embodiments, and other embodiments not specifically described herein, will be apparent to those of skill in the art upon reviewing the description.

It is intended that the foregoing detailed description be regarded as illustrative rather than limiting and that it is understood that the following claims including all equivalents are intended to define the scope of the invention. The claims should not be read as limited to the described order or elements unless stated to that effect. Therefore, all embodiments that come within the scope and spirit of the following claims and equivalents thereto are claimed as the invention.

What is claimed is:

1. A toilet seat comprising:

a top surface;

a bottom surface opposite the top surface;

an inner edge where the top surface and the bottom surface meet;

an outer surface connecting an outer perimeter of the top surface and an outer perimeter of the bottom surface; and

a cavity extending from the outer surface toward the inner edge; and

wherein the top surface and the cushion are configured to deform elastically and vertically in response to a load applied to the top surface,

wherein a shape of the cavity is defined by a cavity interior surface including an inner cavity top surface and an inner cavity bottom surface opposite the inner cavity top surface, and

wherein the cushion includes an outer wall extending between the inner cavity top surface and the inner cavity bottom surface,

the toilet seat further comprising:

at least one slot disposed in an interior surface of the cavity and extending into the seat; and

at least one flange extending radially inward from the outer wall and disposed within the at least one slot.

2. The toilet seat of claim **1**, wherein:

a shape of the cavity is defined by a cavity interior surface; and

an air pocket is disposed between the cushion and an interior surface of the cavity.

3. The toilet seat of claim **1**, wherein:

the at least one slot includes a first slot disposed in the inner cavity top surface and a second slot disposed in the inner cavity bottom surface; and

the at least one flange includes a first flange extending radially inward and disposed in the first slot and a second flange extending radially inward and disposed in the second slot.

4. The toilet seat of claim **1**, wherein the cushion further comprises:

an inner wall disposed inside the outer wall; and

a plurality of bridges extending radially inward from the outer wall connecting the outer wall and the inner wall.

5. The toilet seat of claim **1**, further comprising:

a groove disposed in an interior surface of the cavity and extending into the seat; and

an exterior flange extending upward and/or radially outward from the outer wall and disposed in the groove.

6. The toilet seat of claim **1**, wherein:

the seat further comprises a locking projection; and

the cushion further comprises a locking loop circumscribing the locking projection.

7. A toilet comprising:

a bowl;

a toilet seat coupled to the bowl, the toilet seat comprised of a first material, the seat comprising:

a top surface;

a bottom surface opposite the top surface;

an inner edge where the top surface and the bottom surface meet;

an outer surface connecting an outer perimeter of the top surface and an outer perimeter of the bottom surface;

a cavity extending from the outer surface toward the inner edge; and

a cushion comprised of a second material different than the first material, the cushion removably coupled to the seat so as to be disposed within the cavity when coupled to the seat.

8. The toilet of claim **7**, wherein the top surface and the cushion are configured to deform elastically and vertically in response to a load applied to the top surface.

9. The toilet of claim **7**, wherein:

a shape of the cavity is defined by a cavity interior surface; and

an air pocket is disposed between the cushion and an interior surface of the cavity.

10. The toilet of claim **7**, wherein:

a shape of the cavity is defined by a cavity interior surface including inner cavity top surface and an inner cavity bottom surface opposite the inner cavity top surface; and

the cushion includes an outer wall extending between the inner cavity top surface and the inner cavity bottom surface.

11. The toilet of claim **10**, further comprising:

at least one slot disposed in an interior surface of the cavity and extending into the seat; and

at least one flange extending radially inward from the outer wall and disposed within the at least one slot.

12. The toilet of claim **11**, wherein:

the at least one slot includes a first slot disposed in the inner cavity top surface and a second slot disposed in the inner cavity bottom surface; and

the at least one flange includes a first flange extending radially inward and disposed in the first slot and a second flange extending radially inward and disposed in the second slot.

13. The toilet of claim **10**, wherein the cushion further comprises:

an inner wall disposed inside the outer wall; and

a plurality of bridges extending radially inward from the outer wall connecting the outer wall and the inner wall,

wherein a height of the inner wall is shorter than a height of the outer wall.

14. The toilet of claim **7**, wherein

the seat further comprises a locking projection;

the cushion further comprises a locking loop; and

the cushion is removably coupled to the seat by stretching the cushion around the seat such that the locking loop circumscribes the locking projection.

15. The toilet of claim **7**, wherein:

the first material is one of polypropylene, polyethylene, or polycarbonate; and

the second material is a thermoplastic elastomer.

16. A toilet seat assembly comprising:

a seat including a top surface, a bottom surface opposite the top surface, an inner edge where the top surface and the bottom surface meet, an outer surface connecting an outer perimeter of the top surface and an outer perimeter of the bottom surface, and a cavity extending from the outer surface toward the inner edge; and

a cushion disposed within the cavity,

wherein the seat and the cushion are configured to deform elastically in response to a load applied to the top surface,

wherein a shape of the cavity is defined by a cavity interior surface including an inner cavity top surface and an inner cavity bottom surface opposite the inner cavity top surface,

wherein the cushion includes an outer wall extending between the inner cavity top surface and the inner cavity bottom surface, and

wherein the cushion extends below the inner cavity bottom surface.

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