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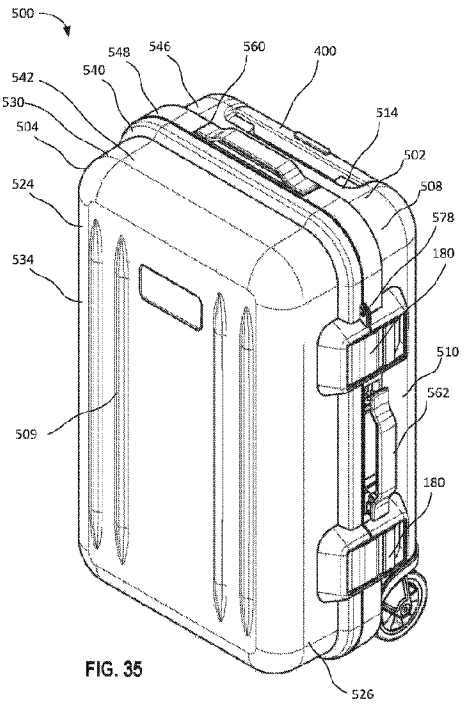


FIG. 35

(57) Abrégé/Abstract:
A suitcase having a base and a lid where the lid may be rotatable about a hinge from a closed configuration to an open configuration and may be secured, via one or more latching assemblies is disclosed. The lid may comprise an upper shell, and the base may comprise a lower shell. The upper shell and the lower shell may be seamlessly formed to create a water resistant and/or waterproof suitcase. The suitcase may have an extendable trolley handle assembly that is externally attached to the base of the suitcase. The trolley handle assembly may comprise a pair of extrusion assemblies that are connected to the base of the suitcase and connected to each other by a grip. The suitcase may also have a removably secured interior liner.

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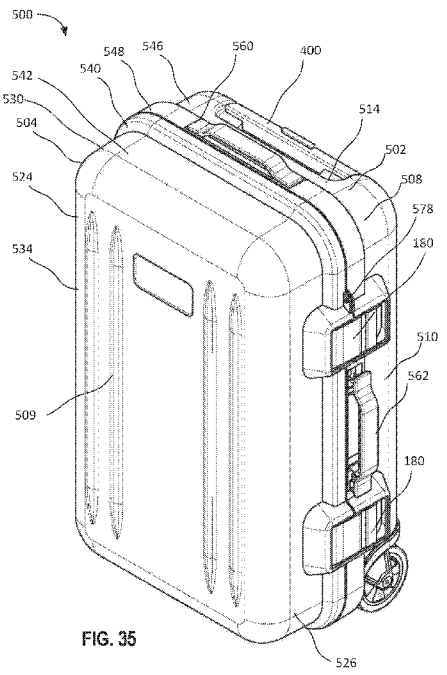


FIG. 35

(57) Abstract: A suitcase having a base and a lid where the lid may be rotatable about a hinge from a closed configuration to an open configuration and may be secured, via one or more latching assemblies is disclosed. The lid may comprise an upper shell, and the base may comprise a lower shell. The upper shell and the lower shell may be seamlessly formed to create a water resistant and/or waterproof suitcase. The suitcase may have an extendable trolley handle assembly that is externally attached to the base of the suitcase. The trolley handle assembly may comprise a pair of extrusion assemblies that are connected to the base of the suitcase and connected to each other by a grip. The suitcase may also have a removably secured interior liner.

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# LUGGAGE SYSTEM

## CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority to U.S. Patent Application No. 16/735,013 filed on January 6, 2020; U.S. Provisional Patent Application No. 62/788,886 filed on January 6, 2019; and U.S. Provisional Patent Application No. 62/788,888 filed on January 6, 2019. All of the above-referenced applications are incorporated by reference in their entirety.

## FIELD OF INVENTION

[0002] This disclosure relates to luggage and luggage systems.

## BACKGROUND

[0003] Suitcases may be used for transporting clothing, footwear, and other materials or items. However, the demands of travel can sometimes cause damage to the suitcase of damage to their contents. Either traveling by airplane or traveling by automobile, a durable and waterproof suitcase may be needed to protect the contents within a suitcase. For ease of movement, a trolley handle gives a user a simple means to pull or push a wheeled suitcase.

## BRIEF SUMMARY

[0004] Aspects of this disclosure may relate to a suitcase having a base including: a first shell structure having a first side and a second side opposite the first side, where the first shell structure has a first end and a second end opposite the first side and where the first side has a first outward facing surface and a second outward facing surface. The second outward facing surface may be offset a first fixed distance from the first outward facing surface. The first shell structure may have a bottom portion connected to a first end of the first shell structure and configured to support the suitcase on a surface. A first interior void may be defined by the first shell structure and the bottom portion, and a lower latch recess may be located in the second outward facing surface, where the lower latch recess includes a rear surface, a lower surface, and a pair of side surfaces. The suitcase may also include a lid rotatably connected to the base, where the lid includes: a second shell structure having a third side and a fourth side opposite the third side, where the second shell structure includes a third end and a fourth end opposite the third

end. The third side may have a third outward facing surface and a fourth outward facing surface, where the fourth outward facing surface may be offset a second fixed distance from the third outward facing surface. The second shell structure may also include a top portion connected to a third end of the second shell structure. A second interior void may be defined by the second shell structure and the top portion; and an upper latch recess located in the second outward facing surface. A latch assembly may be located within the lower latch recess and the upper latch recess, where the lower latch recess and the upper latch recess have a depth that is greater than a thickness of the latch assembly. Additionally, when the suitcase is in a closed configuration, a perimeter of the latch assembly is located within a combined perimeter of the upper latch recess and lower latch recess. The lid may be free of openings that extend through the first outward facing surface into the second interior void. The second outward facing surface may extend along an entire perimeter of the base. The fourth outward facing surface may also extend along an entire perimeter of the lid. The lid is rotatably connected to the base by at least one hinge. A portion of the at least one hinge may be located in an upper hinge recess and a lower hinge recess, where the lower hinge recess is located in the second outward facing surface and the upper hinge recess is located in the fourth outward facing surface.

**[0005]** Still other aspects of this disclosure may relate to a suitcase with a lid connected to a base by at least one hinge, where the at least one hinge comprises at least two linkages, and when the suitcase is in an open configuration, the at least one hinge defines a rotational axis and the rotational axis is located outside of a rear edge of the base and a rear edge of the lid. The base may include a pair of wheel assemblies, where each wheel assembly is attached into a wheel recess formed in the base, and where each wheel assembly includes a wheel housing and a wheel. Each housing may include an outward facing flange surface that is spaced outward a fixed distance from adjacent surfaces of the base around the wheel recess. The bottom portion of the base may also include a tapered region located between the pair of wheel assemblies, where the tapered region forms an angle within a range of 1 degree and 30 degrees when measured from a central portion of the bottom portion to a lower surface of the tapered region. The base may include a second end surface along the second end of the first shell structure, and the lid includes a fourth end surface along the fourth end of the second shell structure, and when the suitcase is in a closed configuration, the second end

surface and the fourth end surface are spaced apart from each other. The second end surface may include a sealing rib that protrudes from the second end surface and the fourth end surface may include a channel that receives a gasket, and when the suitcase is in the closed configuration, the rib engages the gasket. The base may include a plurality of ribs that extend from a surface underneath the lower latch recess to an interior surface of the bottom portion, where each rib of the plurality of ribs is spaced apart from each other by a distance within a range of 8 to 10 times a thickness of each rib. A first volume of the first interior void may be within 10 percent of a second volume to the second interior void. Still additional aspects of this disclosure may relate to a suitcase having a base including: a first shell structure having a first side and a second side opposite the first side, where the shell structure has a first end and a second end opposite the first end and where the first side has a first outward facing surface and a second outward facing surface. The second outward facing surface may be offset a first fixed distance from the first outward facing surface. The first shell structure may also include a bottom portion connected to a first end of the first shell structure. A first interior void may be defined by the first shell structure and the bottom portion; and a lower hinge recess may be located in the second outward facing surface. A lid may be rotatably connected to the base, where the lid includes: a second shell structure having a third side and a fourth side opposite the third side, the shell structure having a third end and a fourth end opposite the third end. The third side may have a third outward facing surface and a fourth outward facing surface, where the fourth outward facing surface is offset a second fixed distance from the third outward facing surface. The second shell structure may have a top portion connected to the third end of the shell structure; and a second interior void may be defined by the second shell structure and the top portion. A hinge assembly may be at least partially received within the lower hinge recess, where the lid is rotatably connected to the base by the hinge assembly. The hinge assembly may include at least two linkages. When the suitcase is in an open configuration, the at least one hinge assembly may define a hinge axis where the hinge axis is located outside of a rear edge of the base and a rear edge of the lid. The hinge assembly may be at least partially received in an upper hinge recess, where the upper hinge recess is located within the fourth outward facing surface. In some examples, the hinge assembly includes three hinge assemblies. Each hinge assembly may include a base hinge insert and a lid hinge insert, where the base hinge insert and the lid hinge insert both include a cavity that at least partially receives the at least two linkages. The

recess of the base hinge insert has a depth that is greater than a thickness of the at least two hinges. The at least two linkages may include a first linkage and a second linkage, where the first linkage includes a first linkage opening and a second linkage pin. For example, a first linkage pin may extend through the first linkage opening and into the base hinge insert, and where a second linkage pin extends through the second linkage opening and into the lid hinge insert.

**[0006]** Yet additional aspects of this disclosure may relate to a method for forming a suitcase, including: (a) molding a base shell, where the base shell has a plurality of lower latch recesses, a plurality of lower hinge recesses, a base shell structure, and a base interior void; (b) molding a lid shell, where the lid shell has a plurality of upper latch recesses and a plurality of upper hinge recesses, an lid shell structure, and a lid interior void; (c) placing the base shell and the lid shell adjacent each other, wherein the base interior void and the lid interior void are both facing the same direction and wherein the lower hinge recess and the upper hinge recess are facing towards each other; (d) placing a first portion of the hinge assembly into the lower hinge recess; (e) placing a second portion of the hinge assembly into the upper hinge recess; (f) securing the first portion of the hinge assembly to the base using a first mechanical fastener; (g) securing the second portion of the hinge assembly to the lid using a second mechanical fastener; (h) placing a latch assembly into the upper latch recess; and (i) securing the latch assembly to the lid using a third mechanical fastener, where the first mechanical fastener, the second mechanical fastener, and the third mechanical fastener are all oriented generally parallel to each other. The first mechanical fastener may be oriented generally parallel to the third side of the lid shell. The method may also include attaching the wheel assembly into a wheel recess on the base shell using a fourth mechanical fastener, where the fourth mechanical fastener is oriented generally parallel to the first mechanical fastener. In addition, the method may include attaching the portion of the latch assembly to a lid latch mount prior to placing the portion of the latch assembly into the upper latch recess, where the lid latch mount includes a body member and a flange, where the flange extends on outward from the body member and wherein the body member of the lid latch mount is received within the upper latch recess. The method may also include securing the lid latch mount to the lid shell with the third mechanical fastener that extends through an opening in the flange and into a thickened portion of the lid shell.

**[0007]** Other aspects of this disclosure may relate to a suitcase that has a base that includes a first shell structure having a first side and a second side opposite the first side, where the first shell structure having a first end and a second end opposite the first end. A bottom portion may be connected to the first end of the first shell structure and configured to support the suitcase on a surface. A first interior void may be defined by the first shell structure and the bottom portion, and a lower latch recess may be located within the second outward facing surface, where the lower latch recess has a rear surface, a lower surface, and a pair of side surfaces. A lid may be rotatably connected to the base, where the lid includes a second shell structure having a third side and a fourth side opposite the third side. The second shell structure may also have a third end and a fourth end, where a top portion is connected a top portion connected to the third end of the second shell structure; and a second interior void defined by the second shell structure and the top portion. An interior liner may be releasably secured to either the base shell within the first interior void or the lid within the second interior void, where the interior liner includes at least one storage cavity recessed from an upper surface of the liner and includes a liner attachment assembly that releasably engages a base attachment member. The liner attachment assembly may be permanently attached to the interior liner, and the base attachment member may be permanently attached to an interior surface of the suitcase. The liner attachment assembly may include a grip member that is rotated a predetermined amount to move the liner attachment assembly from an unlocked position to a locked position. When the liner attachment assembly is in the unlocked position, the liner is secured to the suitcase and when the liner attachment assembly is in the unlocked position, the liner is allowed to be removed from the suitcase.

**[0008]** Additional aspects may relate to a liner that is releasably secured to a suitcase by a liner attachment assembly, where the liner attachment assembly may include a tail member, a flange member, and the grip member, where the tail member includes a tail body member with a locking projection extending outwardly from the tail body member. The tail body member may have a generally cylindrical shape. In some examples, the locking projection may comprise two locking projections that are arranged opposite each other and where each locking projection may include at least one tapered surface. The flange member may include a flange opening that receives a portion of the tail member, and where the grip member may attach to the portion of the tail member that

extends into the flange opening. The liner attachment assembly may be moved to the locked position from the unlocked position by rotating the grip member approximately 90 degrees in a first direction, and the liner attachment assembly is moved to the unlocked position from the locked position by rotating the grip member approximately 90 degrees in a second direction, where the second direction is opposite the first direction. The base attachment member may include a first wall and a second wall where each wall extends away from the interior surface of the base with a first end at the interior surface and a second end opposite the first end. The first wall may include a first base locking projection located at the second end that extends toward the second wall and the second wall may include a second base locking projection located at the second end that extends toward the first wall. When the liner attachment assembly is in the locked position, the locking projection of the liner attachment assembly is at least partially positioned underneath the first base locking projection or the second base locking projection.

**[0009]** Another aspect of this disclosure may relate to a suitcase including a first shell structure having a first side and a second side opposite the first side, where the first shell structure has a first end and a second end opposite the first end and where the first shell structure has a first outward facing surface and a second outward facing surface. The second outward facing surface may be offset a first fixed distance from the first outward facing surface. The first shell structure may also include a bottom portion connected to a first end of the first shell structure. A first interior void may be defined by the first shell structure and the bottom portion; and a lower hinge recess may be located in the second outward facing surface. A lid may be rotatably connected to the base, where the lid includes: a second shell structure having a third side and a fourth side opposite the third side, the shell structure having a third end and a fourth end opposite the third end. The second shell structure may have a third outward facing surface and a fourth outward facing surface, where the fourth outward facing surface is offset a second fixed distance from the third outward facing surface. The second shell structure may have a top portion connected to a third end of the shell structure, and a second interior void may be defined by the second shell structure and the top portion. The suitcase may include an extendable trolley handle, where the trolley handle includes: (a) a pair of nested extrusion assemblies, where each extrusion assembly includes a major extrusion and a minor extrusion, and where the minor extrusion is nested within a central opening of

the major extrusion, and slidably engaged with the major extrusion; and (b) a grip connected to the minor extrusion of each of the pair of extrusion assemblies, where the grip includes a release button. The grip may include a release button that when pressed actuates a rack and pinion gear assembly located within the grip to allow the trolley handle to extend. The rack and pinion gear assembly may include a pair of rack gear members, where each rack gear member includes an engaging member that contacts a portion of the release button, a rack gear portion. Each rack gear portion may engage a pinion gear to equalize movement of the rack gear members and where the engaging member has a first angled surface that engages the release button, where the first angled surface includes a compound angle relative to an upper surface of the base member. Each rack gear member may also include a transmitting member at an end opposite the rack gear member, where the transmitting member has a second angled surface that contacts a third angled surface on an activating member, where the activating member disengages a locking mechanism for the trolley handle assembly.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[0010]** The present invention is illustrated by way of example and not limited in the accompanying figures in which like reference numerals indicate similar elements and in which:

**[0011]** FIG. 1 is a front perspective view of an exemplary suitcase according to one or more aspects described herein.

**[0012]** FIG. 2 is a rear perspective view of the suitcase of FIG. 1 according to one or more aspects described herein.

**[0013]** FIG. 3 is a front view of the suitcase of FIG. 1 according to one or more aspects described herein.

**[0014]** FIG. 4 is a right side view of the suitcase of FIG. 1 according to one or more aspects described herein.

**[0015]** FIG. 5 is a rear view of the suitcase of FIG. 1 according to one or more aspects described herein.

**[0016]** FIG. 6 is a left side view of the suitcase of FIG. 1 according to one or more aspects described herein.

**[0017]** FIG. 7 is a top view of the suitcase of FIG. 1 according to one or more aspects described herein.

**[0018]** FIG. 8 is a bottom view of the suitcase of FIG. 1 according to one or more aspects described herein.

**[0019]** FIG. 9 is a front view of the suitcase of FIG. 1 with the extendable trolley handle in a raised position according to one or more aspects described herein.

**[0020]** FIG. 10A is a front perspective view of a wheel assembly removed from the suitcase of FIG. 1 according to one or more aspects described herein.

**[0021]** FIG. 10B is a rear perspective view of a wheel assembly removed from the suitcase of FIG. 1 according to one or more aspects described herein.

**[0022]** FIG. 11A is an exploded perspective view of an alternate wheel assembly being installed onto the suitcase of FIG. 1 according to one or more aspects described herein.

**[0023]** FIG. 11B is a rear perspective view of the housing of the alternate wheel assembly illustrated in FIG. 11A according to one or more aspects described herein.

**[0024]** FIG. 11C is an enlarged rear perspective view of the wheel recess in the suitcase to receive the alternate wheel assembly illustrated in FIG. 11A according to one or more aspects described herein.

**[0025]** FIG. 11D is a partial cross-sectional view of the alternate wheel assembly illustrated in FIG. 11A installed onto the suitcase of FIG. 1 with some components removed for clarity according to one or more aspects described herein.

**[0026]** FIG. 12A is a partial exploded view of the identification tag holder being installed onto the suitcase of FIG. 1 according to one or more aspects described herein.

**[0027]** FIG. 12B is a rear perspective view of the identification tag holder according to one or more aspects described herein.

**[0028]** FIG. 12C is a partial cross-sectional view of the identification tag holder installed in the suitcase of FIG. 1 according to one or more aspects described herein.

**[0029]** FIG. 13 is a top perspective view of the suitcase of FIG. 1 in an open configuration according to one or more aspects described herein.

**[0030]** FIG. 14A is a side perspective view of the suitcase of FIG. 1 according to one or more aspects described herein.

**[0031]** FIG. 14B is an enlarged side perspective view of the suitcase of FIG. 1 with the latch assembly removed according to one or more aspects described herein.

**[0032]** FIG. 15A is a partial exploded perspective view of the latch assembly being assembled to the lid of the suitcase of FIG. 1 according to one or more aspects described herein.

**[0033]** FIG. 15B is a partial perspective view of the latch assembly assembled to the lid of the suitcase of FIG. 1 according to one or more aspects described herein.

**[0034]** FIG. 15C is a partial exploded perspective view of the latch assembly assembled to the base of the suitcase of FIG. 1 according to one or more aspects described herein.

**[0035]** FIG. 16A is a partial cross-sectional side view through the latch assembly of the suitcase of FIG. 1 in a locked position according to one or more aspects described herein.

**[0036]** FIG. 16B is a partial cross-sectional side view through the latch assembly of the suitcase of FIG. 1 in an unlocked position according to one or more aspects described herein.

**[0037]** FIG. 17 is a front perspective view of a latch assembly of the suitcase of FIG. 1 according to one or more aspects described herein.

**[0038]** FIG. 18 is a rear perspective view of a latch assembly of the suitcase of FIG. 1 according to one or more aspects described herein.

**[0039]** FIG. 19 is a side perspective view of an alternate embodiment of the suitcase of FIG. 1 in a locked orientation according to one or more aspects described herein.

**[0040]** FIG. 20 is a side perspective view of an alternate embodiment of the suitcase of FIG. 1 in an unlocked orientation according to one or more aspects described herein.

**[0041]** FIG. 21 is a perspective schematic view of an alternate embodiment of the suitcase of FIG. 1 with a deployable bag according to one or more aspects described herein.

**[0042]** FIG. 22 is a top perspective view of an alternate embodiment of the suitcase with a deployable bag of FIG. 21 according to one or more aspects described herein.

**[0043]** FIG. 23 is a front right perspective view of the deployable bag in a closed configuration of the suitcase of FIG. 21 according to one or more aspects described herein.

**[0044]** FIG. 24 is a front right perspective view of the deployable bag in an open configuration of the suitcase of FIG. 21 according to one or more aspects described herein.

**[0045]** FIG. 25 is a rear perspective view of the deployable bag in a closed configuration of the suitcase of FIG. 21 according to one or more aspects described herein.

**[0046]** FIG. 26 is a rear perspective view of the deployable bag in an open configuration of the suitcase of FIG. 21 according to one or more aspects described herein.

**[0047]** FIG. 27 is an enlarged view of the deployable bag installed in the suitcase of FIG. 21 according to one or more aspects described herein.

**[0048]** FIG. 28 is an enlarged view of the deployable bag installed in the suitcase of FIG. 21 according to one or more aspects described herein.

**[0049]** FIG. 29 is an enlarged view of the deployable bag installed in the suitcase of FIG. 21 according to one or more aspects described herein.

**[0050]** FIG. 30 is a rear perspective view of the suitcase of FIG. 1 with the trolley handle extended and some components removed according to one or more aspects described herein.

**[0051]** FIG. 31 is a front perspective view of the grip portion of the trolley handle assembly of an exemplary suitcase according to one or more aspects described herein.

**[0052]** FIG. 32 is a side view of the grip portion of FIG. 31 according to one or more aspects described herein.

**[0053]** FIG. 33 is a front view of the grip portion of FIG. 31 with the outer housings removed according to one or more aspects described herein.

**[0054]** FIG. 34 is a perspective view of the grip portion FIG. 33 according to one or more aspects described herein

**[0055]** FIG. 35 is a front perspective view of another exemplary suitcase according to one or more aspects described herein.

**[0056]** FIG. 36 is a rear perspective view of the suitcase of FIG. 35 according to one or more aspects described herein.

**[0057]** FIG. 37 is a front view of the suitcase of FIG. 35 according to one or more aspects described herein.

**[0058]** FIG. 38 is a right side view of the suitcase of FIG. 35 according to one or more aspects described herein.

**[0059]** FIG. 39 is a rear view of the suitcase of FIG. 35 according to one or more aspects described herein.

**[0060]** FIG. 40 is a left side view of the suitcase of FIG. 35 according to one or more aspects described herein.

**[0061]** FIG. 41 is a top view of the suitcase of FIG. 35 according to one or more aspects described herein.

**[0062]** FIG.42 is a bottom view of the suitcase of FIG. 35 according to one or more aspects described herein.

**[0063]** FIG. 43A is a partially exploded top right perspective view of the suitcase of FIG. 35 in an open configuration according to one or more aspects described herein.

**[0064]** FIG. 43B is a perspective partial exploded view of an alternate attachment assembly for an interior liner with the liner removed of the suitcase of FIG. 35 according to one or more aspects described herein.

**[0065]** FIG. 43C is a perspective partial view of the attachment assembly of FIG. 43B according to one or more aspects described herein.

**[0066]** FIG. 43D is a perspective partial view of the attachment assembly of FIG. 43B according to one or more aspects described herein.

**[0067]** FIG. 43E is a perspective exploded view of the liner attachment assembly of FIG. 43B according to one or more aspects described herein.

**[0068]** FIG. 44A is a front view of the suitcase of FIG. 35 in an open configuration with some components removed according to one or more aspects described herein.

**[0069]** FIG. 44B is a partially exploded front perspective view of the suitcase of FIG. 35 in an open configuration with some components removed according to one or more aspects described herein.

**[0070]** FIG. 44C is a partial front perspective view of the suitcase of FIG. 35 in an open configuration with some components removed according to one or more aspects described herein.

**[0071]** FIG. 45 is a partial front perspective view of the suitcase of FIG. 35 in an open configuration with some components removed according to one or more aspects described herein.

**[0072]** FIG. 46 is a partial top view of the suitcase of FIG. 35 in an open configuration with some components removed according to one or more aspects described herein.

**[0073]** FIG. 47 is a rear perspective view of the wheel assembly of the suitcase of FIG. 35 according to one or more aspects described herein.

**[0074]** FIG. 48 is a front perspective view of the wheel assembly of the suitcase of FIG. 35 according to one or more aspects described herein.

**[0075]** FIG. 49 is a right front perspective view of the lid shell of the suitcase of FIG. 35 according to one or more aspects described herein.

**[0076]** FIG. 50 is a left front perspective view of the lid shell of the suitcase of FIG. 35 according to one or more aspects described herein.

**[0077]** FIG. 51 is a left front perspective view of the base shell of the suitcase of FIG. 35 according to one or more aspects described herein.

**[0078]** FIG. 52 is a right front perspective view of the base shell of the suitcase of FIG. 35 according to one or more aspects described herein.

[0079] Further, it is to be understood that the drawings may represent the scale of different components of one single embodiment; however, the disclosed embodiments are not limited to that particular scale.

## DETAILED DESCRIPTION

[0080] In the following description of various example structures according to the invention, reference is made to the accompanying drawings, which form a part hereof, and in which are shown by way of illustration various example devices, systems, and environments in which aspects of the invention may be practiced. It is to be understood that other specific arrangements of parts, example devices, systems, and environments may be utilized and structural and functional modifications may be made without departing from the scope of the present invention. Also, while the terms "top," "bottom," "front," "back," "side," "rear," and the like may be used in this specification to describe various example features and elements of the invention, these terms are used herein as a matter of convenience, e.g., based on the example orientations shown in the figures or the orientation during typical use. Nothing in this specification should be construed as requiring a specific three-dimensional orientation of structures in order to fall within the scope of this invention. Also, the reader is advised that the attached drawings are not necessarily drawn to scale.

[0081] Additionally, the term "plurality," as used herein, indicates any number greater than one, either disjunctively or conjunctively, as necessary, up to an infinite number.

[0082] "Generally parallel," as the term is used herein, means that a first line, segment, plane, edge, surface, etc. is approximately (in this instance, within 5%) equidistant from with another line, plane, edge, surface, etc., over at least 50% of the length of the first line, segment, or edge, or over at least 50% of the area of the plane or surface, etc. In some examples, lines, segments, or edges may be considered "generally parallel" if one such a line, segment, or edge is approximately equidistant (± 5%) to another respective line, segment, or edge over at least 60%, at least 75%, at least 85%, at least 90%, or even at least 95% of a length of either of the lines, segments, or edges being considered. Additionally, planes or surfaces may be considered "generally parallel" if one plane or surface is approximately equidistant (± 5%) to another respective plane or surface over at least 60%, at least 75%, at least 85%, at least 90%, or even at least 95% of a surface area of either of the planes or surfaces being considered.

**[0083]** "Generally perpendicular," as the term is used herein, means that a first line, segment, plane, edge, surface, etc. is approximately (in this instance, within 5%) orthogonal from with another line, plane, edge, surface, etc., over at least 50% of the length of the first line, segment, or edge, or over at least 50% of the area of the plane or surface, etc. In some examples, lines, segments, or edges may be considered "generally perpendicular" if one such a line, segment, or edge is approximately orthogonal (± 5%) to another respective line, segment, or edge over at least 60%, at least 75%, at least 85%, at least 90%, or even at least 95% of a length of either of the lines, segments, or edges being considered. Additionally, planes or surfaces may be considered "generally perpendicular" if one plane or surface is approximately orthogonal (± 5%) to another respective plane or surface over at least 60%, at least 75%, at least 85%, at least 90%, or even at least 95% of a surface area of either of the planes or surfaces being considered.

**[0084]** In general, aspects of this invention relate to suitcases, or containers, and aspects of the suitcase such as latching assemblies, wheel assemblies, and other sub-assemblies. According to various aspects and embodiments, the suitcases and latching assemblies described herein may be formed of one or more of a variety of materials, such as metals (including metal alloys), polymers, and composites, and may be formed in one of a variety of configurations, without departing from the scope of the invention. It is understood that the suitcases may contain components made of several different materials. Additionally, the components may be formed by various forming methods. For example, metal components, may be formed by forging, molding, casting, stamping, machining, and/or other known techniques. Additionally, the polymer components may be formed or manufactured by polymer processing techniques, such as various molding and casting techniques and/or other known techniques.

**[0085]** The various figures in this application illustrate examples of suitcases according to this disclosure. When the same reference number appears in more than one drawing, that reference number is used consistently in this specification and the drawings refer to the same or similar parts throughout. The suitcase may be configured to contain, store, carry, etc., items including but not limited to, clothing, footwear, electronics, or any other items. Additionally or alternatively, the suitcase may be configured to store fragile materials without departing from the scope of the disclosure described herein.

**[0086]** FIGS. 1-8 depict views of the suitcase 100. The suitcase 100 may comprise a base 102 and a lid 104 that may be coupled together. For example, the base 102 and the lid 104 may be rotatably coupled together such that the base 102 and the lid 104 are connected by a hinge 106 or a plurality of hinges 106. Both the base 102 and the lid 104 may be a structure that forms a void for containing articles, as will be discussed more fully herein. In some examples, the base 102 and the lid 104 may have a similar volumetric displacement such that the size of the interior void 103 of the base 102 is substantially the same as the size of the interior void 105 of the lid 104, or where the volume of the void of the base 102 may be within 10 percent of the volume of the void of the lid 104. In some embodiments, the volume of suitcase 100 may be approximately 42,000 cubic centimeters, or within a range of 35,000 cubic centimeters and 45,000 cubic centimeters. The base 102 and the lid 104 may be cuboidal or substantially cuboidal in shape. For example, in some embodiments, the suitcase 100 may have a length of approximately 22 inches (55.9 cm), a width of approximately 14 inches (35.6 cm), and a height of 9 inches (22.9 cm). While in other embodiments, the suitcase 100 may have different dimensions. In other examples, the base 102 may be prismoidal or substantially prismoidal (e.g., a pentagonal prism, hexagonal prism, heptagonal prism, or the like) in shape. In still other examples, the base 102 may be substantially cylindrical in shape or may have a substantially trapezoidal cross section. Various other shapes may be used without departing from the invention.

**[0087]** The suitcase 100 may also include a tow pull or extendable trolley handle assembly 400, a plurality of handles 160, a plurality of wheels 168 located on a bottom of the suitcase 100, a plurality of latch assemblies 180, and a pair of retractable padlock loops 178, 179 to allow a padlock to be installed to secure the suitcase 100 during travel. In addition, suitcase 100 may be configured to be water resistant, or waterproof, or not allow substantially any water or moisture to enter the interior of the suitcase 100. As another feature, the exterior of the suitcase 100 may have a contoured shape that may include a plurality of recesses to accommodate the latch assemblies 180, hinges 106, a trolley handle assembly 400, and wheels 168 to minimize their profile and exposure to possible damage from collisions with other objects during travel.

**[0088]** The base 102 may include a lower shell structure 108 having a first side 110, a second side 112 opposite the first side 110, a third side 114 extending between an edge of the

first side 110 and an edge of the second side 112, and a fourth side 116 opposite the third side 114. The lower shell 108 may also have a first end 118 and a second end 120 near the opening for the interior void 103 of the base 102. The lower shell 108 may also include a bottom portion 122 connected to a first end 118 of the lower shell structure 108 and configured to support the suitcase 100 on a surface such as a table, the ground, or the like. Similarly, the lid 104 may include a upper shell structure 124 having a first side 126, a second side 128 opposite the first side 126, a third side 130 extending between an edge of the first side 126 and an edge of the second side 128, and a fourth side 132 opposite the third side 130. The upper shell structure 124 may also have a first end 134 and a second end 136 near the opening for the interior void 105 of the lid 104. The upper shell structure 124 may also include a top portion 138 connected to a first end 134 of the upper shell structure 124 and configured to support the suitcase 100 on a surface such as a table, the ground, or the like.

**[0089]** In some examples, both the upper shell 124 and the lower shell 108 may each be formed as a unitary, or single, member such that each shell is seamless. Additionally, the upper shell 124 and the lower shell 108 may be free of any apertures or openings that pierce or extend from an exterior surface into the respective interior voids 103, 105 of the base 102 and lid 104. By having shells 108, 124 that are free of openings extending from the exterior to the interior, the suitcase 100 may advantageously prevent any moisture or water from entering the interior of the suitcase 100. The shells 108, 124 may generally have a thickness within a range of 2 mm and 4 mm, or within 1.5 mm and 6 mm. The shells 108, 124 may also include varying wall thicknesses in localized regions. For example, some areas may be thicker than other regions of the shells 108, 124 to provide attachment locations for the various components. These thicker regions may be arranged to receive mechanical fasteners or other connecting members. As another feature, the shells 108, 124 may include ribs, or rubrails, 109, which may be arranged along an outer or inner surface of the lower shell 108 and the upper shell 124 to increase the stiffness and strength of the shells and also provide extra protection for the shells 108, 124. For example, the ribs 109 may be oriented along the length of the top portion 138 of the upper shell 124 and along the bottom portion 122 of the lower shell 108. In some embodiments, the ribs 109 may be evenly spaced from the first and second sides 126, 128 of the upper shell 124 and may be arranged in pairs of ribs 109.

**[0090]** As discussed above, the upper shell 124 and the lower shell 108 may form the majority of the exterior of the suitcase 100 and each may have a contoured shape that includes a primary surface, a raised surface, and a plurality of recesses, where the recesses may protect the components from collisions or damage. For example, the upper shell 124 may include a raised protruded surface 140 that extends near and/or along the second end 120 around the perimeter of the upper shell 124. The raised surface 140 may be offset a fixed distance from a primary surface 142 of the upper shell. A plurality of upper latch recesses 144 may be at least partially formed within the raised surface 140. Each upper latch recess 144 may have a depth equal to or greater than the thickness of each of the latch assemblies 180 to provide protection from the latch assemblies 180. The upper latch recesses 144 may have a substantially rectangular shape, or alternatively a shape that closely matches the shape of the latch assembly 180. Each latch recess 144 may have receiving features to secure a latch assembly 180 within the recess 144. The receiving features may comprise a pocket on either side of the recess 144 to receive a pin or other mounting hardware for the latch assemblies 180.

**[0091]** Similar to the upper shell 124, the lower shell 108 may include a primary surface 146, a raised protruded surface 148 that extends near and/or along the second end 136 around the perimeter of the lower shell 108. The raised surface 148 may be offset a fixed distance from a primary surface 146 of the upper shell. A plurality of lower latch recesses 150 may be at least partially formed within the raised surface 148. Each lower latch recess 150 may have a depth equal to or greater than the thickness of each of the latch assemblies 180. The lower latch recesses 150 may have a depth that is generally the same as the depth of the upper latch recess 144. The latch recesses 150 may include a latch keeper 182 that extends across the recess 150 and provides an engaging surface for the latch assembly 180 to secure the lower shell 108 to the upper shell 124. Each recess 150 may have a substantially rectangular shape, or alternatively a shape that closely matches the shape of the latch assembly 180. The shape and size of the recesses 144, 150 may be mirror images of each other to and may be aligned to form a larger recess to receive the entire latch assembly 180.

**[0092]** The trolley handle assembly 400 may be attached to the lower shell 108 along the exterior of the bottom portion 122. The trolley handle assembly 400 may be formed as a separate member and attached to the lower shell 108. The lower shell 108 may have

a tow pull recess or trolley handle recess 154 that is offset from the primary surface 146 on the bottom portion 122 of the lower shell 108. The tow pull recess 154 may be substantially U-shaped as shown in FIG. 2, or may be a pair of symmetrical elongated recesses 154 to receive trolley handle assembly 400. The recess 154 may have a depth that is equal to or greater than the thickness of the extrusions of the trolley handle to adequately protect the trolley handle assembly 400 from impacts. The trolley handle assembly 400 may include an extendable extrusion assembly 410 that slides upward from the top of the suitcase to provide an elevated grip for a user to easily pull the suitcase 100 as shown in FIG. 9.

**[0093]** Additionally, to allow the user to easily pull the suitcase 100, the bottom of the suitcase may include a plurality of wheel assemblies 164 positioned on the rear and bottom of the suitcase 100. Each wheel assembly 164 may be formed as a separate member, as shown in FIGS. 10A and 10B, and may include a wheel housing 166 having a rounded shape and at least one mounting flange 167 located on at least one end, and a wheel 168 mounted on an axle (not shown) such that the axle is aligned with a center of the rounded shape. The mounting flange 167 may include a mounting hole. The lower shell 108 may include a wheel recess 170 to receive the wheel assembly 164. The wheel assembly 164 may be secured to the wheel recess using at least one mechanical fastener extending through the mounting hole positioned in the mounting flange 167. As shown in the exemplary embodiment, the suitcase 100 may comprise a pair of wheel assemblies 164; however, in other embodiments the suitcase may include more additional wheel assemblies 164. The wheel assemblies 164 may be evenly spaced from the sides of the suitcase 100. The housing 166 may be formed from a polymer material, such as a polyamide (nylon) or similar material, while the wheels 168 may be formed from a polymer material, such as a polyurethane, or similar material.

**[0094]** FIGS. 11A-11D illustrate another option for the wheel assembly 264 that may install onto suitcase 100. Wheel assembly 264 may include a wheel housing 266 that has a rounded shape and a mounting flange 267. The wheel assembly 264 may further include a wheel 268 mounted on axle 269. The housing 266 may further include a pair of horizontally oriented projections 271 positioned along each side of the housing 266 that may insert into a pair of grooves 273 oriented within the recess 270 of the lower shell 108. Each projection 271 of the pair of projections is received into each groove

273 of the pair of grooves to support to the housing 266 in a vertical direction within the recess 270. The wheel assembly 264 may then be secured in a horizontal direction by a mechanical fastener extending through a mounting hole on the flange 267 and into a thickened portion of the shell 108, which prevents the fastener from piercing into an interior of the shell. As another option, the housing 266 may also include a detent 275, or protrusion, on a forward end of the housing 266. The detent 275 may be received in a slot 277 near the rear end of the recess 270 to provide additional support in a horizontal direction to the wheel assembly 264.

**[0095]** In some embodiments, the bottom (corresponding to the fourth side 132 of the upper shell 124) of the suitcase 100 may also and/or alternatively include one or more feet 172A which may support the suitcase 100 on a surface such as a table, the ground, or the like. The feet 172 may be attached may be attached to the upper shell 124 and may be located opposite the wheel assemblies 164 to give a proper balance as shown in FIG. 8. The feet 172 may be formed of a non-skid or non-sliding impact absorbing material, such as a rubber, elastomer, or other similar material. For example, the feet 172 may be formed from an EPDM (ethylene propylene diene monomer) rubber (ethylene propylene diene monomer) or similar material. The feet may be attached to the shell using an adhesive, ultrasonic welding technique, or electromagnetic bonding (such as Emabond®). By attaching the feet using a bonding or welding technique the shells 108, 124 may remain free of any intrusions into their interior.

**[0096]** Each of the feet 172 may be received in a foot recess 174 that may be formed within the raised surface 148 of the upper shell 124. The foot 172 may have a substantially elliptical shape, a square shape, or any shape. In addition, each foot 172 may extend an amount equal to the distance each wheel 168 extends beyond the suitcase. Thus, the top of the suitcase 100 may be approximately level when sitting on the ground. As another option, one or more feet 172B may also be located along the second side 112, 128 of the shells 108, 124 such that the feet 172B are positioned opposite each other on both the upper shell 124 and the lower shell 108. As shown in FIG. 6, the feet 172B may be positioned along the second side 128 of the upper shell 124 and along the second side 112 of the lower shell 108. The feet 172 B may be formed from a similar material to the feet 172A on the bottom of the suitcase 100. While having the same material, the shape of the feet 172B may be slightly different than the feet 172A in that the feet

172B may have a generally truncated elliptical shape. The feet 172 may be generally aligned with one of the hinges 106 where a flat portion of the feet 172B are spaced from an edge of a hinge 106. In addition, the feet 172B may be arranged to contact one another when the suitcase 100 is fully opened to reduce the impact forces on the hinges and the other components of the suitcase 100 when it is opened.

**[0097]** Still another feature of the suitcase 100 is an identification tag holder 250 to help a user easily identify the suitcase 100 as illustrated in FIGS. 12A-12C. The identification tag holder 250 may be located on either the lid 104 or the base 102. For example, the identification holder 250 may be located between the extrusion assemblies 410 of the trolley handle assembly 400. The identification tag holder 250 may include a transparent card sleeve 252, and a slidable card mount 254. The card mount 254 may have a central opening 253 and may be slidably engaged with a slot 255 positioned in the lower shell 108 such that the card mount 254 moves in a vertical direction. The card mount 254 may include a pocket to secure the card sleeve 252. The card sleeve 252 may have an opening to receive an identification tag 257 such as a business card or similar material that may contain a user's identification information. The card mount 254 may slide upward along the slot 255 to an open position exposing the pocket to allow a user to install the card sleeve 252 and then slide the card mount 254 downward into the slot 255. The card mount 254 may include a pair of grooves or depressions 258 arranged on each side of the card mount 254 to receive a detent 260, or protrusion, positioned within the slot 255. As the card mount 254 is slid downward within the slot 255, the detent 260 may be received within the groove 258 of the card mount 254. The card mount 254 may be secured within the slot 255 by the detents 260 engagement with the grooves 258. The slot 255 may have a pair of detents 260 with a detent 260 being located on both sides of the slot 255. The grooves 258 may be positioned near a lower end 259. The identification material may then be easily viewed through the opening 253 of the card mount 254. In some embodiments, the detents 260 may be arranged on the card mount 254 and the grooves 258 arranged within the slot 255.

**[0098]** To help improve the security of the suitcase 100, the suitcase 100 may include a pair of padlock loops 178, 179 to receive a padlock (not shown) to prevent any unauthorized opening of the suitcase 100. A first padlock loop 178 may be connected to the upper shell 124 and a second padlock loop 179 may be connected to the lower shell 108 such

that the first padlock loop 178 is aligned with the second padlock loop 179 to allow a padlock to be inserted into the opening of each padlock loop 178, 179. Each padlock loop 178, 179 may be retractable where they can rotate into slots on the respective shells 124, 108 to store and protect the loops 178, 179 when they are not in use.

**[0099]** The suitcase 100 including the upper and lower shells 124, 108 may be formed from various materials, such as one or more metals, alloys, polymers, ceramics, or fiber-reinforced materials. In some examples, the upper and lower shells 124, 108 may be formed of a polymer material, such as a polycarbonate alloy, a thermoplastic olefin (TPO), or other similar material, that is molded to form both the shells 108, 124. In some arrangements, the shells 108, 124 are formed using injection molding or roto-molding/rotational molding processes as would be understood by one of ordinary skill in the art (not shown). However, various other types of molding or other manufacturing processes (e.g., stamping, casting, forging, and the like) may be used to form the suitcase 100 without departing from the invention.

**[0100]** As discussed above, the base 102 and the lid 104 may be rotatably coupled to each other. The hinges 106 may be one of various types of hinges, including a continuous piano hinge, double hinge, ball joint hinge, living hinge, and the like double hinges to allow the base 102 and the lid 104 to rotate away from each other up to at least 180 degrees in a fully opened position as shown in FIG. 13. In some examples, the lid 104 may be removably or permanently connected to the base 102 at the hinge(s) 106. When in the open configuration, the interior voids 103, 105 of both the base 102 and the lid 104 may be accessible to a user. When in the closed configuration, the hinge 106 may facilitate rotation of the lid 104 and the base 102 to secure the contents within the suitcase 100.

**[0101]** Additionally, as shown in FIG. 13, the interiors 105, 103 of both the lid 104 and the base 102 may include a liner 115 to provide a soft interior surface. The liner 115 may include a waterproof fabric material to provide an extra level of moisture protection for the contents of the suitcase 100. As another option, a plurality of magnetic or ferromagnetic elements may be arranged around the inner edges along the second end 120 of the lower shell 108 of the base 102 and also along the inner edges along the second end 136 of the upper shell 124 of the lid 104. These magnetic elements may assist in aligning and closing the lid 104 and the base 102.

**[0102]** In addition, in some arrangements, the suitcase 100 may include a gasket 176 or other sealing device. The gasket 176 may be arranged in either the lid 104 or the base 102 and may aid in sealing the lid 104 and base 102 when the suitcase 100 is in a closed configuration. The gasket 176 may be arranged in a recess or channel in the lid 104. Alternatively, the gasket 176 may be arranged in a recess or channel formed in the base 102. In some examples, the gasket 176 may be a traditional gasket having a substantially circular cross section.

**[0103]** In still other embodiments, the suitcase 100 may be capable of achieving an IP52 rating up to an IP67 rating (as set forth by International Electrotechnical Commission). For example, in one embodiment, the suitcase 100 may be manufactured such that it is protected from limited dust ingress and water resistant to a water spray test corresponding to achieving an IP52 rating. While in other embodiments, the suitcase 100 may be manufactured such that it is dust tight when tested for 8 hours and/or waterproof when tested for 30 minutes under 1 meter of water. In some embodiments, the suitcase 100 may be capable of achieving an IP67 rating which specifies that there is no ingress of dust or complete protection from dust when tested for 8 hours and ingress of water in harmful quantities is not possible when the enclosure is immersed in water under defined conditions of pressure and time (up to 1 m of submersion). The IP67 dust test is 8 hours long and the enclosure is tested in a vacuum. The IP67 water test is 30 minutes long and the enclosure is tested with the lowest point of the enclosure 1000 mm below the surface of the water, or the highest point 150 mm below the surface whichever is deeper. Depending on the IP rating, the suitcase 100 may include a one-way air vent. For example, if the rating is an IP52, a one-way air vent may not be necessary, but if the rating is higher such as an IP67, a one-way air vent may be necessary.

**[0104]** In some arrangements, the suitcase 100 may include one or more handles 160. The handles 160 may be arranged on one or more portions of the base 102 along the lower shell 108. The handles 160 may be arranged on a top side and a right side of the suitcase 100. The handles 160 may be secured to the raised surface 148 of the lower shell 108. The handles 160 may be formed from a polymer and molded with a thermoplastic urethane (TPU) to provide a soft comfortable surface for a user to grip. The handles 160 may be connected to camming rings that attach to brackets 162. The brackets 162

may be engaged/secured to the lower shell 108 using mechanical fasteners, where the mechanical fasteners do not extend into the interior of the lower shell 108.

**[0105]** As discussed above, the suitcase 100 may also include one or more latch assemblies 180. The latch assemblies 180 may have a locked position and an unlocked position and may be configured to lock the lid 104 to the base 102 when the lid 104 is in a closed configuration. The latch assemblies 180 may include one or more portions integrally formed with or otherwise attached to the suitcase 100. As shown in FIGS. 14A-16B, the suitcase 100 may include a latch keeper 182 located within lower latch recess 150. The latch keeper 182 may extend from a sidewall of the lower latch recess 150 of the lower shell 108. The recess 150 has a shape configured to receive a portion of the locking member 190 as will be discussed in more detail below. The latch keeper 182 may have an upper surface 184, an inner surface 186 and a lower surface 188. As will be discussed in greater detail below, the latch assemblies 180 may engage the latch keeper 182 to lock the lid 104 to the base 102 when the suitcase 100 is in a closed configuration.

**[0106]** In some embodiments, the latch assembly 180 may be rotatably coupled to a lid latch mount 181 prior to being installed to the lid 104. The latch assembly 180 may be coupled to the lid latch mount 181 using a pin 203, or hinge. The pin 203 may be inserted into an opening in the latch body 200 of the latch assembly 180 and into a pair of openings in the sides of the lid latch mount 181 as shown in FIGS. 15A and 15B. The lid latch mount 181 may be received in the upper latch recess 144 of the upper shell 124. The lid latch mount 181 may be installed in recess 144 in a direction generally parallel to the surface of the first side 126 and secured to the shell 124 using at least one mechanical fastener inserted into an opening on flange 183 of lid latch mount 181. The mechanical fastener securing the flange 183 to the upper shell 124 may insert into a threaded hole in a thickened portion of the shell 124, which may prevent the fastener from piercing into the interior of the shell 124. The pin 203 may be a straight pin, or a stepped pin and may have knurled features.

**[0107]** Similarly, in some examples, a base latch mount 185 may be received in lower latch recess 150 of the lower shell 108 as shown in FIG. 15C. The latch keeper 182 may be installed into the base latch mount 185 prior to being installed to the base 102. The base latch mount 185 may be installed in recess 150 in a direction generally parallel to

the surface of the first side 110 and secured to the lower shell 108 using at least one mechanical fastener inserted into an opening on flange 187 of lid latch mount 185. The mechanical fastener securing the flange 187 to the shell 108 may insert into a threaded hole in a thickened portion of the shell 108 to prevent the fastener from piercing into the interior of the shell 108.

**[0108]** Referring now to the latch assembly 180 as shown in FIGS. 15A-18, the latch assembly 180 may include multiple components including a latch body 200, a locking member 190, a biasing member 220, and an activating member 230. As discussed above, the latch assembly 180 may include a locked position and an unlocked position.

**[0109]** The latch body 200 may be pivotally engaged with the lid 104. As shown in FIG. 17, the latch body 200 may be pivotally engaged with the lid 104 using pin, or hinge 203, however, any suitable pivotal engagement may be used. In some embodiments, the hinge 203 may be removably engaged with the suitcase 100. This hinge 203 may allow a user to easily remove and replace the latch assembly 180 if it becomes damaged. The latch body 200 may include an inner surface 204 and an outer surface 206. The outer surface 206 may be contoured and may not extend outward of the outer edge of the raised surface 148 of the lower shell 108 or raised surface 140 of the upper shell 124. The inner surface 204 may also be curved and may also include a number of different features. One exemplary feature that may be included on the latch body 200 may be one or more engagement lugs 208. As will be discussed in more detail below the engagement lugs 208 may engage the base 102, or latch keeper 182, and may assist in compressing the lid 104 against the base 102 of the suitcase 100.

**[0110]** The latch body 200 may also be engaged with the locking member 190. As shown in FIGS. 16A and 16B, the locking member 190 may be slidably engaged with the latch body 200 such that the locking member 190 may move between an upward position and a downward position in a substantially linear path. The locking member 190 may be configured to lock the lid 104 in a closed configuration when the locking member 190 is in the downward position and unlock the lid 104 when the locking member 190 is in the upward position.

**[0111]** As shown primarily in FIG. 18, the locking member 190 may be movably engaged with one or more guide members 192 such that the locking member 190 may slide up and

down the guide members 192. In one embodiment, the locking member 190 may include apertures 194 passing through the locking member 190 and through which the guide members 192 may also pass. The guide members 192 may be engaged with the latch body 200 at a top end 195 and at a bottom end 196. As shown in FIG. 18 the guide members 192 are cylindrical rods but any suitable shape may be used that permits upward and downward movement of the locking member 190. For example, guide members 192 may be prismoidal or substantially prismoidal (e.g., a pentagonal prism, hexagonal prism, heptagonal prism, or the like) in shape. In still other examples, the latching assembly 180 may include other devices suitable for allowing generally linear movement between the locking member 190 and the latch body 200, including for example, rails.

**[0112]** As also shown in FIG. 18, the latch assembly 180 may also include at least one biasing member 220 engaged with the latch body 200 and the locking member 190. As will be discussed in more detail below, the biasing member 220 is configured to bias the locking member 190 in a downward position. The biasing member 220 may be a compression spring as shown in FIG. 18, but may in alternative embodiments be any suitable device for biasing the locking member 190 in the downward position.

**[0113]** The locking member 190 may include a base portion 210 and a hook portion 212 extending inwards from the base portion 210. The hook portion 212 may include a lower surface 214 and an inward facing surface 216. As shown in FIG. 15, when the latch assembly 180 is in the locked position, the lower surface 214 of hook portion 212 of the locking member 190 may engage the upper surface 184 of the latch keeper 182 and the inward facing surface 216 of the hook portion 212 may engage the inner surface 186 of the latch keeper 182. Additionally, when the latch assembly 180 is in the locked position the upper surface of the engagement lugs 202 may engage the lower surface 188 of the latch keeper 182.

**[0114]** The latch body 200 may also be pivotally engaged with an activating member 230. The activating member 230 may also be engaged with the locking member 190 and may be configured to move the locking member 190 from the downward position to the upward position. As shown in FIGS. 15 and 16, the activating member 230 may be pivotally engaged to the latch body 200 by a hinge 232 extending through the latch body 200 and the activating member 230. The activating member 230 may include a grip portion

234, an activating barrel 236, and one or more arms 238 connecting the grip portion 234 and the activating barrel 236. As shown in FIG. 16B, the grip portion 234 is spaced a distance from the lower surface of the recess 150 of the lower shell 108. This distance may allow a user grip the back surface 240 of the grip portion 234 with their fingers placed between the lower surface of the recess 150 and the grip portion 234. As shown in FIGS. 15 and 16, the activating barrel 236 of the activating member 230 may engage the locking member 190. The activating barrel 236 may include a raised portion 242. As will be discussed in greater detail below, a user may pull the grip portion 234 of the activating member 230 forward causing the raised portion 242 of the activating barrel 236 to rotate and lift up the locking member 190. This movement causes the latch assembly 180 to unlock and allows the lid 104 to be moved from the closed configuration to an open configuration.

**[0115]** Referring now to FIGS. 16A and 16B, a procedure for moving an embodiment of the latch assembly 180 from the locked position to an unlocked position is shown with side cross-sectional views of the latch assembly 180 and portions of the base 102 and lid 104. FIGS. 16A and 16B illustrate simplified versions of the base 102 and the lid 104 to focus the illustrations on the latch assembly 180. FIG. 16A depicts the latch assembly 180 in the locked position, and FIG. 16B depicts the latch assembly 180 in an unlocked position. As shown in FIG. 16A, in the locked position, the lower surface 214 of hook portion 212 is engaged with the upper surface 184 of the latch keeper 182; the inward facing surface 216 of the hook portion 212 is engaged with the inner surface 186 of the latch keeper 182, and the engagement lugs 202 are engaged with the lower surface 188 of the latch keeper 182.

**[0116]** As shown in FIG. 16B, the latching assembly 180 may be moved to the unlocked position by rotating the activating member 230 as shown with arrow. This rotation may be accomplished by a user pulling forward on back surface 240. As the activating barrel 236 rotates, the raised portion 242 engages the locking member 190 and raises the locking member 190.

**[0117]** The latch assembly 180, including the latch body 200, locking member 190, and activating member 230, may each be separately formed and may be formed of materials such as plastic materials or another suitable material which can be formed or molded into the desired shape. The latch assembly 180 may be made of sufficient size,

thickness and materials of construction to withstand repeated cycles of stress as the latch is engage/disengaged with the latch keeper 182 over time. The suitcases described herein include various features that ensure easy and efficient manufacture of the suitcases, while providing durability and wear resistance.

**[0118]** FIGS. 19-20 illustrate suitcase 100 with alternate latching assemblies 280 to lock and unlock the lid 104 to the base 102. The latching assemblies 280 may include a handle 282 that can rotate about an axis that is generally oriented generally perpendicularly to the first side 110 of the lower shell 108 and the first side 126 of the upper shell 124. The handle 282 may be permanently attached to the lid 104 and have a latch or hook such that when in a locked orientation, the latch engages to the base 102 to lock the lid 104 to the base 102. To unlock the suitcase 100, the handle 282 may be rotated approximately 90 degrees to disengage the latch from the base 102 allowing the lid 104 to move relative to the base 102.

**[0119]** FIGS. 21-29 illustrate another option for the suitcase 100. In this embodiment, the suitcase 100 may include a deployable bag 300 that attaches to one or both of the interior voids 103, 105. FIG. 21 illustrates the conversion of the bag 300 from being removed from interior void 105 of the lid 104, and then converted to a backpack. FIG. 21 also shows the bag 300 in an open configuration with a front pocket unzipped. While the illustrated embodiment shows the deployable bag 300 releasably attached to the interior void 105 of the lid 104, the deployable bag 300 may be releasably attached to the interior void 103 of the base 102. The deployable bag 300 may be secured within the suitcase 100 and then removed to easily convert to a portable bag that can easily be carried by a user. The deployable bag 300 may have at least one carrying strap or a pair of carrying straps 302 as shown such that the bag 300 may be worn as a backpack by the user.

**[0120]** The deployable bag 300 may have a plurality of pockets including a rear pocket 304 that may secure and store the straps 302 such that the bag 300 may be carried by either the handle 306A located on the top of bag 300 or the handle 306B located on the side of the bag 300. The bag 300 may also have a closure 320 on the front side of the bag along with a closure 322 along the sides that allow access to the interior of the bag 300. The front closure 320 allows a user to access the interior of the bag 300 even when the bag 300 is secured within the lid 104. The bag 300 may include a waterproof exterior

material and may have a volume of approximately 20 liters or within a range of 15 to 30 liters. As another way of defining the size, the bag 300 may substantially fill the volume of the interior void 105 of the lid 104. As another option for the deployable bag 300, a one-way air vent may be provided to allow the bag 300 to be compressed to remove the air from the bag 300 to minimize the volume of the bag within the suitcase 100.

**[0121]** In addition, bag 300 may include a plurality of attachment loops 308 arranged along an exterior perimeter of the bag 300. For instance, the attachment loops 308 may be evenly spaced along the top, bottom, left, and right sides of the bag 300. Each side of the bag 300 may include at least two attachment loops 308, or in some embodiments, each side of the bag 300 may have three or more attachment loops 308. Each attachment loop 308 may engage a hook 310 located along the sides of the interior void 105 of the lid 104. As shown in FIGS. 27, the hook 310 may engage and extend through the loop 308 to secure the bag 300 to the suitcase 100. FIG. 28 illustrates the removal of the loop 308 from the hook 310 to disengage the bag 300 from the suitcase 100. The hook 310 may be permanently connected to an interior side surface 312 of the lid 104. The hook 310 may comprise an outward member 314 extending outward from the side surface 312 and then a downward member 316 that extends from the edge of the outward member 314 towards the interior bottom surface 318 of the lid 104.

**[0122]** The attachment loops 308 may be part of an outer band that is attached to the exterior surface of the bag 300, or alternatively, the loops 308 may be individually placed along the exterior surface of the bag. The attachment loops 308 may be formed from a nylon or other suitable fabric material. As an alternative, the attachment loops 308 may be replaced by alternate fastening methods such as hook and loop type fasteners, magnetic elements, or other releasable element that may be positioned around the perimeter of the bag 300.

**[0123]** As another option, the bag 300 may be replaced by a plurality of deployable bags 300 that are removably coupled to the interior of the lid 104. The plurality of deployable bags 300 may be modular bags of different sizes. For example, the plurality of deployable bags 300 may include a first bag that fills approximately one-half of the interior void 105 and a second and third bag that each fills approximately one-quarter

of the interior void 105. Additionally, at least one of the plurality of bags may be waterproof or all of the plurality of bags may be waterproof.

**[0124]** The suitcase 100 may also include a trolley handle assembly 400 or tow pull handle. The trolley handle assembly, or tow pull, may be used in conjunction with wheels on a suitcase to easily pull or push the suitcase making it more maneuverable. The trolley handle assembly 400 may comprise a pair of extrusion assemblies 410 that are connected to the base 102 of the suitcase 100 and connected to each other by a handle or grip 402. The components of the trolley handle assembly 400 may be formed by various forming methods. For example, metal components, may be formed by forging, extruding, molding, casting, stamping, machining, and/or other known techniques. The polymer components may be formed or manufactured by polymer processing techniques, such as various molding and casting techniques and/or other known techniques.

**[0125]** As discussed above, the exterior of the suitcase 100 may have a contoured shape that may include a plurality of recesses to accommodate the latch assemblies, trolley handle assembly 400, and wheels 168 to minimize their profile and exposure to possible damage from collisions with other objects during travel. For instance, the lower shell 108 may have a tow pull recess 154 that is offset from the primary surface 146 on the bottom portion 122 of the lower shell 108. The tow pull recess 154 may have a depth that is equal to or greater than the thickness of the extrusion assembly 410 to adequately protect the trolley handle assembly 400 from impacts. The trolley handle assembly 400 may include an a pair of extendable extrusion assemblies 410 that can extend above from the top of the suitcase 100 to provide an elevated grip 402 for a user to easily pull the suitcase 100 as shown in FIG. 30. The extrusion assemblies 410 may include a major extrusion 420 and one or more minor extrusions 430, 460, where the minor extrusions may be nested within a central opening of the major extrusion 420, and slidably engaged with the major extrusion 420.

**[0126]** FIGS. 31-34 illustrate an exemplary grip or handle 402 of the trolley handle assembly 400. As discussed above the grip 402 may extend between the extrusion assemblies 410 and act as the interface for a user to extend and lower the trolley handle 400. The grip 402 may include a release button 411, an upper grip housing 413, and a lower grip housing 415. The lower grip housing 415 may include a pair of extension members

417 that extend away from an upper surface 419 of the upper grip housing 413. These extension members 417 may have an opening 431 with a shape and profile that is slightly larger than the profile of the minor extrusion 430 or tertiary extrusion 460 such that the uppermost extrusion member 430, 460 may be inserted into the opening 431 and secured. The extrusion member 430, 460 may then be secured to the grip 402 by means known to one skilled in the art.

**[0127]** The release button 411 may be centrally located in both a horizontal and vertical direction along the grip 402. In addition, the upper surface 419 may be contoured to match the adjacent surfaces of the suitcase to provide a clean aesthetic appearance. The release button 411 also may be include a contoured upper surface 433 to correspond with the upper surface 419 of the grip 402. Further, the release button 411 may be coupled to a rack and pinion gear assembly 435 as shown in FIGS. 33 and 34 that are illustrated with the upper grip housing 413 and the lower grip housing 415 removed. The release button 411 may have two lower engaging members 437 on each end of the button 411 that contact an engaging member 441 located on each of a pair of rack gear members 439. Each rack gear member 439 may include an engaging member 441, a rack gear portion 443 at a first end, a base member 445, and a transmitting member 447 at a second end opposite the first end. The rack gear portion 443 of each of the rack gear members 439 may engage with a pinion gear 449. The pinion gear 449 may be centrally located beneath the release button 411, such that when the release button 411 is pushed, the release button 411 may move in a direction generally perpendicular to the upper surface 419 of the grip 402. As the button 411 is pushed, the lower engaging members 437, which may have an angled surface 461, may contact and slide along a corresponding angled surface 463 of the engaging member 441 on the rack gear member 439. Angled surface 463 may have a compound angle relative to an upper surface of the base member 445, where the compound angle is angled to two orthogonal planes that are also orthogonal to the upper surface of the base member 445. The compound angle of surface 463 may form acute angles between 1 degree and 60 degrees to the two orthogonal planes. As the angled surfaces 461, 463 move along one another, both of the rack gear members 439 be urged to move outward. The pinion gear 449 may help to keep the movement between both gear members 439 equal and in a controlled manner. As the gear members 439 move outward, the transmitting member 447 then applies a force to an activating member 465 located in a slot positioned within

the lower extension 417. The transmitting member 447 may include an angled surface that contacts an angled surface on activating member 465. Activating member 465 may disengage a locking mechanism for the trolley handle assembly 400 allowing the grip 402 to be pulled upward and extend the extrusion assembly 410.

**[0128]** FIGS. 35-52 illustrate exemplary suitcase 500. The features of suitcase 500 are referred to using similar reference numerals under the "5xx" series of reference numerals, rather than "1xx" as used in the embodiment of FIGS. 1-30. Accordingly, certain features of suitcase 100 that were already described above as shown in FIGS. 1-30 may be described in lesser detail, or may not be described at all. In addition, suitcase 500 may also include a latch assembly 180 and trolley handle 400 as described above. Exemplary suitcase 500 may include a base 502 and the lid 504 rotatably coupled together by a hinge 506 or a plurality of hinges 506.

**[0129]** The base 502 may include a lower shell structure 508 having a first side 510, a second side 512 opposite the first side 510, a third side 514 extending between an edge of the first side 510 and an edge of the second side 512, and a fourth side 516 opposite the third side 514. The lower shell 508 may also have a first end 518 and a second end 520 near the opening for the interior void 503 of the base 502. The lower shell 508 may also include a bottom portion 522 connected to a first end 518 of the lower shell structure 508 and configured to support the suitcase 500 on a surface such as a table, the ground, or the like. Similarly, the lid 504 may include a upper shell structure 524 having a first side 526, a second side 528 opposite the first side 526, a third side 530 extending between an edge of the first side 526 and an edge of the second side 528, and a fourth side 532 opposite the third side 530. The upper shell structure 524 may also have a first end 534 and a second end 536 near the opening for the interior void 505 of the lid 504. The upper shell structure 524 may also include a bottom portion 538 connected to a first end 534 of the upper shell structure 524 and configured to support the suitcase 100 on a surface such as a table, the ground, or the like.

**[0130]** Similar to the example suitcase 100, both the upper shell 524 and the lower shell 508 may each be formed as a unitary, or single, member such that each shell is seamless. Additionally, the upper shell 524 and the lower shell 508 may be free of any apertures or openings that pierce or extend from an exterior surface into the respective interior voids 503, 505 of the base 502 and lid 504 when the various components of the suitcase

500 are assembled to the shells 524, 508. Shells 508, 524 may generally have a thickness within a range of 2 mm and 4 mm, or within 1.5 mm and 6 mm. The shells 508, 524 may also include varying wall thicknesses. As another feature, the shells 508, 524 may include external ribs (or rubrails) 509, which may be arranged along an outer or inner surface of the lower shell 108 and the upper shell 524 to increase the stiffness and strength of the shells as well as to protect the shells from impacts.

**[0131]** Upper shell 524 and lower shell 508 may form the majority of the exterior of the suitcase 500 and each may have a contoured shape that includes a primary surface, a raised surface, and a plurality of recesses, where the recesses may protect the components from collisions or damage. For example, the upper shell 524 may include a raised outward facing surface 540 that extends near and/or along the second end 520 around the perimeter of the upper shell 524. The raised outward facing surface 540 may be offset a fixed distance from an outward facing primary surface 542 of the upper shell 524. A plurality of upper latch recesses 544 and hinge recesses 545 may be formed within the raised surface 540. Each upper latch recess 544 may have a depth equal to or greater than the thickness of each of the latch assemblies 180 to provide protection for the latch assemblies 180. In some examples, each upper latch recess may have a rear surface 544A, an upper surface 544B, and a pair of opposing side surfaces 544C, and an opening 544D opposite the upper surface 545B. The upper recess depth of latch recess 544 may be defined as the horizontal distance between the outward facing surface 540 to the rear surface 544A. The upper latch recesses 544 may have a substantially rectangular shape, or alternatively a shape that closely matches the shape of the latch assembly 180. Each latch recess 544 may have receiving features to secure a latch assembly 180 within the recess 544. The receiving features may include a pocket on either side of the recess 544 to receive a pin or other mounting hardware for the latch assemblies 180. Similarly, each hinge recess 545 may be formed within the raised surface 540. Each upper hinge recess 545 may have a depth equal to or greater than the thickness of each of each hinge 506 to provide protection for hinge 506 from impacts.

**[0132]** Similar to the upper shell 124, the lower shell 508 may include a primary outward facing surface 546, a raised outward facing surface 548 that extends near and/or along the second end 536 around the perimeter of the lower shell 508. The raised outward facing surface 548 may be offset a fixed distance from a primary outward facing surface 546

of the lower shell 508. A plurality of lower latch recesses 550 and lower hinge recesses 551 may be formed within the raised surface 548. Each lower latch recess 550 may have a depth equal to or greater than the thickness of each of the latch assemblies 180. The lower latch recesses 550 may have a depth that is generally the same as the depth of the upper latch recess 544. In some examples, each lower latch recess 550 may have a rear surface 550A, an upper surface 550B, and a pair of opposing side surfaces 550C, and an opening 550D opposite the upper surface 550B. The lower recess depth of lower latch recess 550 may be defined as the horizontal distance between the outward facing surface 548 to the rear surface 550A. The latch recesses 550 may include a latch keeper 182 that extends across the lower recess 550 and provides an engaging surface for the latch assembly 180 to secure the lower shell 508 to the upper shell 524. Each latch recess 550 may have a substantially rectangular shape, or alternatively a shape that closely matches the shape of the latch assembly 180. The shape and size of the latch recesses 544, 550 may be mirror images of each other to and may be aligned to form a larger recess to receive the entire latch assembly 180 when the suitcase 500 is in a closed configuration. By receiving the entire latch assembly 180 within this larger recess, the exposed surfaces of latch assembly 180 may be below outward facing surfaces 540, 548 and also protected around the sides of the latch assembly 180 such that when the suitcase is in the closed configuration, a perimeter of the latch assembly 180 may be located within a combined perimeter of the upper latch recess 544 and lower latch recess 550.

**[0133]** In some examples, as shown in FIGS. 44B and 44C, the latch assembly 180 may be rotatably coupled to a lid latch mount 181 prior to being installed to the lid 504. The lid latch mount 181 may include a body member 189 that may be received within upper latch recess 544 and a flange 183 that may be mounted to a shelf within recess 544 or mount to a surface adjacent the upper latch recess 544. The lid latch mount 181 may be installed in recess 544 in a direction generally parallel to the surface of the first side 526 and secured to the shell 124 using at least one mechanical fastener inserted into an opening on flange 183 of lid latch mount 181. The mechanical fastener securing the flange 183 to the upper shell 524 may insert into a threaded hole in a thickened portion of the shell 524, which may prevent the fastener from piercing into the interior of the shell 524. As described above, in some examples, a base latch mount 185 may be received in lower latch recess 550 of the lower shell 508. The latch keeper 182 may be

installed into the base latch mount 185 prior to being installed to the base 102. The base latch mount 185 may include a base member 191 that may be received within lower latch recess 550 and a flange member 187 that may be mounted to a shelf within recess 544 or mount to a surface adjacent the upper latch recess 544. The lower latch mount 185 may be installed in lower latch recess 550 in a direction generally parallel to the surface of the first side 110 and secured to the lower shell 508 using at least one mechanical fastener inserted into an opening on flange 187 of lid latch mount 185. The mechanical fastener securing the flange 187 to the shell 108 may insert into a threaded hole in a thickened portion of the shell 508 to prevent the fastener from piercing into the interior of the shell 508. The mechanical fasteners 624 securing the latch mounts 181, 185 to their respective shells 524, 508 may be oriented generally parallel to each other and may also be parallel to the first side 510 of the shell 508 and also may be parallel to the first side 526 of shell 524.

**[0134]** The lower hinge recesses 551 may be formed within the raised surface 548. Each lower hinge recess 551 may have a depth equal to or greater than the thickness of each of each hinge 506 to provide protection for hinge 506 from impacts. The shape and size of the recesses 545, 551 may be mirror images of each other to and may be aligned to form a larger recess to receive the entire hinge 506. The larger recess formed from recesses 545, 551 may have a shape that surrounds a majority of the perimeter of the hinge assembly 506.

**[0135]** As shown in FIG. 43A, suitcase 500 may include an interior liner 600. The interior liner 600 may be molded and may be releasably secured into either the interior void 503 of the base 502 or the interior void 505 of the lid 504. The interior liner 600 may have a formed exterior shape to match the interior profile of either interior void 503, 505. The interior liner 600 may include a storage cavity 602 recessed from an upper surface 608 of the liner 600 to accommodate different cargo. For example, the storage cavity 602 may include a plurality of different shaped cavities to receive and protect different shaped items. The interior liner 600 may be formed via a molding process where the liner 600 is molded from a rubber, polymer, or foam material such as ethylene-vinyl acetate (EVA) or other similar material. The liner 600 may be include mechanical elements 604, such as clips or hooks, that are spaced around the exterior of the liner 600 where the mechanical elements 604 engage corresponding mechanical

elements, such as loops, positioned along the interior of the base 502 and the lid 504. Optionally, the interior liner 600 may also be secured using an adhesive, hook and loop type fasteners (Velcro), magnetic elements, or other connection methods. For example, the interior liner 600 may have a plurality of magnetic or ferromagnetic elements positioned along a perimeter and/or bottom surface that may attach to corresponding magnetic or ferromagnetic elements positioned along or within the interior surfaces of the shells 508, 524. In some instances, suitcase 500 may include multiple interior liners 600 where the interior liners 600 may be interchangeably installed into suitcase 500 depending on the contents to be secured. In some examples, the liner 600 may include a releasable netting or layer 606 to further secure items within the liner 600.

**[0136]** As another option to releasably secure the interior liner 600 to within the interior void 503 of the base shell 508 or interior void 505 of the lid shell 524, the liner 600 may include a liner attachment assembly 620 that releasably engages a base attachment member 640. FIGS. 43B-43E illustrate an alternate means to releasably attach the liner 600 to either of the shells 508, 524. The liner attachment assembly 620 may move between a locked position to secure the liner 600 to one of the shells 508, 524 and an unlocked position that allows the liner 600 to be removed from the suitcase 500. The liner attachment member 620 may be permanently attached to the interior liner 600 and the base attachment member 640 may be permanently attached to an interior surface 507, 525 of the base shell 508 or the lid shell 524. The liner attachment assembly 620 may include a tail member 622, a flange member 628, and a grip member 634. The tail member 622 may include a tail body member 624 with a locking projection 626 extending outwardly from the tail body member 624. In some cases, such as the illustrated example in FIG. 43E, the tail member 622 may have a pair of locking projections 626 that are arranged opposite each other. The locking projections 626 may have at least one tapered surface to securely engage the base attachment member 640. In addition or optionally, each locking projection 626 may have a detente or recess to engage a corresponding recess or detent on the base attachment member 640 to provide positive feedback of the attachment assembly 620 reaching the locked position. The body member 624 of the tail member 622 may have a generally cylindrical shape or may have any shape that is symmetrical around a central axis. .The flange member 628 may include a flange body 630 that may be permanently secured to the liner 600 (i.e. through stitching, rivets, adhesives, or other means known to one skilled in the art)

and a flange opening 632 The flange opening 632 may receive a portion of the tail member 622, and the grip member 634 may attach to the portion of the tail member 622 that extends into the flange opening 632. The grip member 634 may be any shape and provide a surface to allow a user to grab and rotate the grip member 634.

**[0137]** The base attachment member 640 may include a first wall 642 and a second wall 644 where each wall 642, 644 may extend away from the interior surface 507 of the base shell 508 with a first end 646 at the interior surface and a second end 648 opposite the first end 646. The first wall 642 may include a first base locking projection 650 located at the second end 648 that extends toward the second wall 644, where the second wall 644 includes a second base locking projection 650 located at the second end that extends toward the first wall 644. The first wall 642 and second wall 644 may be spaced a fixed distance from each other. Each of the base locking projections 650 may include a contoured edge shape 652 to receive the tail member 622 such that the body member 624, the contoured edge shape 652, and the opening 632 may be coaxial with each other when the attachment assembly 620 is in a locked position.

**[0138]** The liner attachment assembly 620 may be moved to a locked position from an unlocked position by rotating the grip member 634 a predetermined amount in a first direction, and may be moved to an unlocked position from a locked position by rotating the grip member 634 a predetermined amount in a second direction, where the second direction is opposite the first direction. For example, the liner attachment assembly 620 may be moved to a locked position from an unlocked position by rotating the grip member 634 approximately 90 degrees in a first direction, and may be moved to an unlocked position from a locked position by rotating the grip member 634 approximately 90 degrees in a second direction, where the second direction is opposite the first direction. In some examples, the grip member 634 may be moved to a predetermined amount in the same direction to move the attachment assembly 620 from a locked position to an unlocked position. When in the locked position, the locking projection of the liner attachment assembly is at least partially positioned underneath the first base locking projection or the second base locking projection.

**[0139]** The liner may include a plurality of liner attachment assemblies 620 that may be attached to the base attachment members 640. For examples, the liner attachment assemblies 620 may be located within the storage cavities 602 or within anywhere on

the liner 600 such as the sidewalls or bottom surface. Similarly, the shells 508, 524 may include a plurality of base attachment members 640 that may be arranged anywhere along the interior surfaces of the corresponding shell. For examples, base attachment members 640 may be placed along the interior side surfaces and/or bottom surfaces of the shells 508, 524. As another option, backpack 300 may also include the liner attachment assemblies 620 and may be releasably secured to the shells 508, 524 as described above.

**[0140]** FIG. 44A illustrates a front view of the suitcase in an open configuration with some components removed. The plurality of hinges 506 that join the base 502 and lid 504 together may be secured to the base 502 and lid 504 such that the lid portion and base portion of the hinge 506 may be slid into the respective hinge recess 545, 551 and then secured the using a mechanical element 622, such as a mechanical fastener. The mechanical element 622 may be oriented generally perpendicular to the bottom portion 522 of the base 502. Similarly, the latch assembly 180 may be installed into the lid 504 by sliding the latch assembly 180 into the lid latch recess 544 and securing it to the lid 504 using a mechanical element 624, such as a mechanical fastener, where the mechanical element 624 may also be oriented generally perpendicular to the bottom surface 522 of the base 502.

**[0141]** As discussed above, the suitcase 500 may include a gasket 576 or other sealing device. As shown, the gasket 576 may be arranged in a recess 577 arranged on the lower surface 537 at the second end 536 of the lid 504. The base 502 may have a sealing rib 581 arranged along the upper surface 521 at the second end 520 of the base 502 that engages the gasket 576 when the suitcase 500 is in the closed configuration. In addition, when the suitcase 500 is in the closed configuration, the engagement of the gasket 576 and the sealing rib 581 may prevent the upper surface 521 of the base 502 from contacting the lower surface of the lid 504, where the upper surface and the lower surface and the fourth end surface are spaced apart from each other where the lid 504 is spaced apart a fixed distance from the base 502 creating a gap between them. The gasket 576 may be formed from a rubber or polymeric material and in some examples, have a substantially circular cross-section. Alternatively, the gasket 576 may be arranged in a recess or channel formed in the base 502.

**[0142]** In addition, the base 502 of suitcase 500 may include a tapered region 523 between the bottom portion 522 and the fourth surface 516. The tapered region 523 may be located between the pair of wheel assemblies 564 and form an acute angle with the central region of the bottom portion 522. This tapered portion may extend at an angle within a range of 1 degree and 30 degrees when measured from the central portion of the bottom portion 522 to a lower surface of the tapered region 523 (or tangent plane to a lower surface of the tapered region 523). Tapered portion 523 allows suitcase 500 to be pulled using the trolley handle 400 in a larger variety of positions to accommodate users having different heights.

**[0143]** FIGS. 63 and 64 illustrate the hinge 506. The hinge assembly 506 may include at least two linkages 626, a base hinge insert 628, a lid hinge insert 630, and a plurality of linkage pins 632. A portion of each linkage 626 may be connected via a linkage pin 632 to the lid 504 and a portion of each linkage 626 may be connected via a linkage pin 632 to the base 502. The hinge assembly 506 may define a hinge axis 633 for the rotation of the lid 504 relative to the base 502. Hinge axis 633 may be located outside of a rear edge of the base 502 and also outside of a rear edge of the lid 504. Additionally, the hinge axis 633 may be outside of the physical geometry of the hinge assembly 506. The base hinge insert 628 and the lid hinge insert 630 may each have a recess 636, 638 respectively. The hinge recesses 636, 638 may receive the plurality of linkages 626. Each recess 636, 638 may have a depth measured from a respective top surface 640, 642 of the hinge insert 628, 630 to a bottom surface of the recess that is greater than a thickness of each of the linkages 626. This arrangement allows the hinge inserts 628, 630 to protect the linkages 626 from any damage.

**[0144]** Each linkage 626 may have a top surface 640 and a bottom surface 642 opposite the top surface 640 as well as side surfaces 644 extending between the top and bottom surfaces 640, 642. A pair of holes 646 may extend through the side surfaces 644 where the holes 646 receive the linkage pins 632. For example, linkage 626 may include a first linkage opening 646 that receives a first linkage pin 632 that extends through the opening 646 into an opening in the base hinge insert 628 and a second linkage opening 646 that receives a second linkage pin 632 that extends through the opening 646 into an opening in the lid hinge insert 630. Thus, each linkage 626 is connected to both the base 502 and the lid 504. In addition, the bottom surface 642 may include a slot 648

that receives one of the linkage pins 632 when the suitcase is in the closed configuration and a slot 650 on the top surface 640 that receives one of the linkage pins 632 when the suitcase is in the open configuration. The linkages 626 may be arranged adjacent each other where the first linkage may be oriented with the top surface 640 facing toward the top perimeter of both the lid 504 and the base 502 when the suitcase 500 is in the open configuration and the second linkage may be oriented with the bottom surface 642 facing toward the top perimeter of both the lid 504 and the base 502 when the suitcase 500 is in the open configuration as shown in FIG. 45.

**[0145]** Each of the base hinge insert 628 and lid hinge insert 630 may have a generally rectangular shape when viewed from the left side view of the suitcase 500. As discussed above, each hinge insert 628, 630 has a hinge recess 636, 638, where each hinge recess is open on one end and surrounded by a hinge insert wall on the remaining sides. When installed, the open end of each recess 636, 638 may align with each other to form an overall hinge recess to receive the linkages 626 and allow them to move. Each hinge insert 628, 630 may have a hinge flange 652 extending from the hinge insert wall at the end of the hinge insert 628, 630 that has the open end of the recess 636, 638. The hinge flange 652 may have at least one opening to receive the mechanical element 622 that secures the hinges 506 within the respective hinge recesses 550, 551 of the base 502 and lid 504.

**[0146]** Similar to the configuration of suitcase 100, the feet 572 may be generally aligned with one or more of the hinges 506 where a flat portion of the feet 572B are spaced from an edge of a hinge 506. In addition, the feet 572B may be arranged to contact one another when the suitcase 500 is fully opened to reduce the impact forces on the hinges and the other components of the suitcase 500 when it is opened as shown in FIG. 46. While the illustrated example suitcase 500 has three hinge assemblies 506, the suitcase 500 may only have two hinges 506 or may have more than three hinges.

**[0147]** The components of the hinge assembly 506 such as the linkages 626, hinge inserts 628, 630, linkage pins 632, may be formed of metallic materials such as steel or aluminum to provide adequate strength and stiffness. Alternatively, these components may be formed from a polymeric material or composite material such as a fiber-filled polymer. The components may be manufactured using known methods such as casting, machining, and molding.

**[0148]** Similar to suitcase 100, suitcase 500 may include a plurality of wheel assemblies 564 positioned near the rear and bottom corners of suitcase 500. As shown in FIG. 47, wheel assembly 564 may be installed into wheel recess 570 of the lower shell 508. Wheel assembly 564 may include a wheel housing 566 that has a rounded shape and a mounting flange 567. The wheel assembly 564 may further include a wheel 568 mounted on an axle and bearings (not shown). The housing 566 may further include a plurality of guide rails 569 oriented along a side surface of wheel housing 566 and a plurality of guide rails 571 positioned along the top surface of the wheel housing 566. The guide rails 569, 571 will slide into corresponding guide slots 573, 575 arranged within the wheel recess 570 of the lower shell 508. The guide slots 573, 575 and guide rails 569, 571 may include at least one tapered surface to provide a tighter fit as the wheel assembly 564 is slid into its final position. Furthermore, the guide rails 573, 575 and guide slots 569, 571 may secure the wheel assembly 564 in both a lateral and vertical direction (when looking at the rear view of the suitcase 500). The wheel assembly 564 may be secured to the wheel recess 570 using at least one mechanical element, such as mechanical fastener, extending through the mounting hole positioned in the mounting flange 567, wherein the mechanical element is oriented parallel to the mechanical elements 622 and 624 that secure the hinges 506 and latch assemblies 180 respectively. As shown in the illustrated example, each wheel assembly may be secured with a single mechanical fastener.

**[0149]** Each wheel assembly 564 may be formed as a separate member, as shown in FIGS. 65 and 66. Each wheel assembly 564 may include a wheel housing 566 having a rounded shape and at least one mounting flange 567 located on at least one end, and a wheel 568 mounted on an axle and bearings (not shown) such that the axle is aligned with a center of the rounded shape. In addition, each wheel housing 566 may have a contoured surface that generally follows the contour of the bottom surface 522 of the suitcase and includes the tapered portion 523. The outward facing surface 583 of wheel housing 566, when installed, may be spaced outward of the bottom surface 522 and tapered portion 523 of the base 502. By spacing the outward facing surface 583 away from the base 502 may help to protect the base 502 from any impacts.

**[0150]** As shown in the illustrated examples, the suitcase 500 may comprise a pair of wheel assemblies 564, however, in other embodiments the suitcase may include additional

wheel assemblies 564. The wheel assemblies 564 may be evenly spaced apart and may be located on the outer edges of the suitcase 500 such that the wheel housing 566 is exposed on at least three sides of the base 502. The housing 566 may be formed from a polymer material, such as a polyamide (nylon) or similar material, w646le the wheels 568 may be formed from a polymer material, such as a polyurethane, or similar material. In some examples, the wheels 568 may include a rubber coating or rubber exterior for better traction and wear.

**[0151]** As discussed above, the base 502 may include a lower shell 508 and the lid 504 may include an upper shell 524 to provide a rigid structure that may form a barrier to protect the stored contents. The lower and upper shells 508, 524 may be formed from various materials, such as one or more metals, alloys, polymers, ceramics, or fiber-reinforced materials. In some examples, the upper and lower shells 124, 108 may be formed of a polymer material, such as a polycarbonate alloy, a thermoplastic olefin (TPO), or other similar material, that is molded to form both the shells 508, 524. In some arrangements, the shells 508, 524 are formed using injection molding or roto-molding/rotational molding processes as would be understood by one of ordinary skill in the art (not shown). In order to further enhance the structure, the shells 508, 524 may include elongated rib structures to further stiffen the structure in areas around the latch assemblies 180 and hinges 506. For instance, as shown in FIGS. 67 and 68, upper shell 524 may have a set of elongated ribs 527 extending from a surface underneath each of the upper latch recesses 544 to the interior surface on the top portion 538 of upper shell 524. Similarly, a set of elongated ribs 527 may extend from a surface underneath each of the upper hinge recesses 545 to the interior surface of the top portion 538 of upper shell 524. Each rib 527, 529 within each set may be evenly spaced apart from the next adjacent rib, where each rib may be spaced apart from each other a distance of approximately 9.5 times the thickness of each rib 527, 529, or spaced apart from each other within a range of 8 time to 10 times the thickness of each rib 527, 529, or spaced apart from each other within a range of 6 to 12 times the thickness of each rib 527, 529. Each rib 527, 529 may have a thickness of approximately 1.6 mm or within a range of 1.0 mm and 2.2 mm. Similarly, as shown in FIGS. 69 and 70, the lower shell 508 may have a set of elongated ribs 511 extending from a surface underneath each of the lower latch recesses 550 to the interior surface bottom portion 522 of lower shell 508. Similarly, a set of elongated ribs 513 may extend from a surface underneath each of the

lower hinge recesses 551 to the interior surface of the bottom portion 522 of lower shell 508. Each rib 511, 513 within its set of ribs may be evenly spaced apart from the next adjacent rib, where each rib 511, 513 may be spaced apart from each other a distance of approximately 9.5 times the thickness of each rib 511, 513, or spaced apart from each other within a range of 8 to 10 times the thickness of each rib 511, 513, or spaced apart from each other within a range of 6 to 12 times the thickness of each rib 511, 513. Each rib 511, 513 may have a thickness of approximately 1.6 mm or within a range of 1.0 mm and 2.2 mm. The rib structures 511, 513, 527, 529 may also be connected to the adjacent interior surface of the shell structure of the respective lid and base shells 524, 508. The rib structures 511, 513, 527, 529 help to stiffen and strengthen shells 508, 524. As another option, the lower shell 508 may have an opening 515 arranged within the ribs 513 under one of the hinge recesses 551 to receive a one-way pressure release valve.

**[0152]** In some embodiments, this disclosure relates to a suitcase comprising a lid rotatably connected to a base, where the lid may include an upper shell formed as a unitary member and where the base includes a lower shell formed as a unitary member. The suitcase may be configured in an open orientation or a closed configuration, where in the closed configuration, a plurality of latch assemblies secure the lid to the base. In addition, the upper shell and the lower shell may be free of apertures or openings extending from an exterior surface through an interior surface. As another option, the latch assemblies may be located within an upper latch recess and a lower latch recess located on the lid and base respectively. Additionally, a wheel assembly comprising a housing, a wheel, and an axle may be formed as a separate member and received in a recess formed on the lower shell.

**[0153]** The present disclosure is disclosed above and in the accompanying drawings with reference to a variety of examples. The purpose served by the disclosure, however, is to provide examples of the various features and concepts related to the disclosure, not to limit the scope of the invention. One skilled in the relevant art will recognize that numerous variations and modifications may be made to the examples described above without departing from the scope of the present disclosure.

What is claimed is:

1. A suitcase comprising:

a base including:

a first shell structure that includes a first side and a second side opposite the first side, wherein the first shell structure has a first end and a second end opposite the first end and wherein the first side has a first outward facing surface and a second outward facing surface, wherein the second outward facing surface is offset a first fixed distance from the first outward facing surface;

a bottom portion connected to a first end of the first shell structure and configured to support the suitcase on a surface;

a first interior void defined by the first shell structure and the bottom portion; and

a lower latch recess located in the second outward facing surface, wherein the lower latch recess has a rear surface, a lower surface, and a pair of side surfaces;

a lid rotatably connected to the base, the lid including:

a second shell structure including a third side and a fourth side opposite the third side, wherein the second shell structure having a third end and a fourth end opposite the third end, wherein the third side has a third outward facing surface and a fourth outward facing surface, wherein the fourth outward facing surface is offset a second fixed distance from the third outward facing surface;

a top portion connected to the third end of the second shell structure; and

a second interior void defined by the second shell structure and the top portion; and

an upper latch recess located in the second outward facing surface, wherein the upper latch recess has a rear surface, an upper surface, and a pair of side surfaces;

a latch assembly located within the lower latch recess and the upper latch recess, wherein the lower latch recess and the upper latch recess are aligned and have a depth that is greater than a thickness of the latch assembly, and

wherein when the suitcase is in a closed configuration, a perimeter of the latch assembly is located within a combined perimeter of the upper latch recess and lower latch recess.

2. The suitcase of claim 1, wherein the lid is free of openings that extend through the first outward facing surface into the second interior void.

3. The suitcase of claim 1, wherein the second outward facing surface extends along an entire perimeter of the base, and wherein the fourth outward facing surface extends along an entire perimeter of the lid.

4. The suitcase of claim 1, wherein the lid is rotatably connected to the base by at least one hinge.

5. The suitcase of claim 4, wherein a portion of the at least one hinge is located in an upper hinge recess and a lower hinge recess, wherein the lower hinge recess is located in the second outward facing surface and the upper hinge recess is located in the fourth outward facing surface.

6. The suitcase of claim 5, wherein the at least one hinge comprises at least two linkages, and wherein when the suitcase is in an open configuration, the at least one hinge defines a rotational axis and the rotational axis is located outside of a rear edge of the base and a rear edge of the lid.

7. The suitcase of claim 1, wherein the base includes a pair of wheel assemblies, and wherein each wheel assembly is attached into a wheel recess formed in the base, wherein each wheel assembly includes a wheel housing and a wheel.

8. The suitcase of claim 7, wherein each wheel housing includes an outward facing flange surface that is spaced outward a fixed distance from adjacent surfaces of the base around the wheel recess.

9. The suitcase of claim 7, wherein the bottom portion of the base includes a tapered region between the pair of wheel assemblies, wherein the tapered region forms an angle within a range of 1 degree and 30 degrees when measured from a central portion of the bottom portion to a lower surface of the tapered region.

10. The suitcase of claim 1, wherein the base includes a second end surface along the second end of the first shell structure, and the lid includes a fourth end surface along the fourth end of the second shell structure, and wherein when the suitcase is in a closed configuration, the second end surface and the fourth end surface are spaced apart from each other.

11. The suitcase of claim 10, wherein the second end surface includes a sealing rib that protrudes from the second end surface and the second end surface includes a channel that receives a gasket, and wherein when the suitcase is in the closed configuration, the sealing rib engages the gasket.

12. The suitcase of claim 1, wherein the base includes a plurality of ribs that extend from a surface underneath the lower latch recess to an interior surface of the bottom portion.

13. The suitcase of claim 12, wherein each rib of the plurality of ribs is spaced apart from each other by a distance within a range of 8 to 10 times a thickness of each rib.

14. The suitcase of claim 1, wherein a first volume of the first interior void is within 10 percent of a second volume to the second interior void.

15. A suitcase comprising:

a base including:

a first shell structure having a first side and a second side opposite the first side, wherein the first shell structure has a first end and a second end opposite the first end and wherein the first side has a first outward facing surface and a second outward facing surface, wherein the second outward facing surface is offset a first fixed distance from the first outward facing surface;

a bottom portion connected to a first end of the first shell structure;

a first interior void defined by the first shell structure and the bottom portion; and

a lower hinge recess located in the second outward facing surface;

a lid rotatably connected to the base, the lid including:

a second shell structure including a third side and a fourth side opposite the third side, wherein the second shell structure having a third end and a fourth end opposite the third end, wherein the third side has a third outward facing surface and a fourth outward

facing surface, wherein the fourth outward facing surface is offset a second fixed distance from the third outward facing surface;

a top portion connected to the third end of the second shell structure; and

a second interior void defined by the second shell structure and the top portion; and

a hinge assembly at least partially received within the lower hinge recess, wherein the lid is rotatably connected to the base by the hinge assembly, wherein the hinge assembly comprises at least two linkages, and wherein when the suitcase is in an open configuration, the hinge assembly defines a hinge axis, wherein the hinge axis is located outside of a rear edge of the base and a rear edge of the lid.

16. The suitcase of claim 15, wherein the hinge assembly is at least partially received in an upper hinge recess, wherein the upper hinge recess is located within the fourth outward facing surface.

17. The suitcase of claim 15, wherein the hinge assembly comprises three hinge assemblies.

18. The suitcase of claim 15, wherein the hinge assembly further comprises a base hinge insert and a lid hinge insert, wherein the base hinge insert and the lid hinge insert both include a cavity that at least partially receives the at least two linkages.

19. The suitcase of claim 18, wherein the cavity of the base hinge insert has a depth that is greater than a thickness of the at least two linkages.

20. The suitcase of claim 19, wherein the at least two linkages include a first linkage and a second linkage, wherein the first linkage includes a first linkage opening and a second linkage pin, wherein a first linkage pin extends through the first linkage opening and into the base hinge insert, and wherein a second linkage pin extends through the second linkage opening and into the lid hinge insert.

21. A method for forming a suitcase, comprising:

molding a base shell, wherein the base shell has a plurality of lower latch recesses, a plurality of lower hinge recesses, a base shell structure, and a base interior

void, wherein the base shell includes a first side and a second side opposite the first side, wherein the base shell has a first end and a second end opposite the first end, and wherein the base shell includes a bottom portion connected to a first end of the base shell;

molding a lid shell, wherein the lid shell has a plurality of upper latch recesses and a plurality of upper hinge recesses, an lid shell structure, and a lid interior void; wherein the lid shell includes a third side and a fourth side opposite the third side, wherein the third side has a third end and a fourth end opposite the third end, and wherein the lid shell includes a top portion connected to the third end of the lid shell,

placing the base shell and the lid shell adjacent each other, wherein the base interior void and the lid interior void are both facing the same direction and wherein the lower hinge recess and the upper hinge recess are facing towards each other;

placing a first portion of a hinge assembly into the lower hinge recess;

placing a second portion of the hinge assembly into the upper hinge recess;

securing the first portion of the hinge assembly to the base using a first mechanical fastener;

securing the second portion of the hinge assembly to the lid using a second mechanical fastener;

placing a portion of a latch assembly into the upper latch recess;

securing the portion latch assembly to the lid using a third mechanical fastener; and

wherein the first mechanical fastener, the second mechanical fastener, and the third mechanical fastener are all oriented generally parallel to each other.

22. The method of claim 21, further comprising attaching a wheel assembly into a wheel recess on the base shell using a fourth mechanical fastener, wherein the fourth mechanical fastener is oriented generally parallel to the first mechanical fastener.

23. The method of claim 21, further comprising:

attaching the portion of the latch assembly to a lid latch mount prior to placing the portion of the latch assembly into the upper latch recess, wherein the lid latch mount includes a body member and a flange, wherein the flange extends on outward from the body member and wherein the body member of the lid latch mount is received within the upper latch recess.

24. The method of claim 23, further comprising:

securing the lid latch mount to the lid shell with the third mechanical fastener that extends through an opening in the flange and into a thickened portion of the lid shell.

25. The method of claim 24, wherein the first mechanical fastener is oriented generally parallel to the third side of the lid shell.

26. A suitcase comprising:

a base including:

a first shell structure having a first side and a second side opposite the first side, the first shell structure having a first end and a second end opposite the first end;

a bottom portion connected to the first end of the first shell structure and configured to support the suitcase on a surface;

a first interior void defined by the first shell structure and the bottom portion; and

a lower latch recess located within the second outward facing surface, wherein the lower latch recess has a rear surface, a lower surface, and a pair of side surfaces;

a lid rotatably connected to the base, the lid including:

a second shell structure having a third side and a fourth side opposite the third side, the second shell structure having a third end and a fourth end;

a top portion connected to the third end of the second shell structure; and

a second interior void defined by the second shell structure and the top portion; and

an interior liner releasably secured to either the base shell within the first interior void or the lid within the second interior void, wherein the interior liner includes at least one storage cavity recessed from an upper surface of the interior liner and includes a liner attachment assembly that releasably engages a base attachment member, wherein the liner attachment assembly is permanently attached to the interior liner and the base attachment member is permanently attached to an interior surface of the suitcase, wherein the liner attachment assembly includes a grip member that is rotated a predetermined amount to move the liner attachment assembly from an unlocked position to a locked position, wherein when the liner attachment assembly is in the

unlocked position, the interior liner is secured to the suitcase and wherein when the liner attachment assembly is in the unlocked position, the liner is allowed to be removed from the suitcase.

27. The suitcase of claim 26, wherein the liner attachment assembly includes a tail member, a flange member, and the grip member, wherein the tail member includes a tail body member with a locking projection extending outwardly from the tail body member.

28. The suitcase of claim 27, wherein the tail body member have a generally cylindrical shape.

29. The suitcase of claim 27, wherein the locking projection comprises two locking projections that are arranged opposite each other.

30. The suitcase of claim 27, wherein each locking projection has at least one tapered surface.

31. The suitcase of claim 27, wherein the flange member includes a flange opening that receives a portion of the tail member, and wherein the grip member attaches to the portion of the tail member extending into the flange opening.

32. The suitcase of claim 27, wherein the liner attachment assembly is moved to the locked position from the unlocked position by rotating the grip member approximately 90 degrees in a first direction, and the liner attachment assembly is moved to the unlocked position from the locked position by rotating the grip member approximately 90 degrees in a second direction, wherein the second direction is opposite the first direction.

33. The suitcase of claim 26, wherein the base attachment member includes a first wall and a second wall, wherein each wall extends away from the interior surface of the base with a first end at the interior surface and a second end opposite the first end, wherein the first wall includes a first base locking projection located at the second end that extends toward the second wall and the second wall includes a second base locking projection located at the second end that extends toward the first wall, and

wherein when the liner attachment assembly is in the locked position, the locking projection of the liner attachment assembly is at least partially positioned underneath the first base locking projection or the second base locking projection.

34. A suitcase comprising:

a base, the base including:

a first shell structure having a first side and a second side opposite the first side, wherein the first shell structure has a first end and a second end opposite the first end and wherein the first side includes a first outward facing surface and a second outward facing surface, wherein the second outward facing surface is offset a first fixed distance from the first outward facing surface;

a bottom portion connected to a first end of the first shell structure;

a first interior void defined by the first shell structure and the bottom portion;

a lid rotatably connected to the base, the lid including:

a second shell structure having a third side and a fourth side opposite the third side, the second shell structure having a third end and a fourth end opposite the third end; wherein the second shell structure has a third outward facing surface and a fourth outward facing surface, wherein the fourth outward facing surface is offset a second fixed distance from the third outward facing surface;

a top portion connected to the third end of the second shell structure; and

an extendable trolley handle, the trolley handle including:

a pair of nested extrusion assemblies, wherein each extrusion assembly includes a major extrusion and a minor extrusion, wherein the minor extrusion is nested within a central opening of the major extrusion, and slidably engaged with the major extrusion; and

a grip connected to the minor extrusion of each extrusion assembly, wherein the grip includes a release button that when pressed actuates a rack and pinion gear assembly located within the grip to allow the trolley handle to extend; and

wherein the rack and pinion gear assembly includes a pair of rack gear members, wherein each rack gear member includes an engaging member that contacts a portion of the release button, a rack gear portion, wherein each rack gear portion engages a pinion gear to equalize movement of the rack gear members and wherein the engaging member has a first angled surface that engages the release button, wherein the first angled surface includes a compound angle relative to an upper surface of the base member.

35. The suitcase of claim 34, wherein each rack gear member further includes a transmitting member at an end opposite the rack gear member, wherein the transmitting member has a second angled surface that contacts a third angled surface on an activating member, wherein the activating member disengages a locking mechanism for the trolley handle assembly.

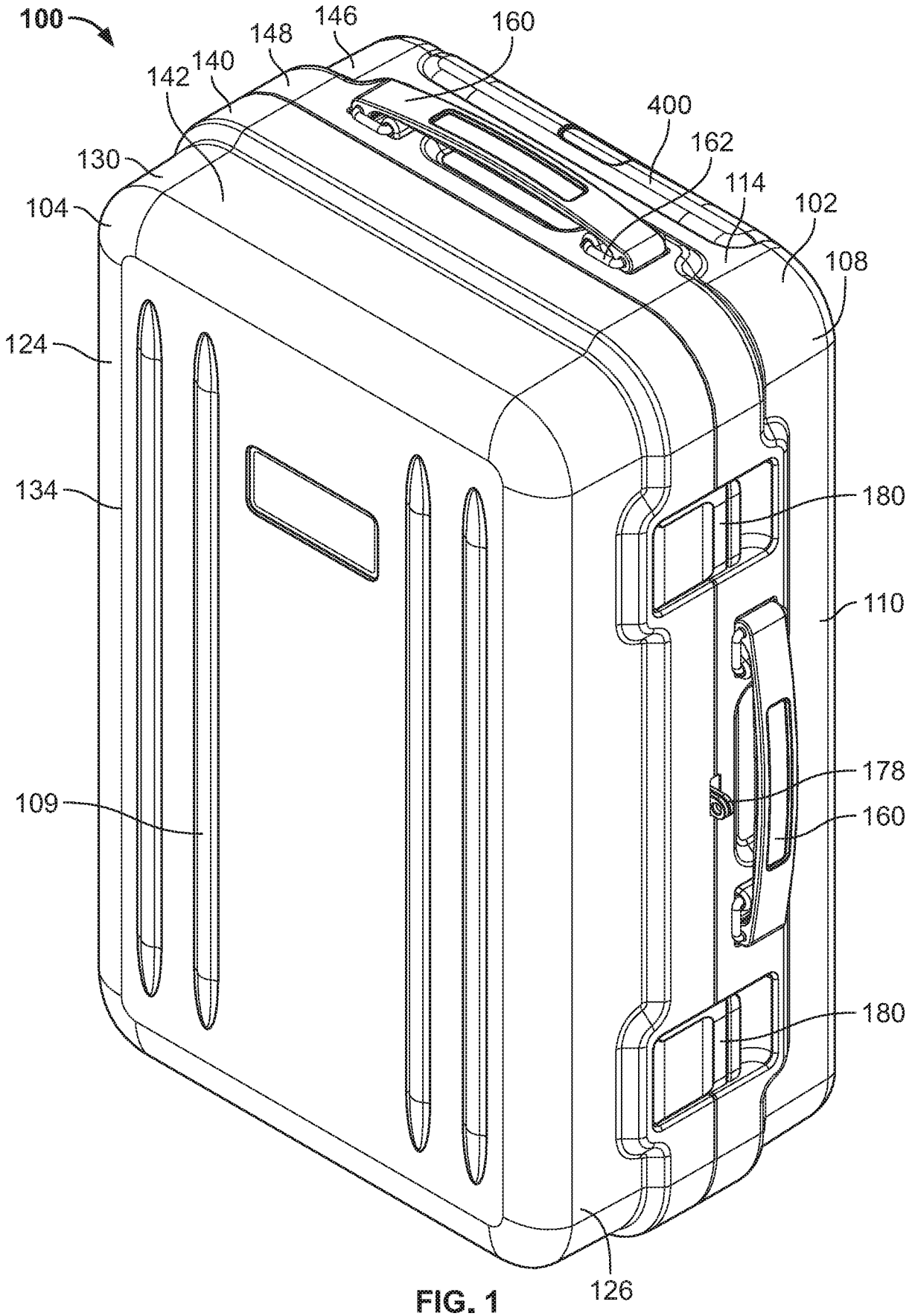
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FIG. 1

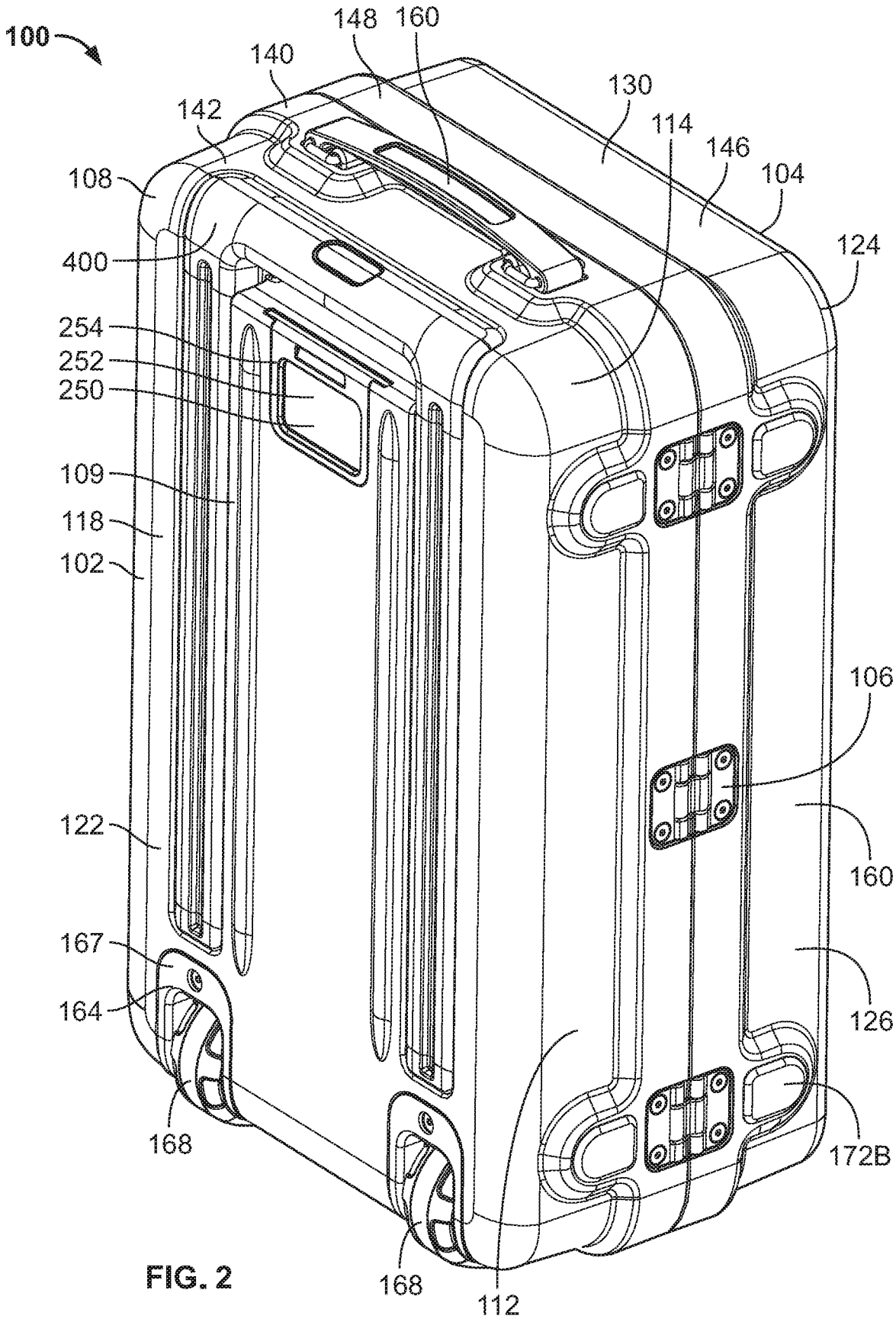
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FIG. 2

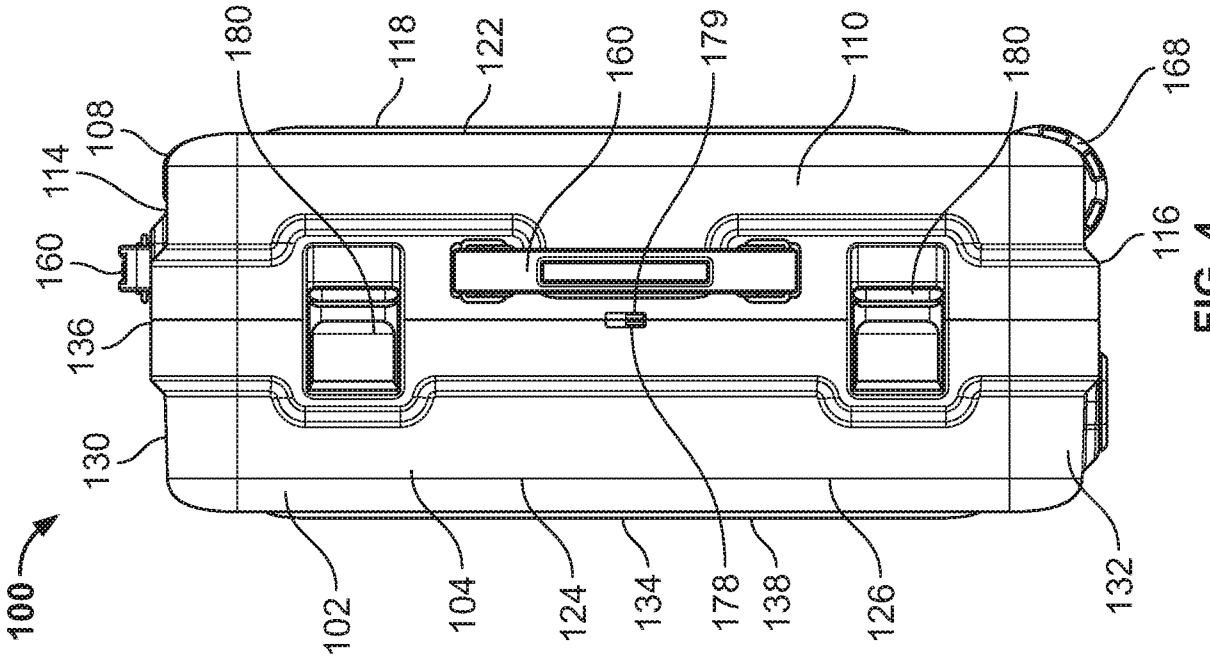
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FIG. 4

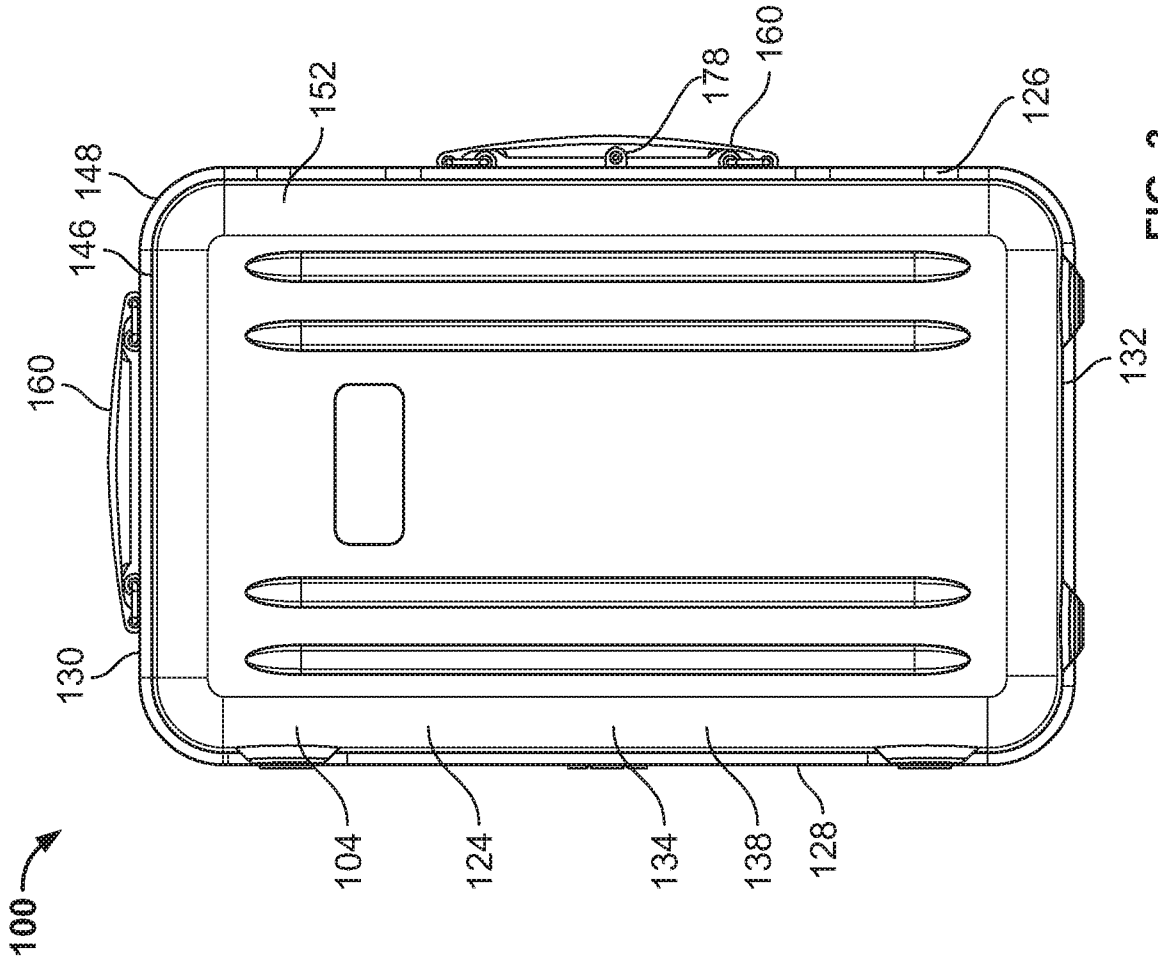
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FIG. 3

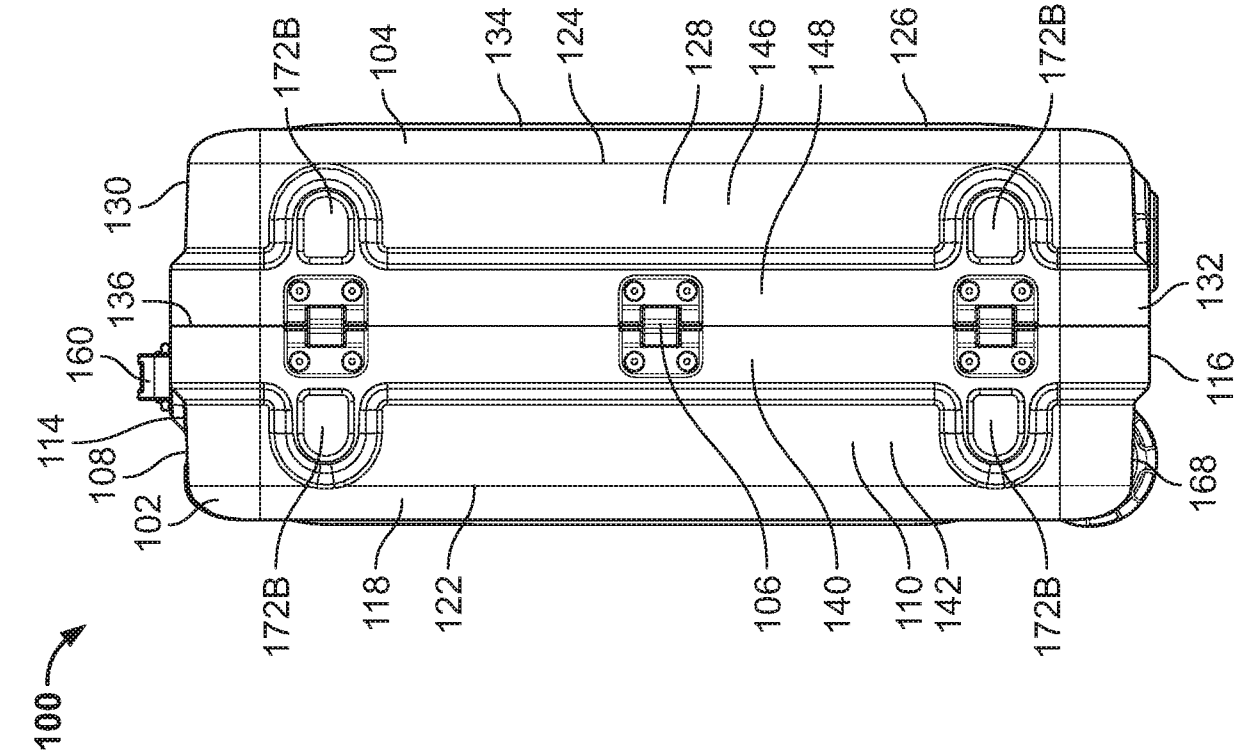
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FIG. 6

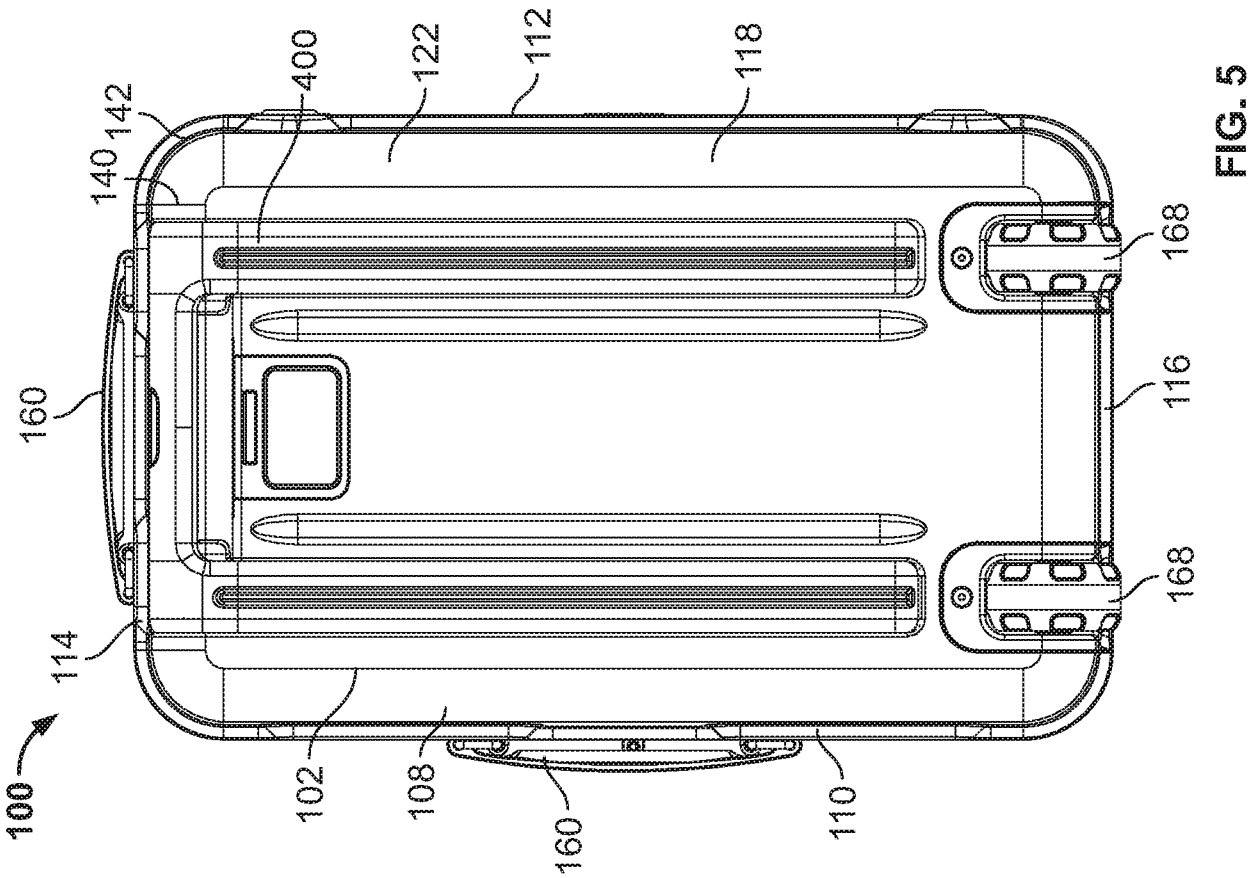
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FIG. 5

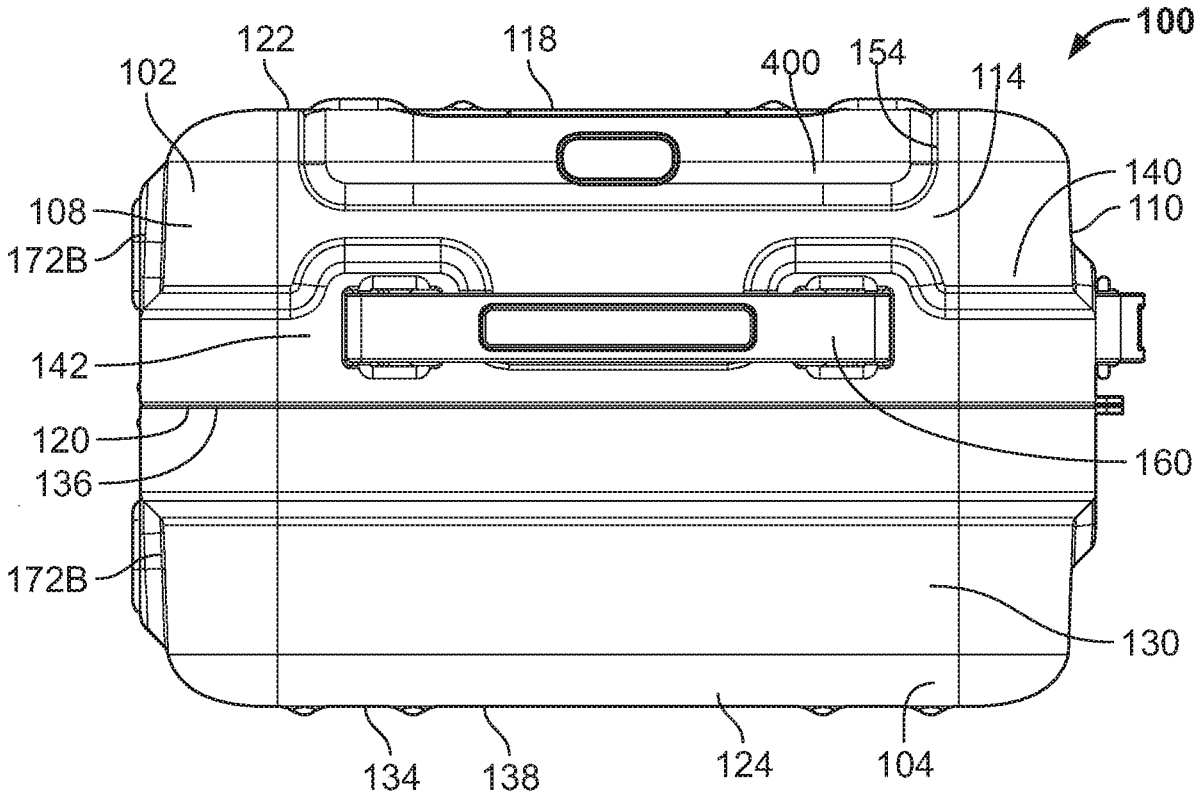
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FIG. 7

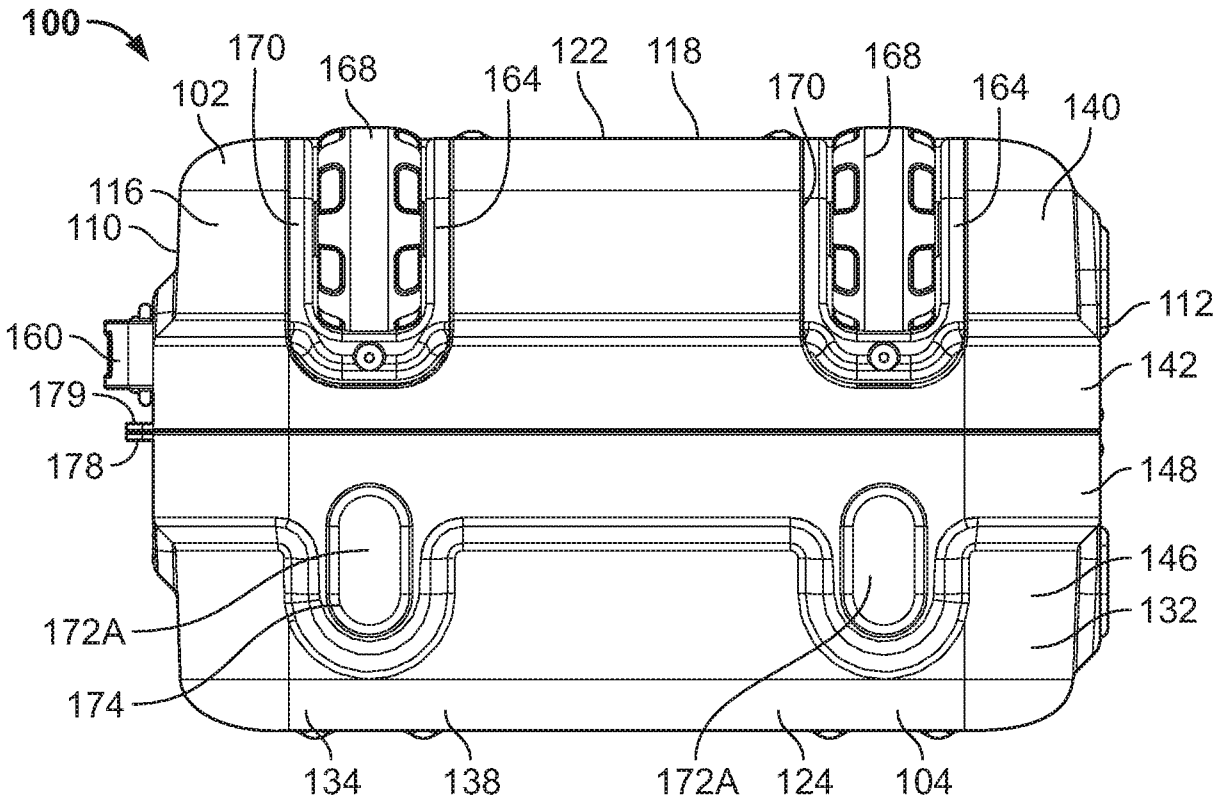
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FIG. 8

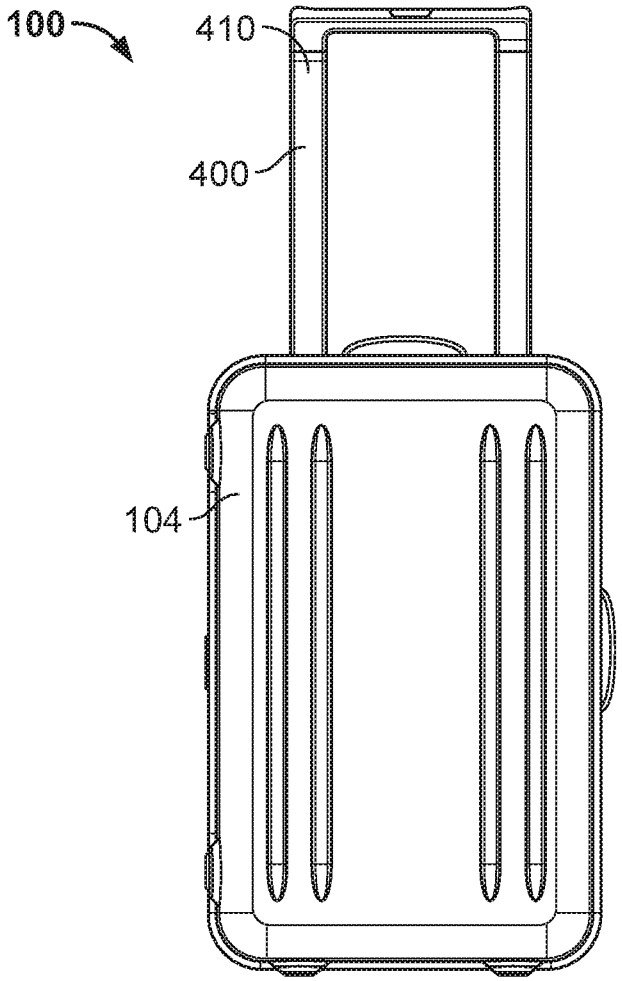



FIG. 9

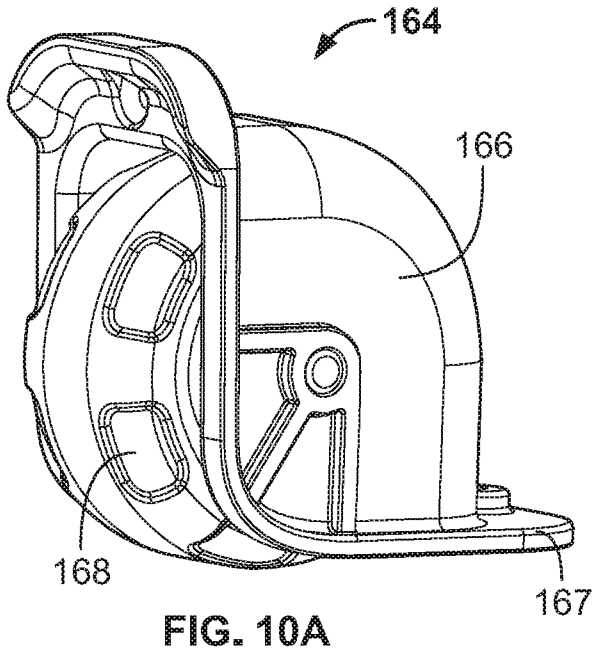



FIG. 10A

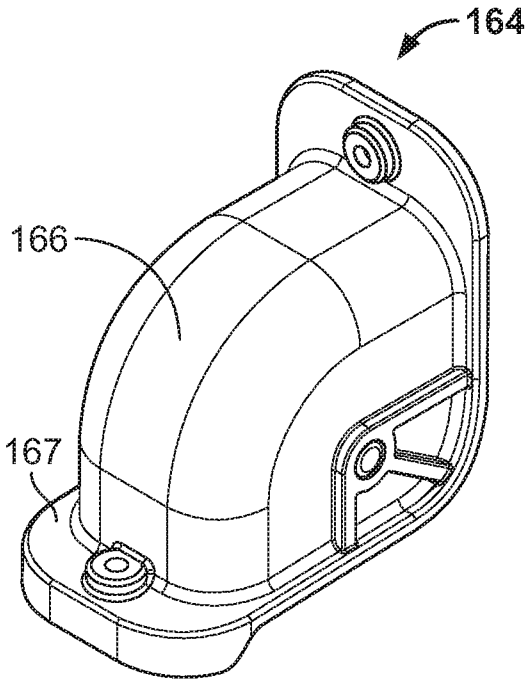



FIG. 10B

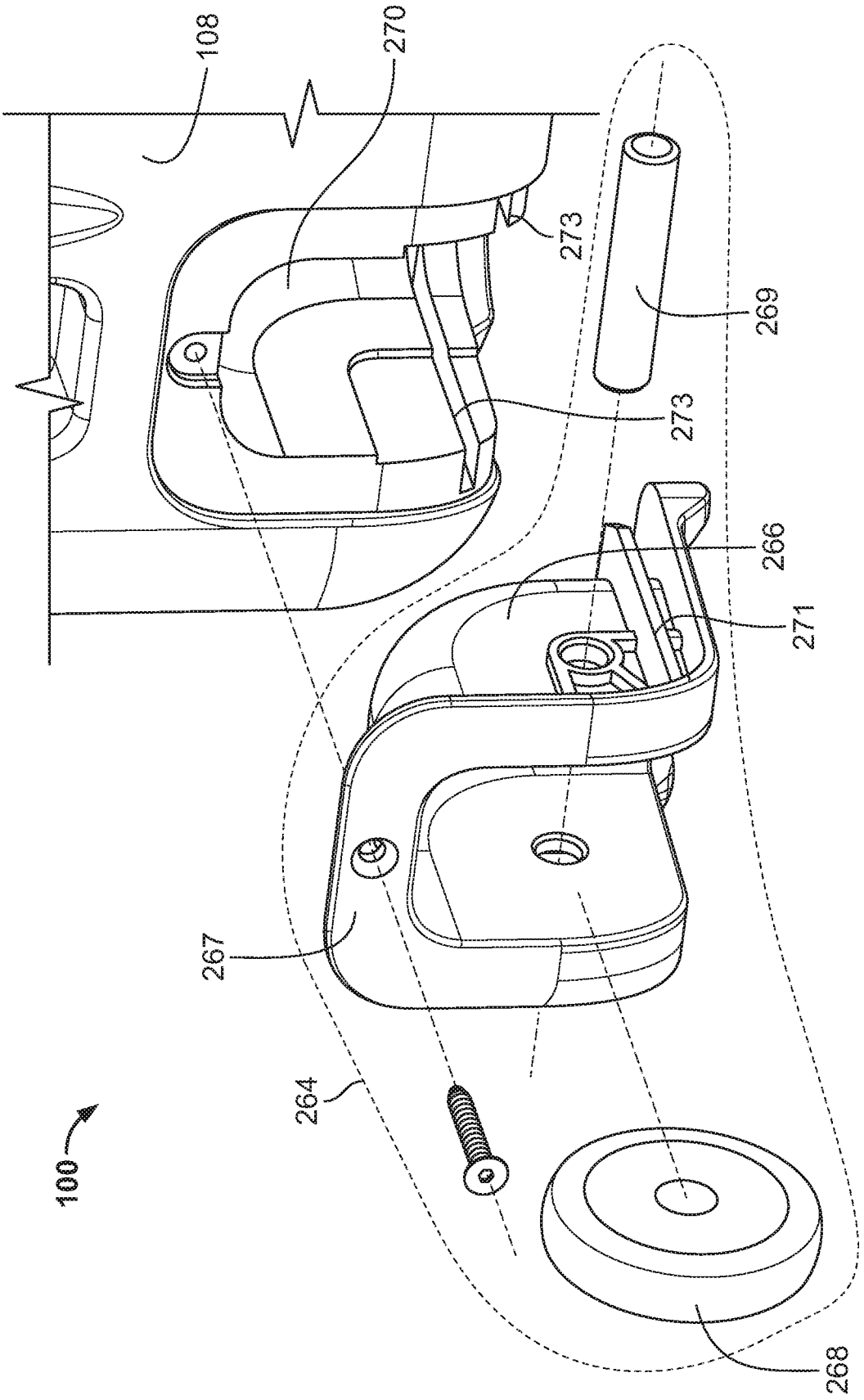



FIG. 11A

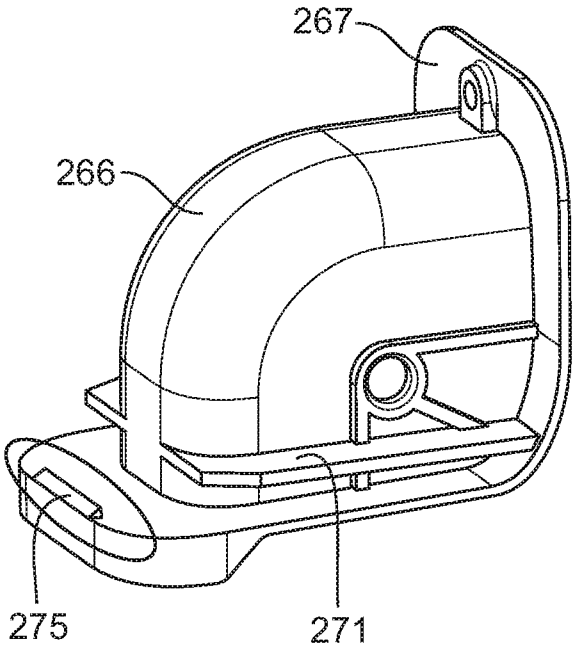



FIG. 11B

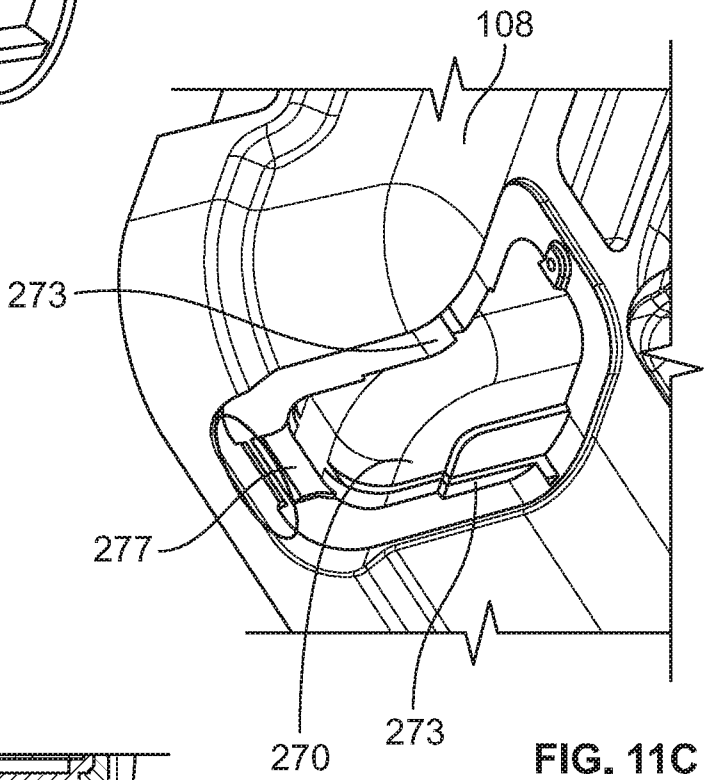



FIG. 11C

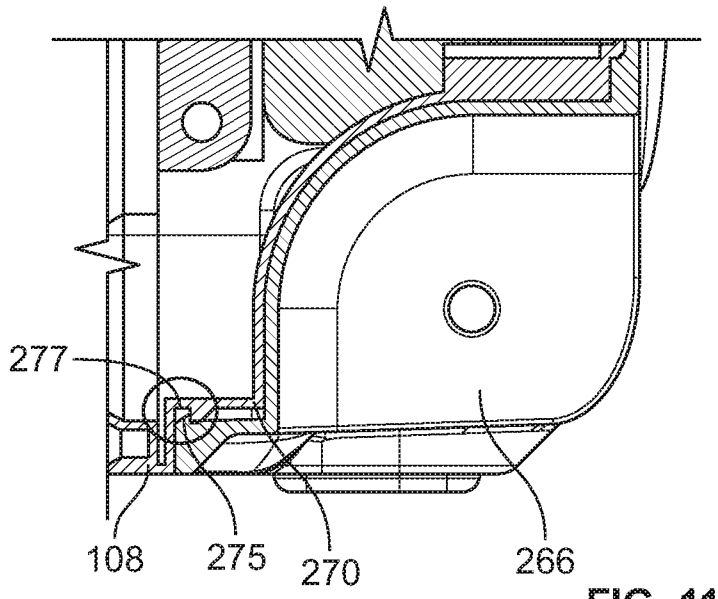



FIG. 11D

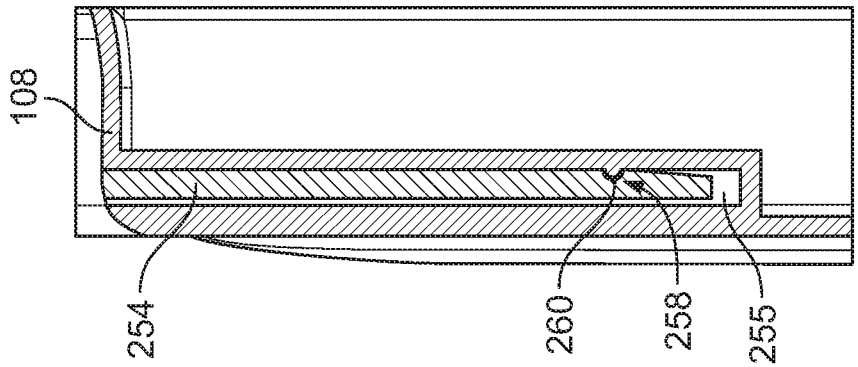



FIG. 12C

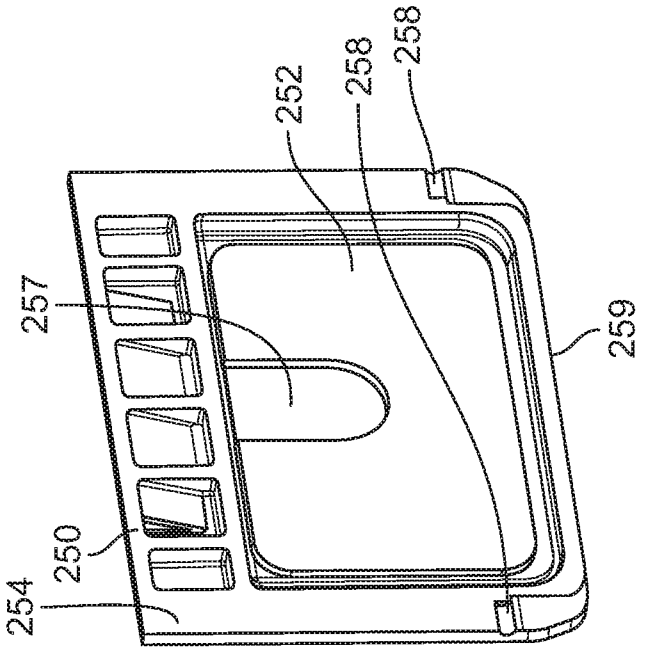



FIG. 12B

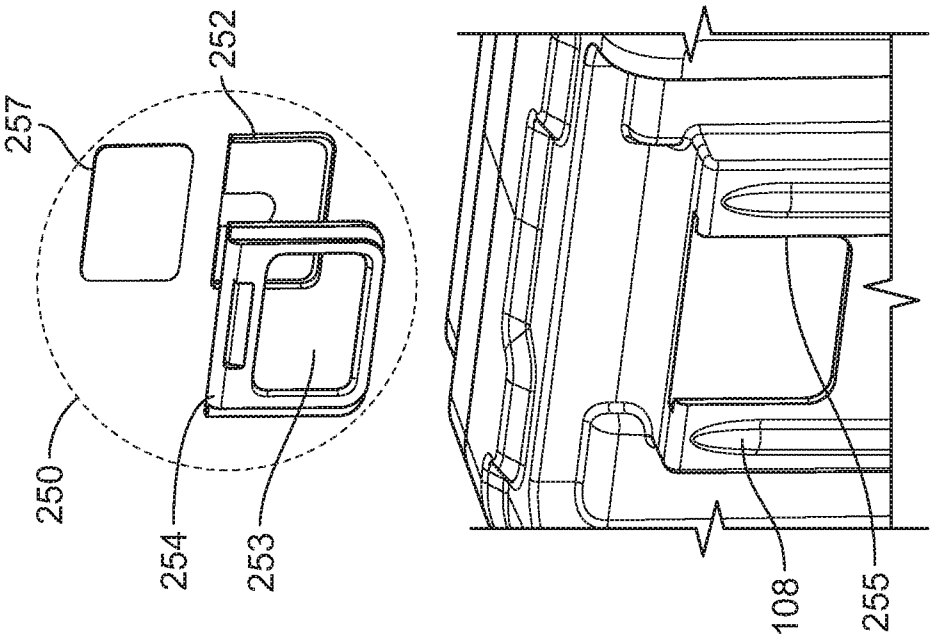



FIG. 12A

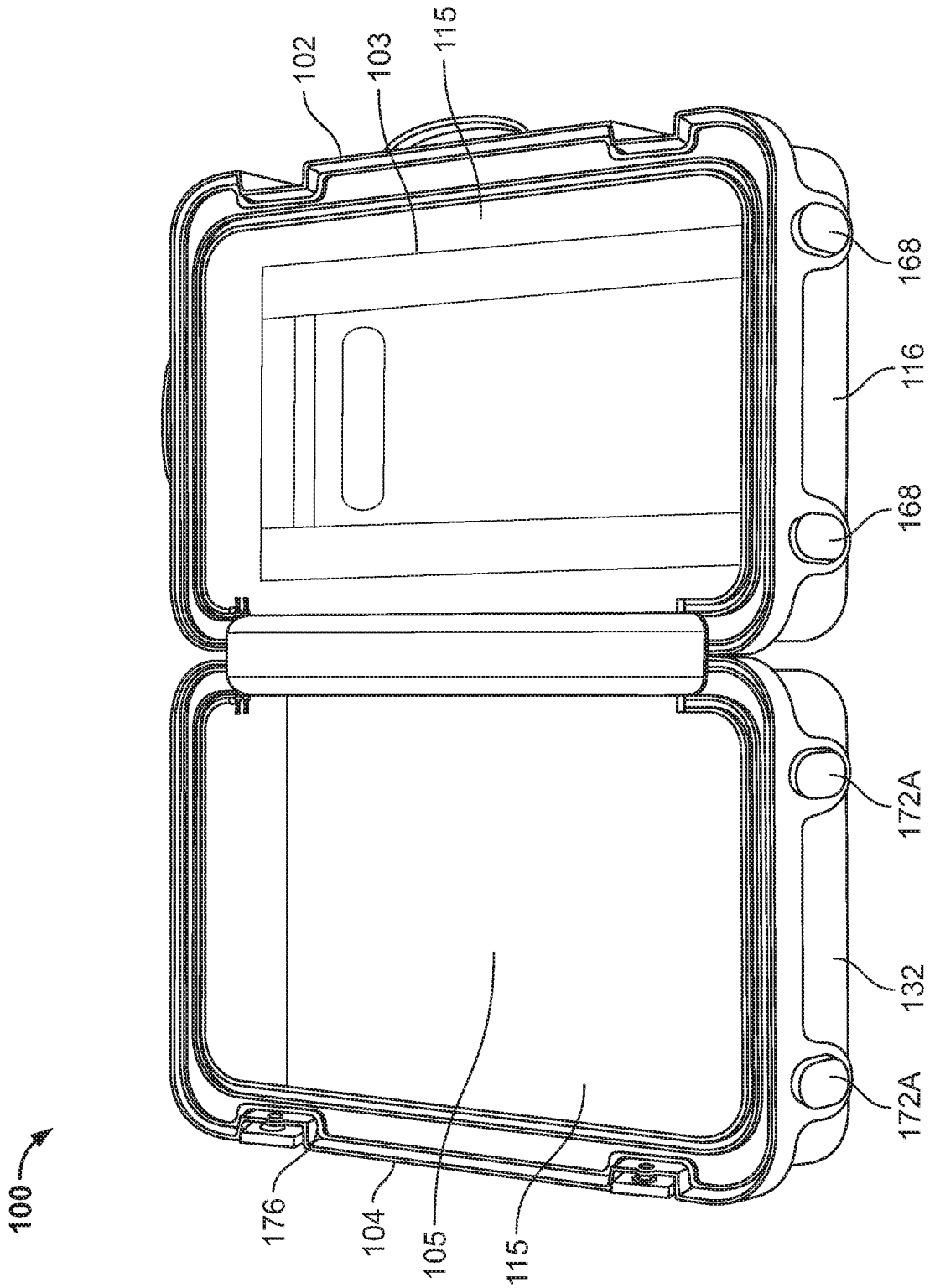



FIG. 13

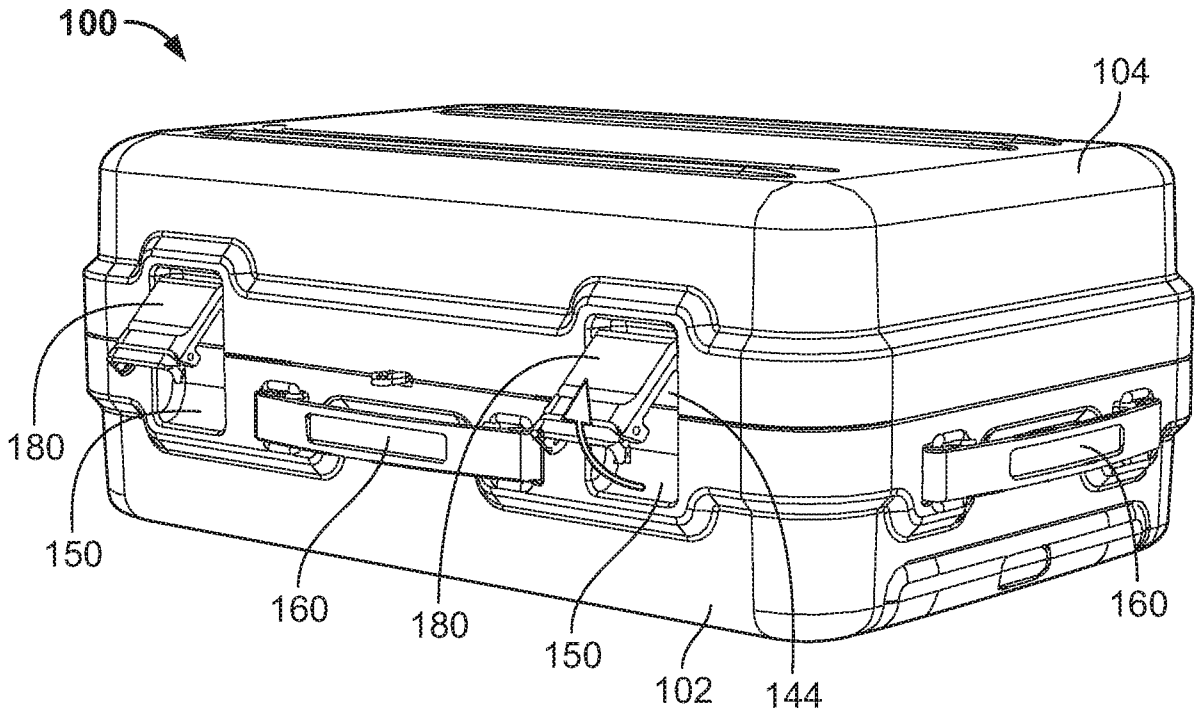



FIG. 14A

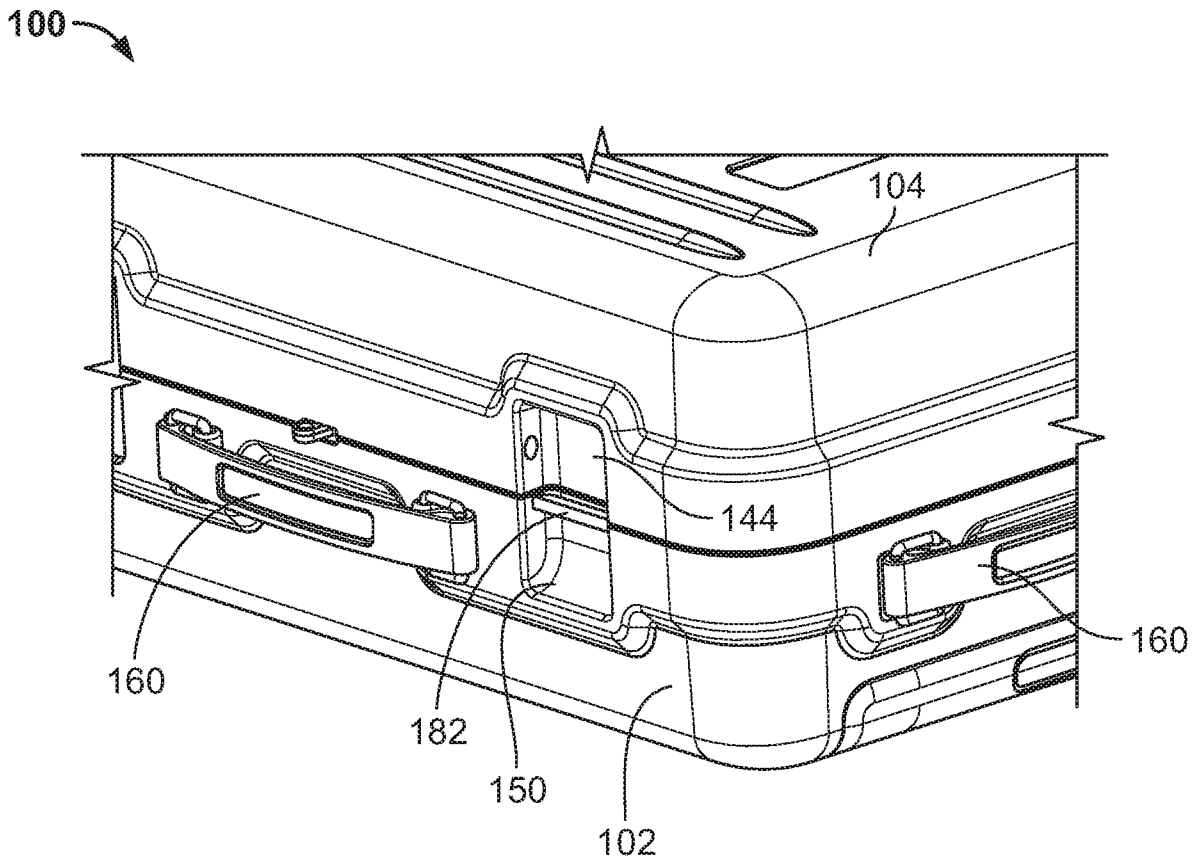



FIG. 14B

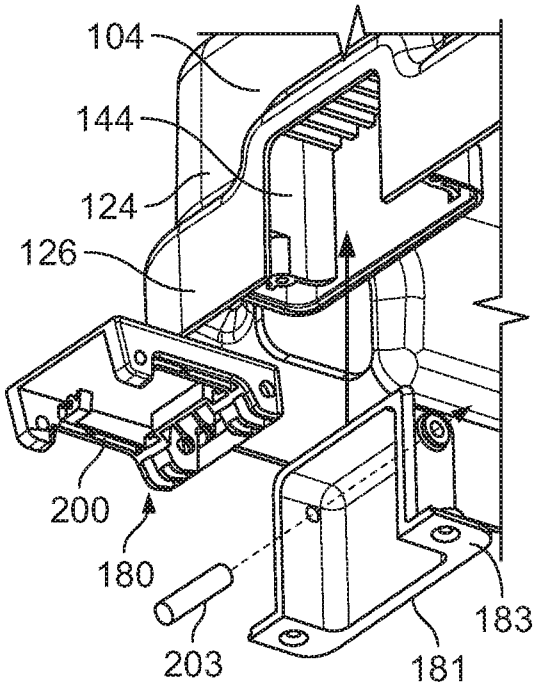



FIG. 15A

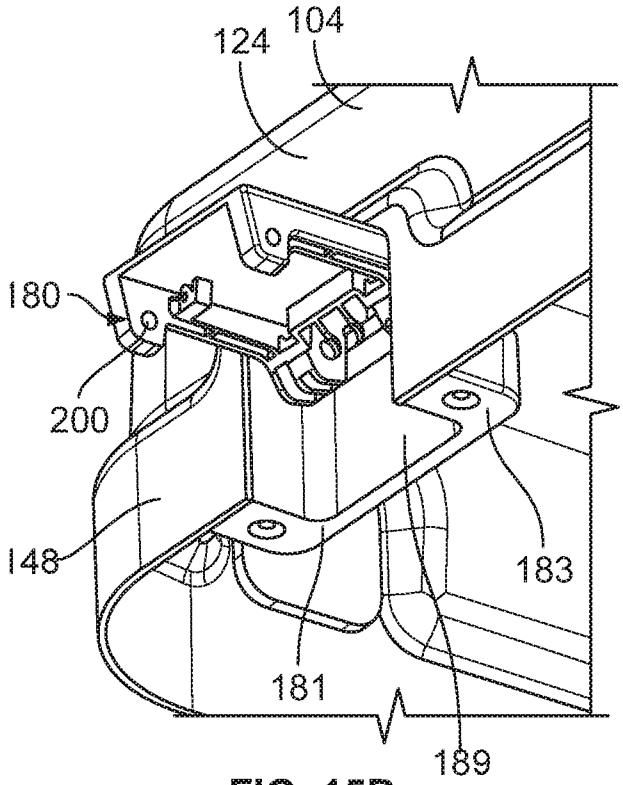



FIG. 15B

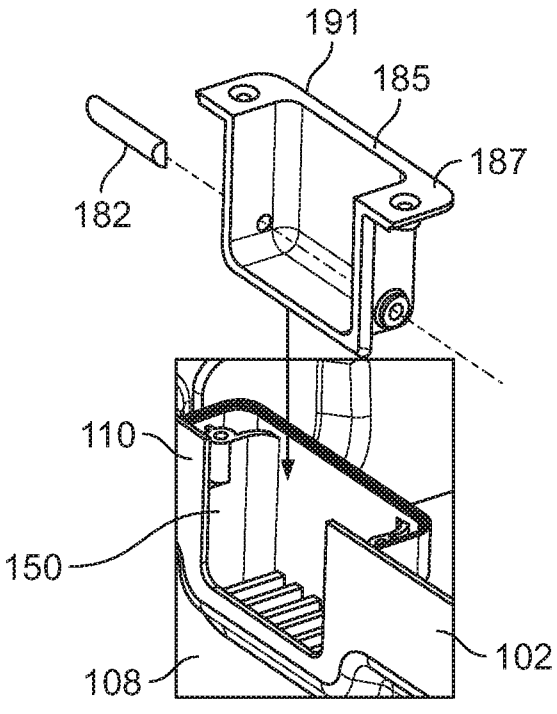



FIG. 15C

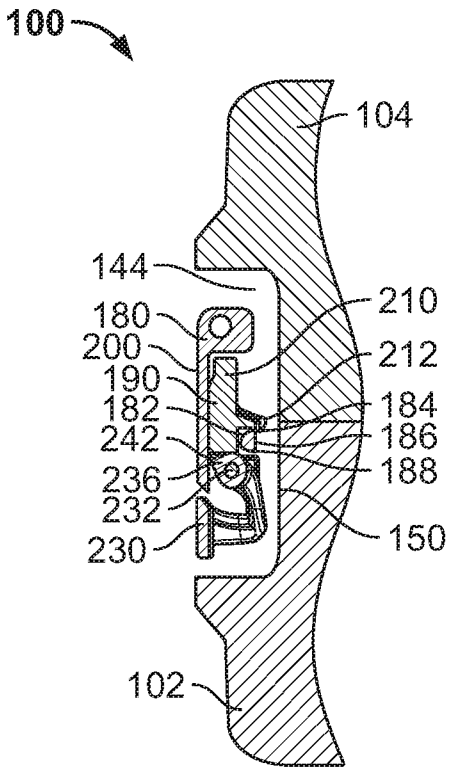



FIG. 16A

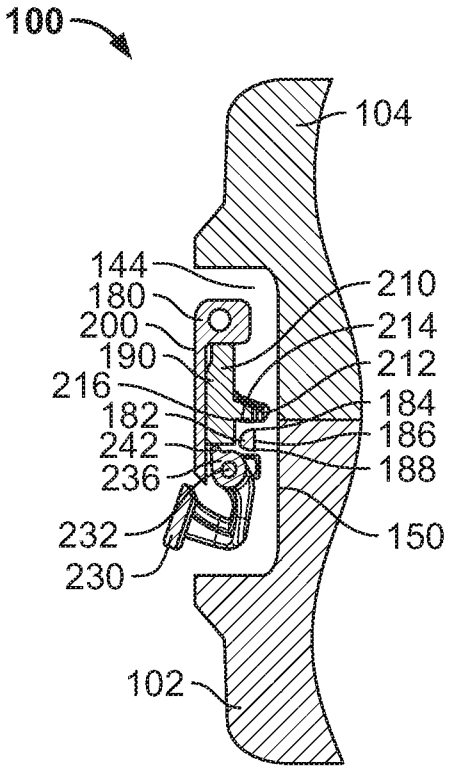
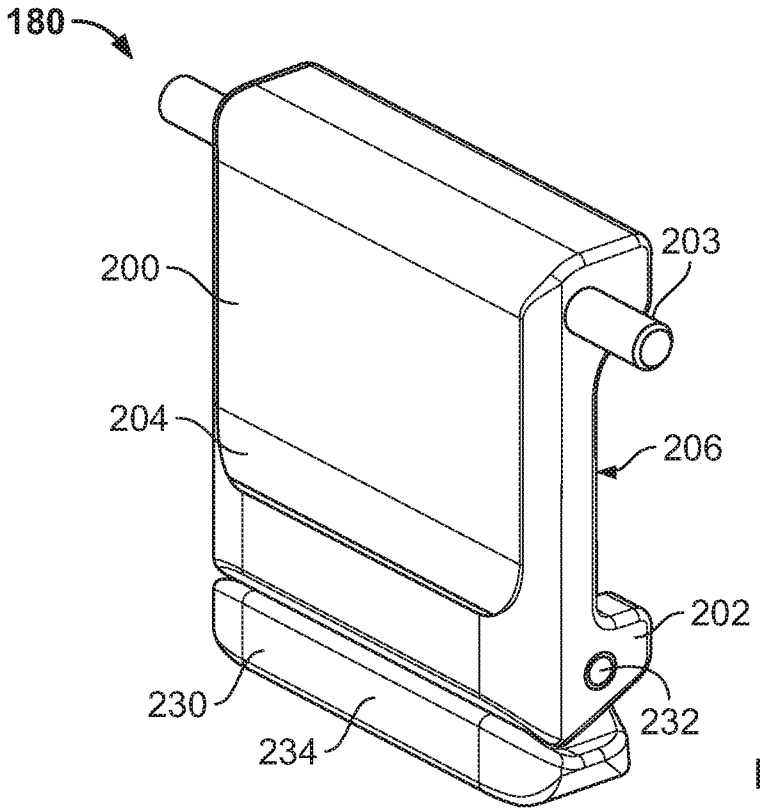



FIG. 16B


180
200
203
204
206
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230
232
234

FIG. 17

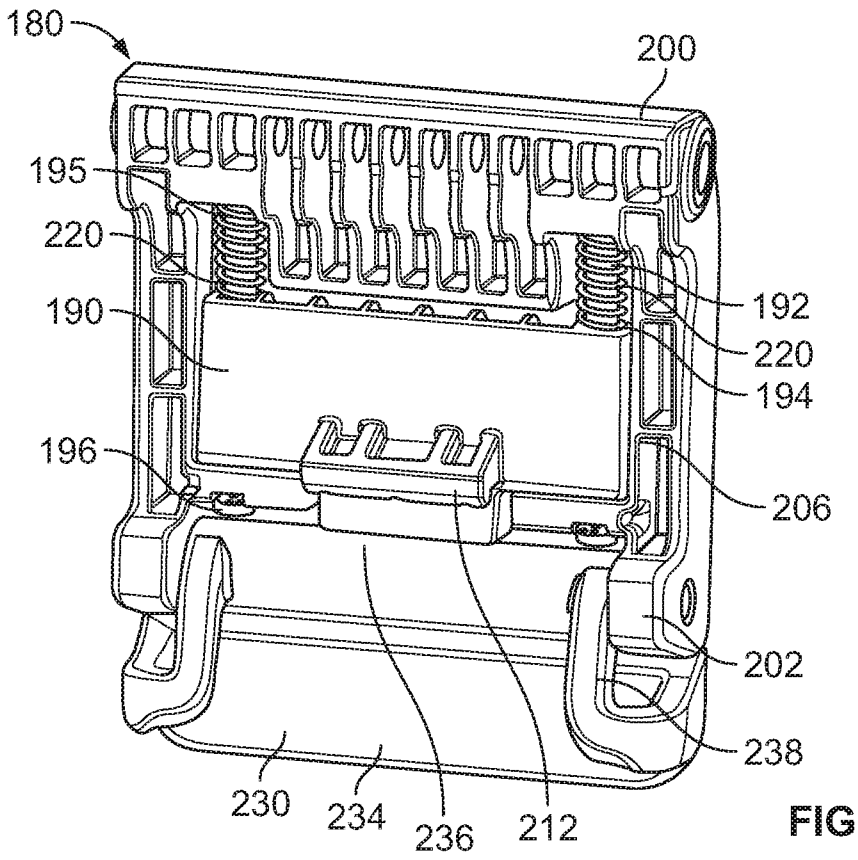
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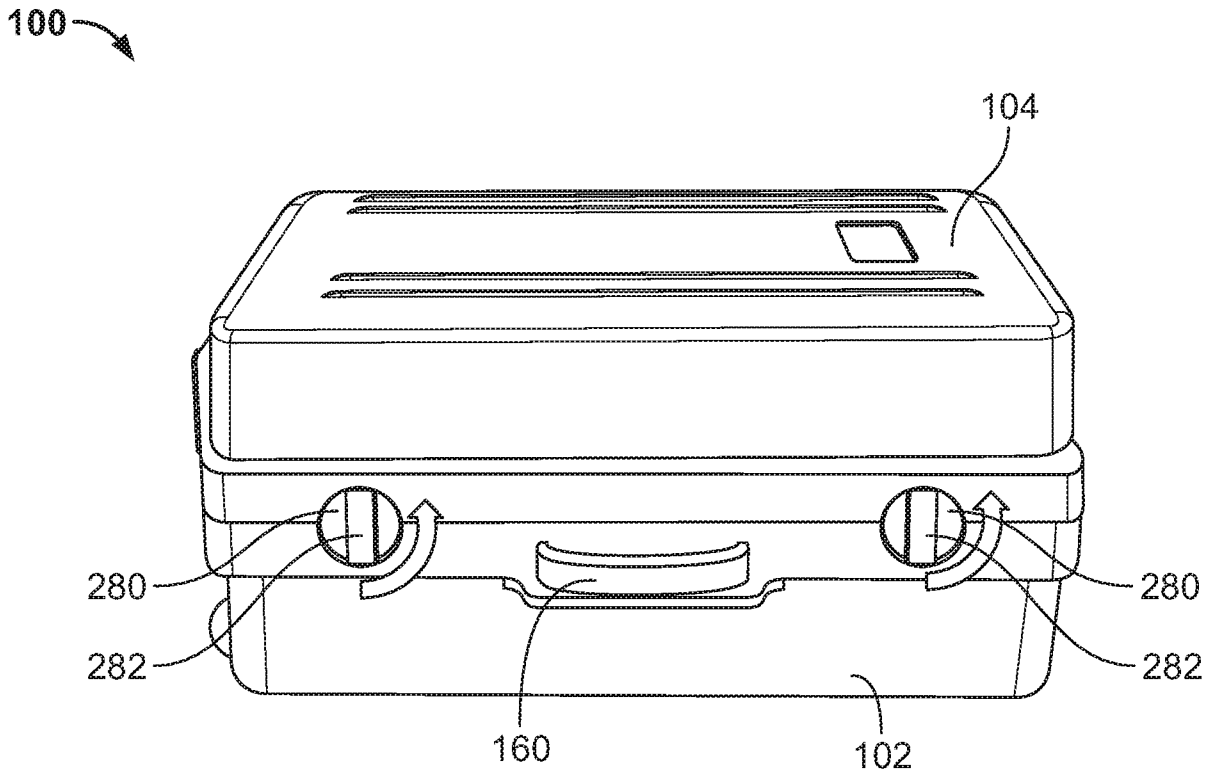
FIG. 18


100
104
280
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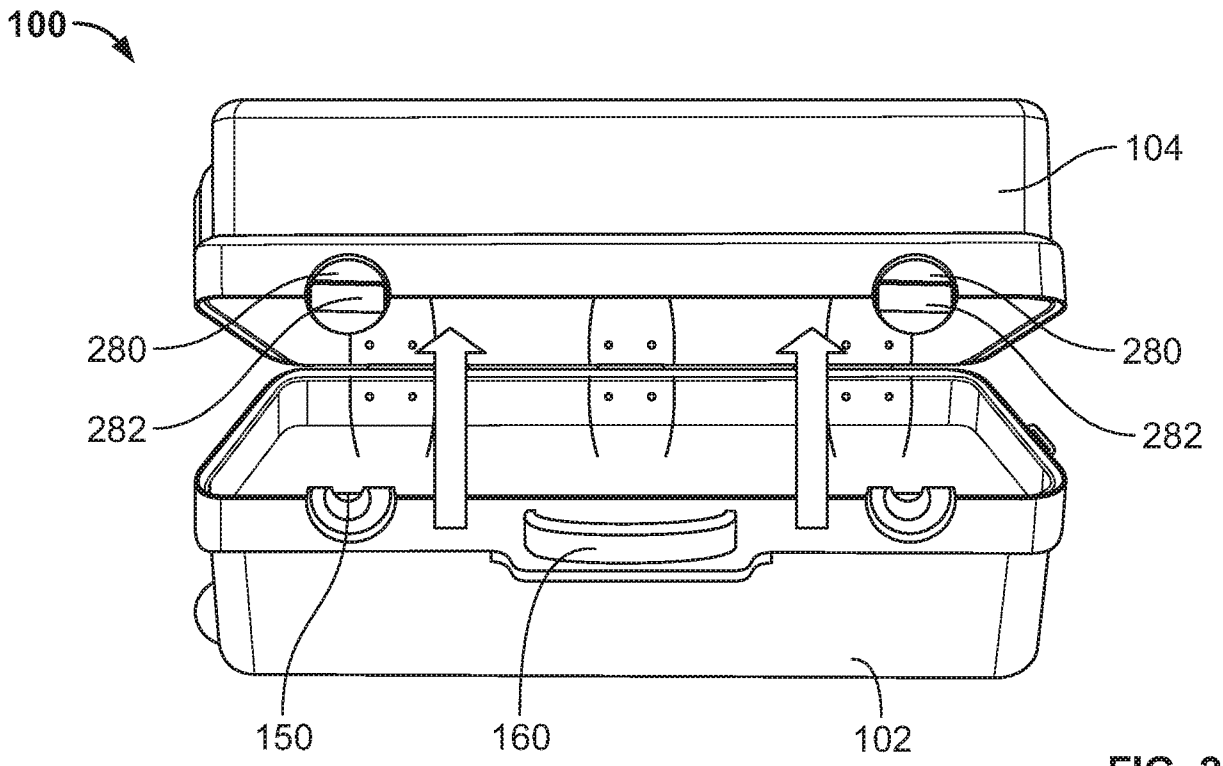
280
282
160
102

FIG. 19


100
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282
280
282
150
160
102

FIG. 20

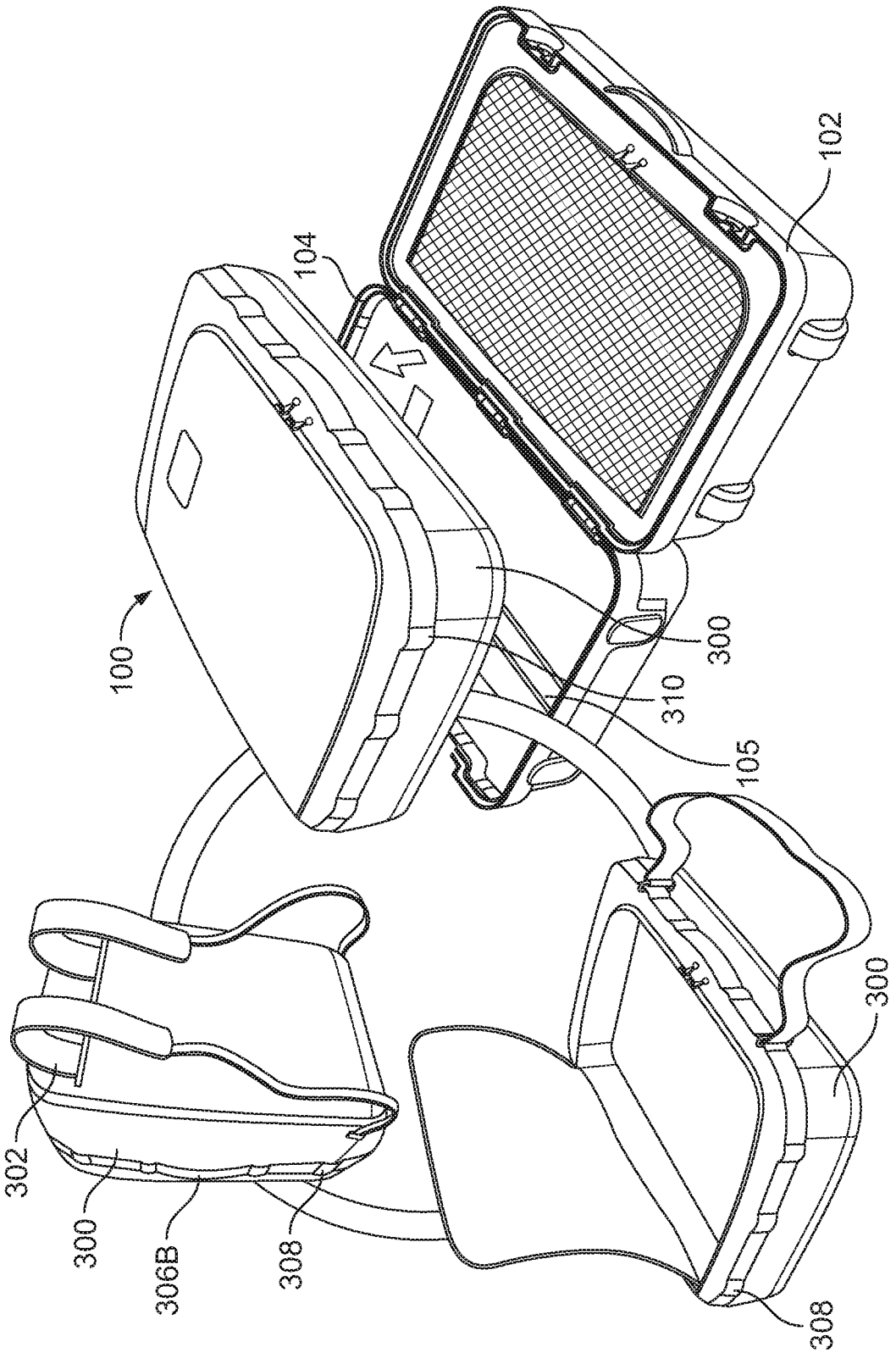
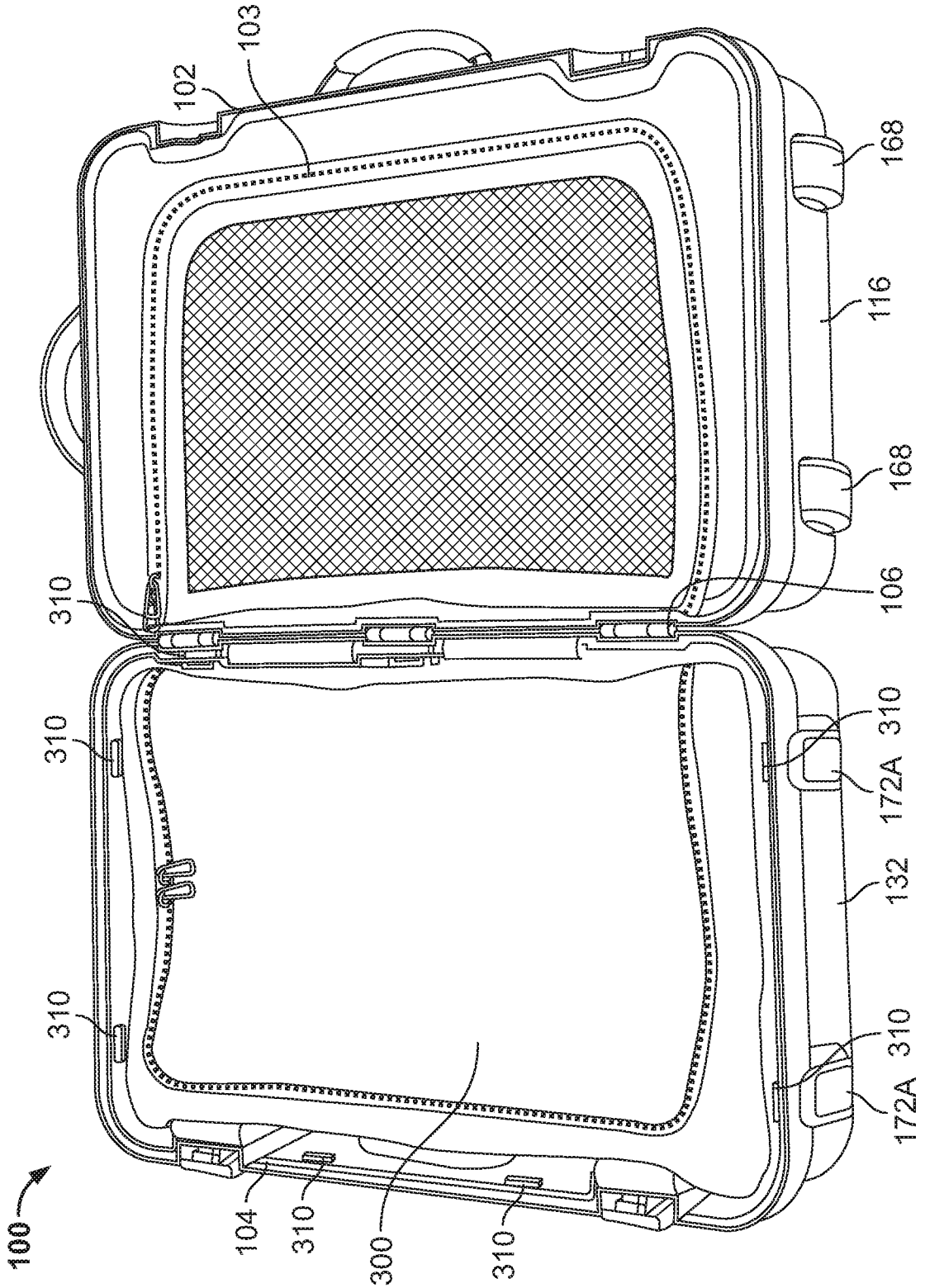



FIG. 21


100
102
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132
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168
172A
172A
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310

FIG. 22

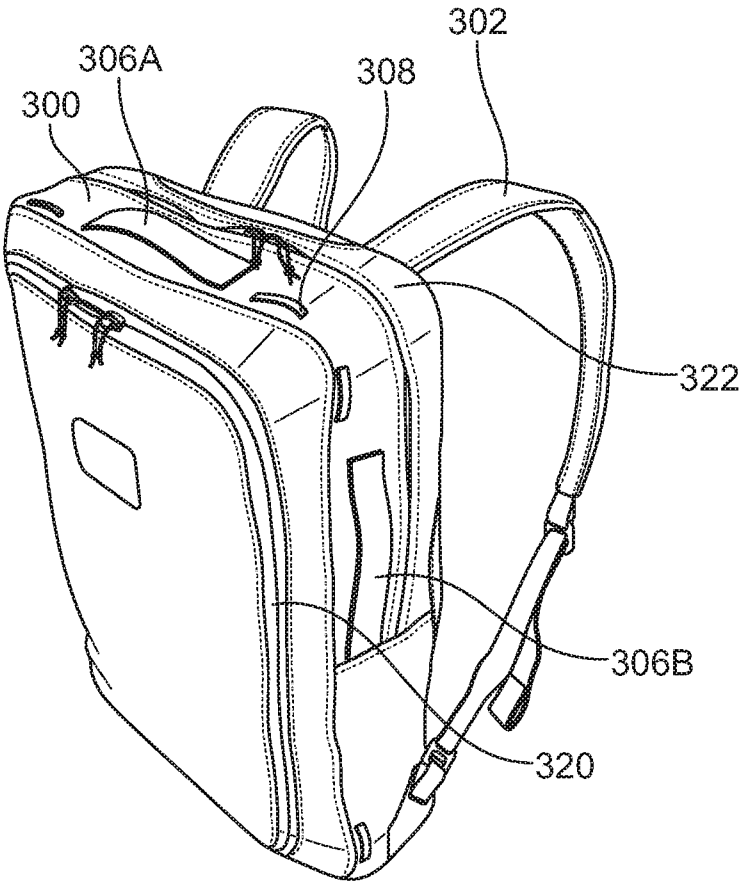



FIG. 23

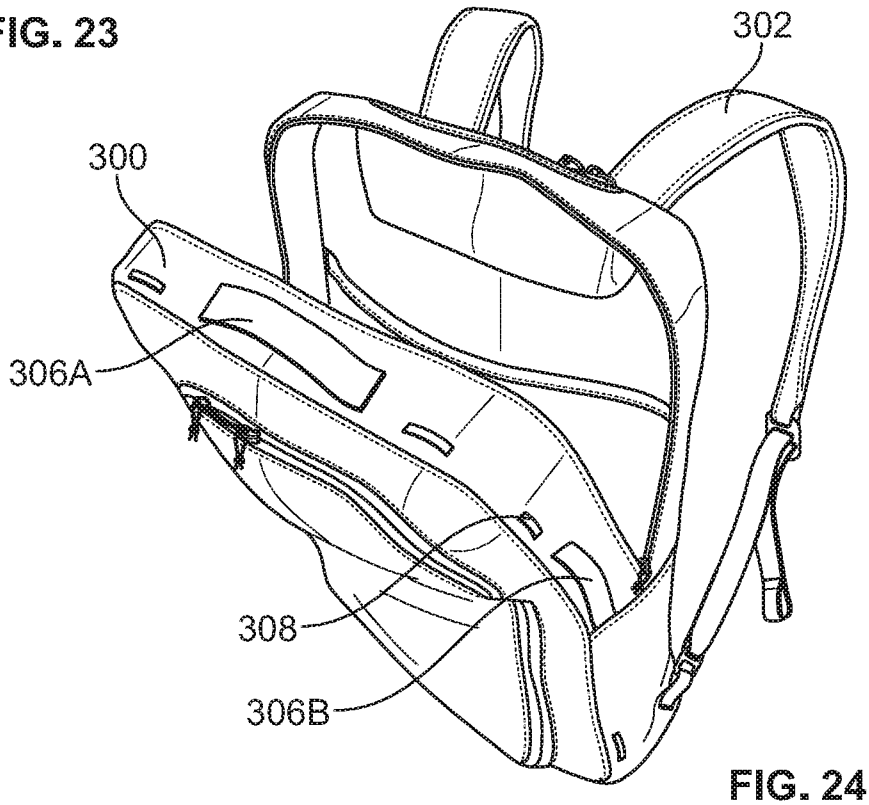



FIG. 24

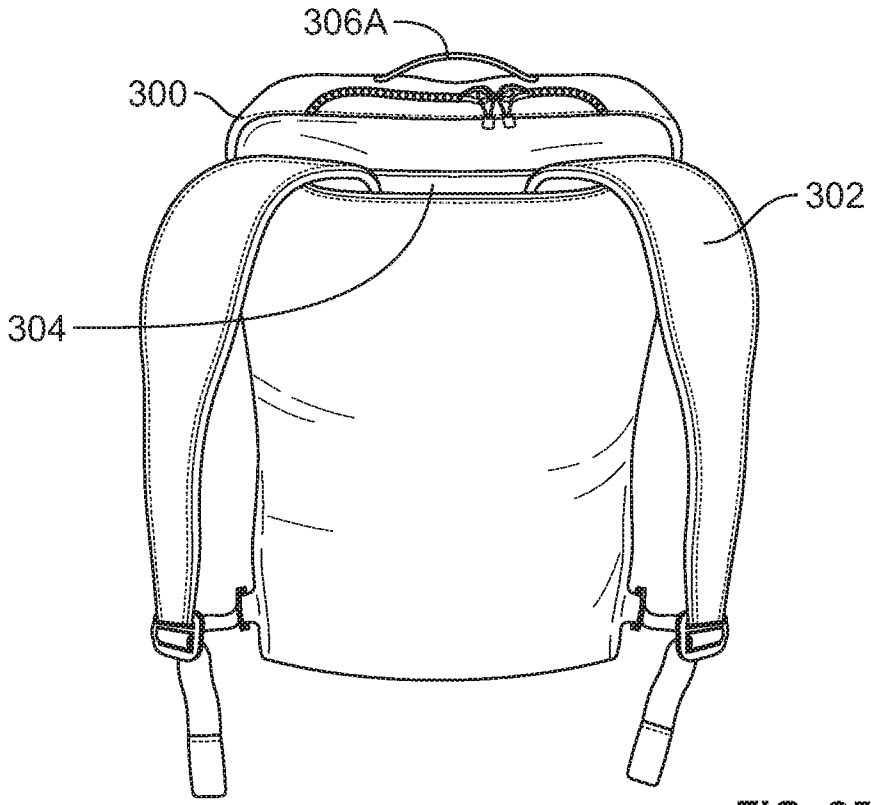



FIG. 25

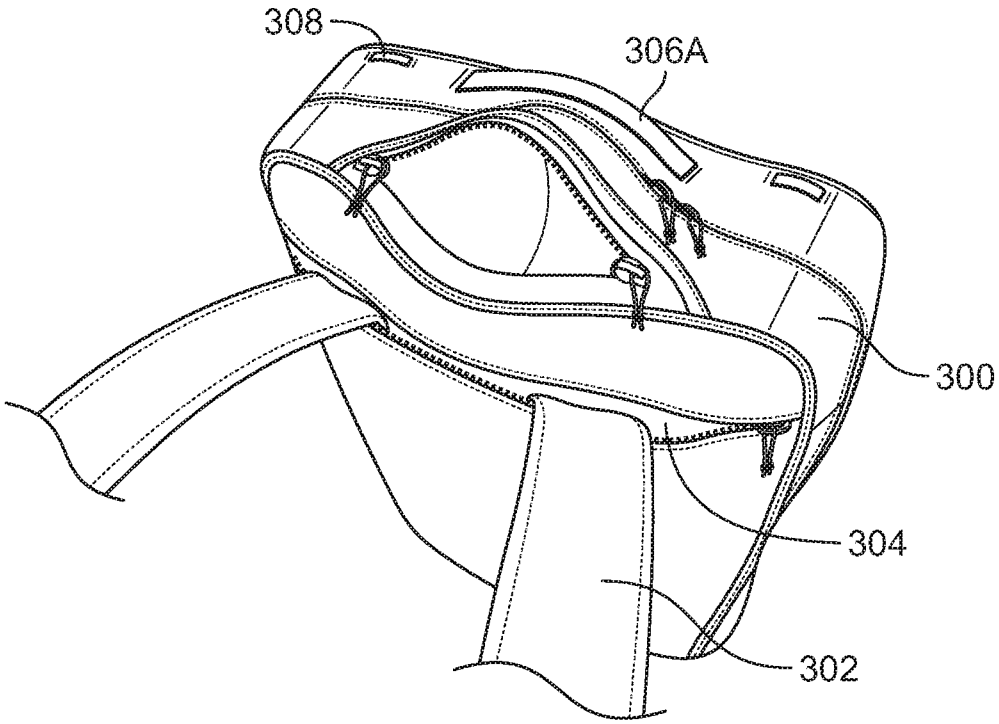



FIG. 26

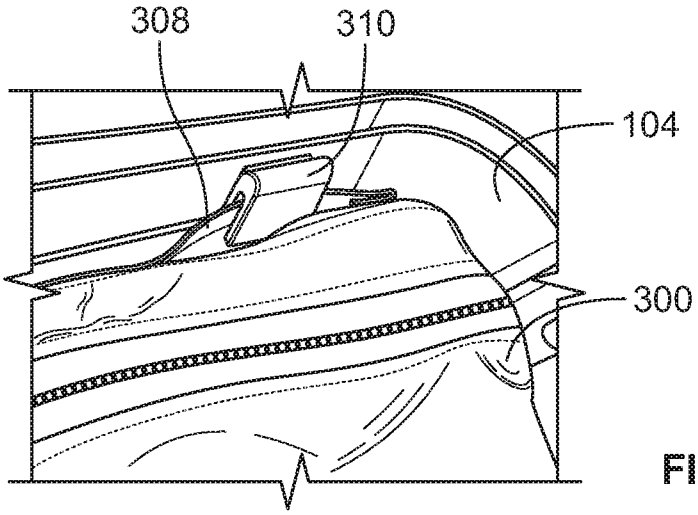



FIG. 27

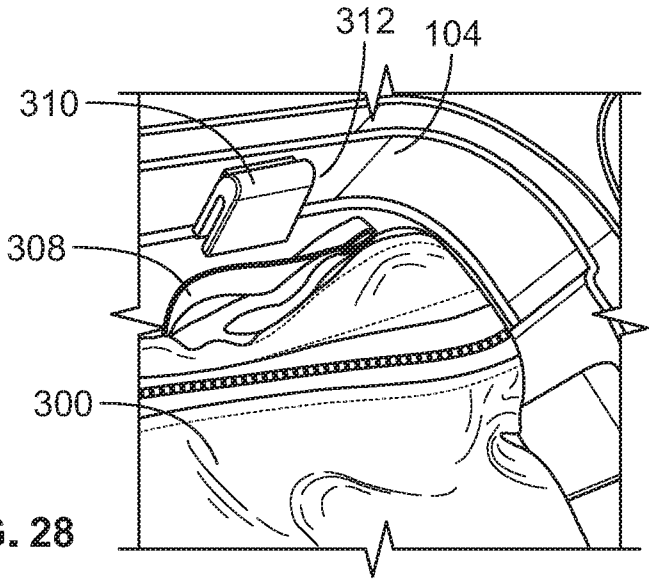



FIG. 28

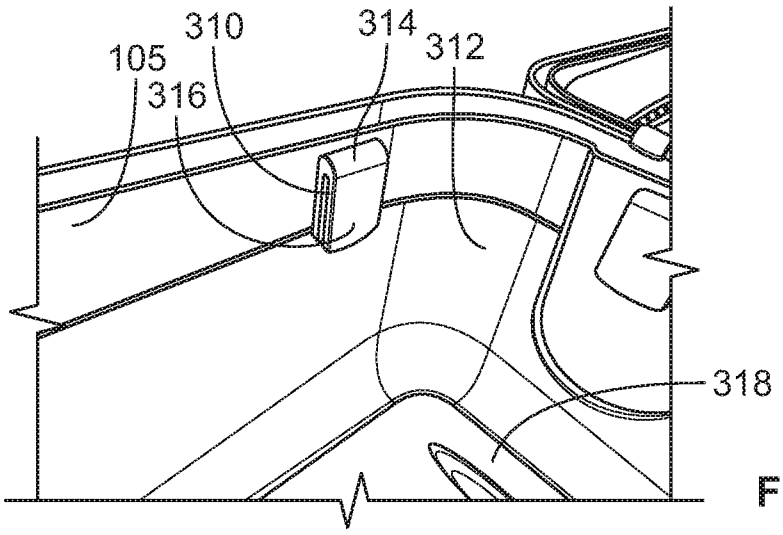



FIG. 29

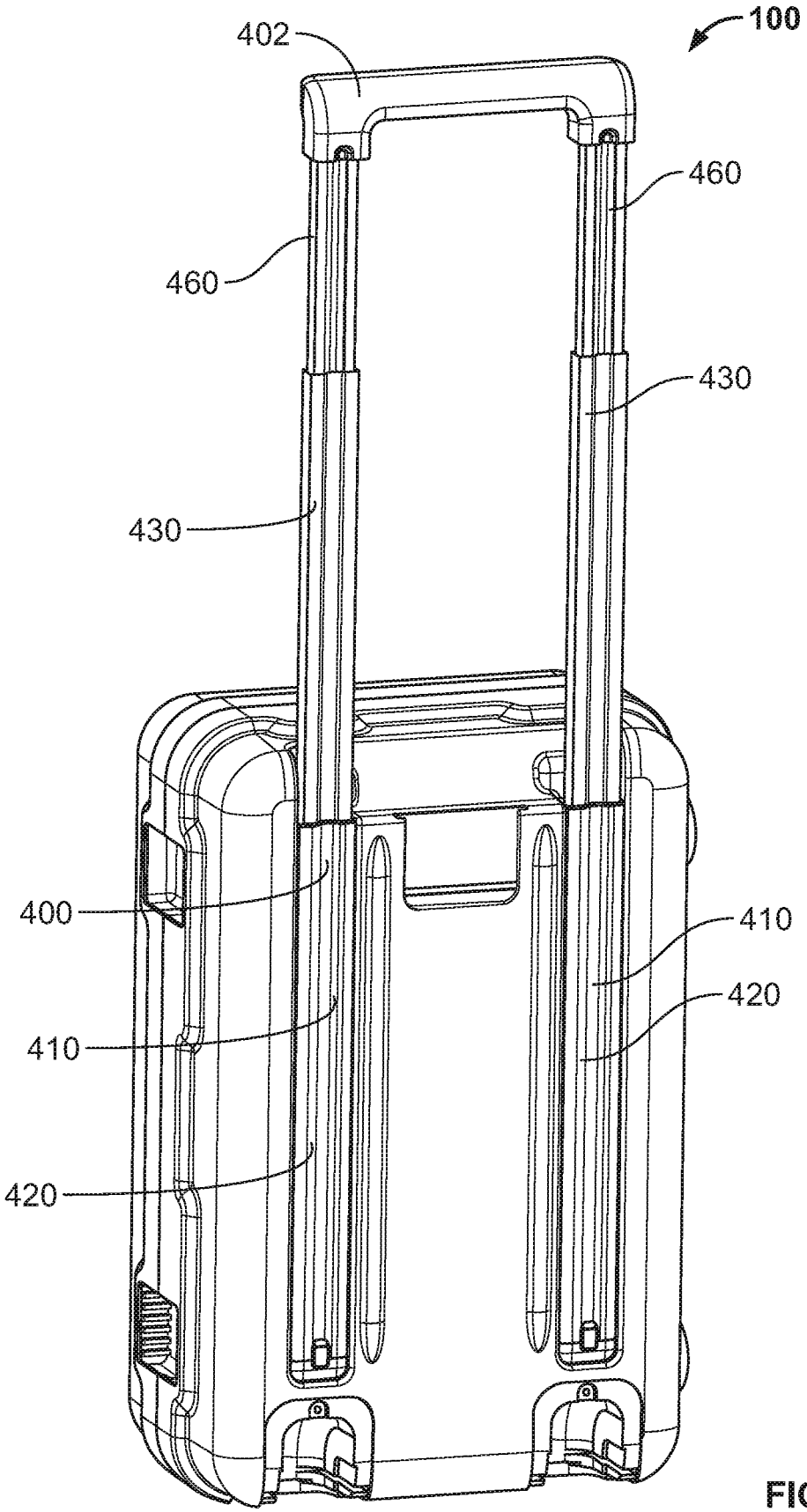
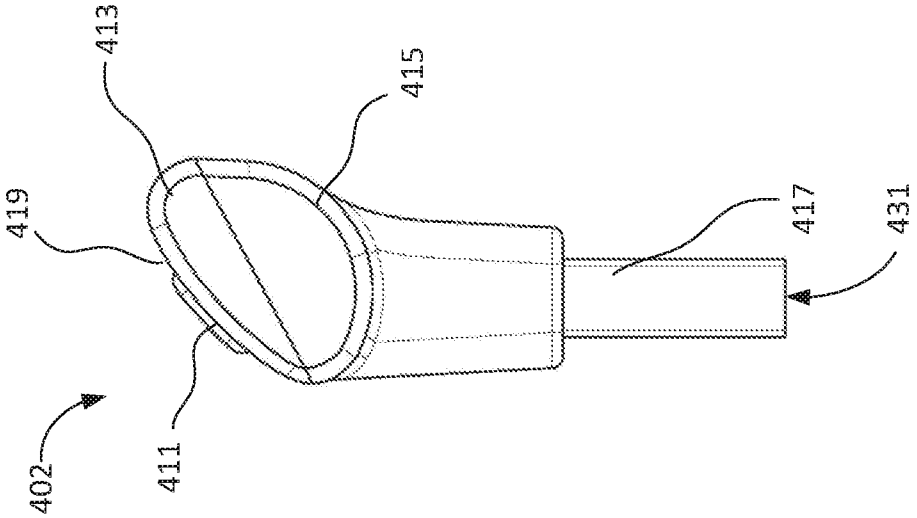



FIG. 30


413
415
419
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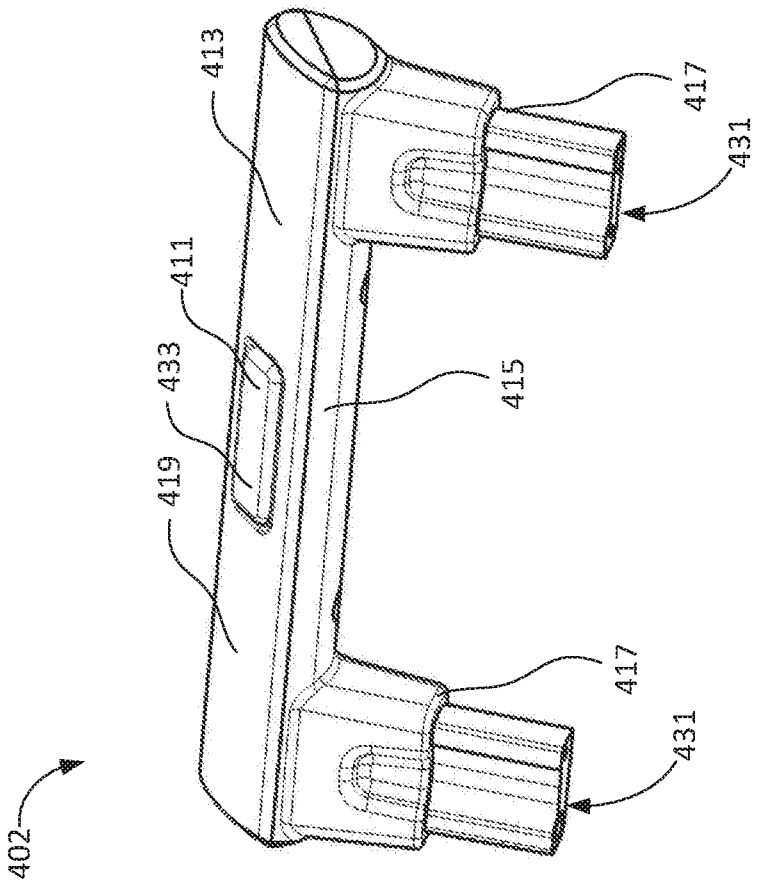
431
402
411

FIG. 32


413
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431
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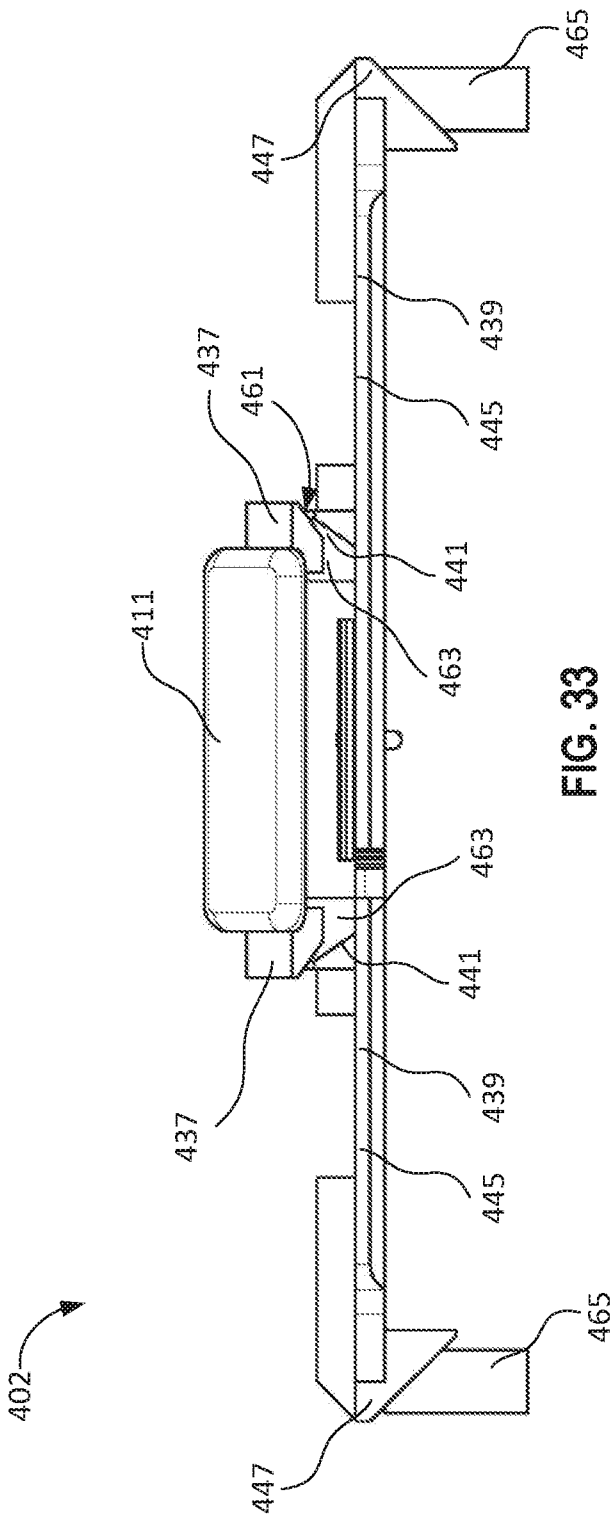
FIG. 31


402
411
437
461
463
441
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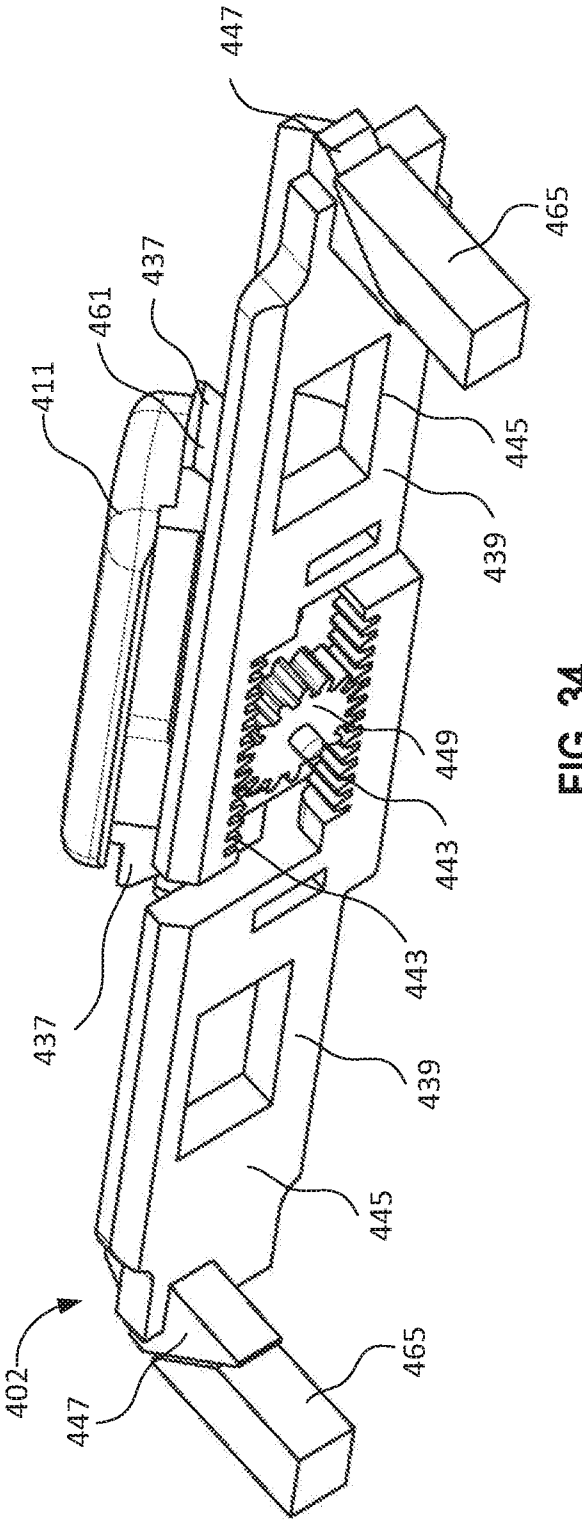
445
447
465

FIG. 33


402
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437
461
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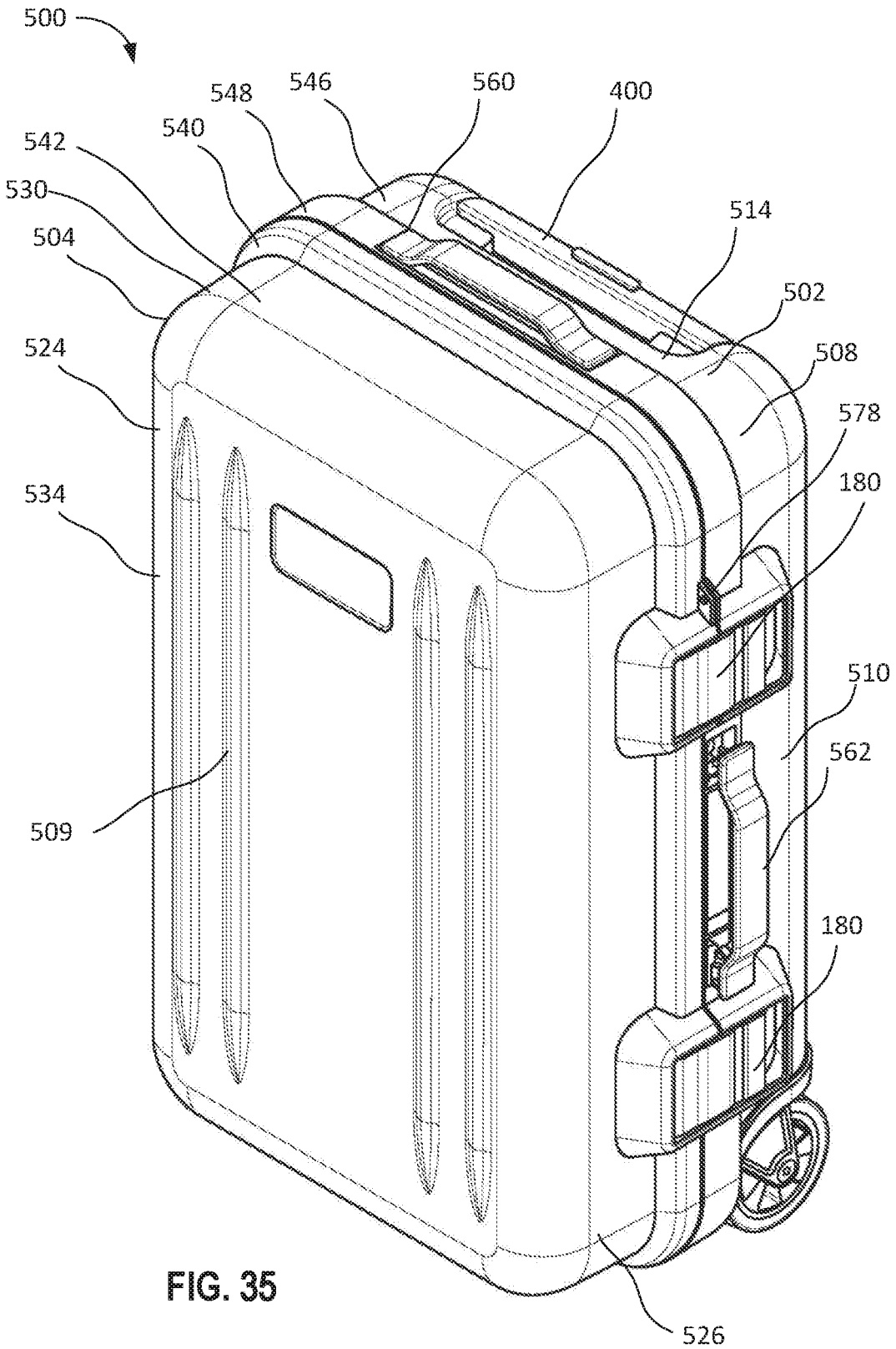
443

FIG. 34


500
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508
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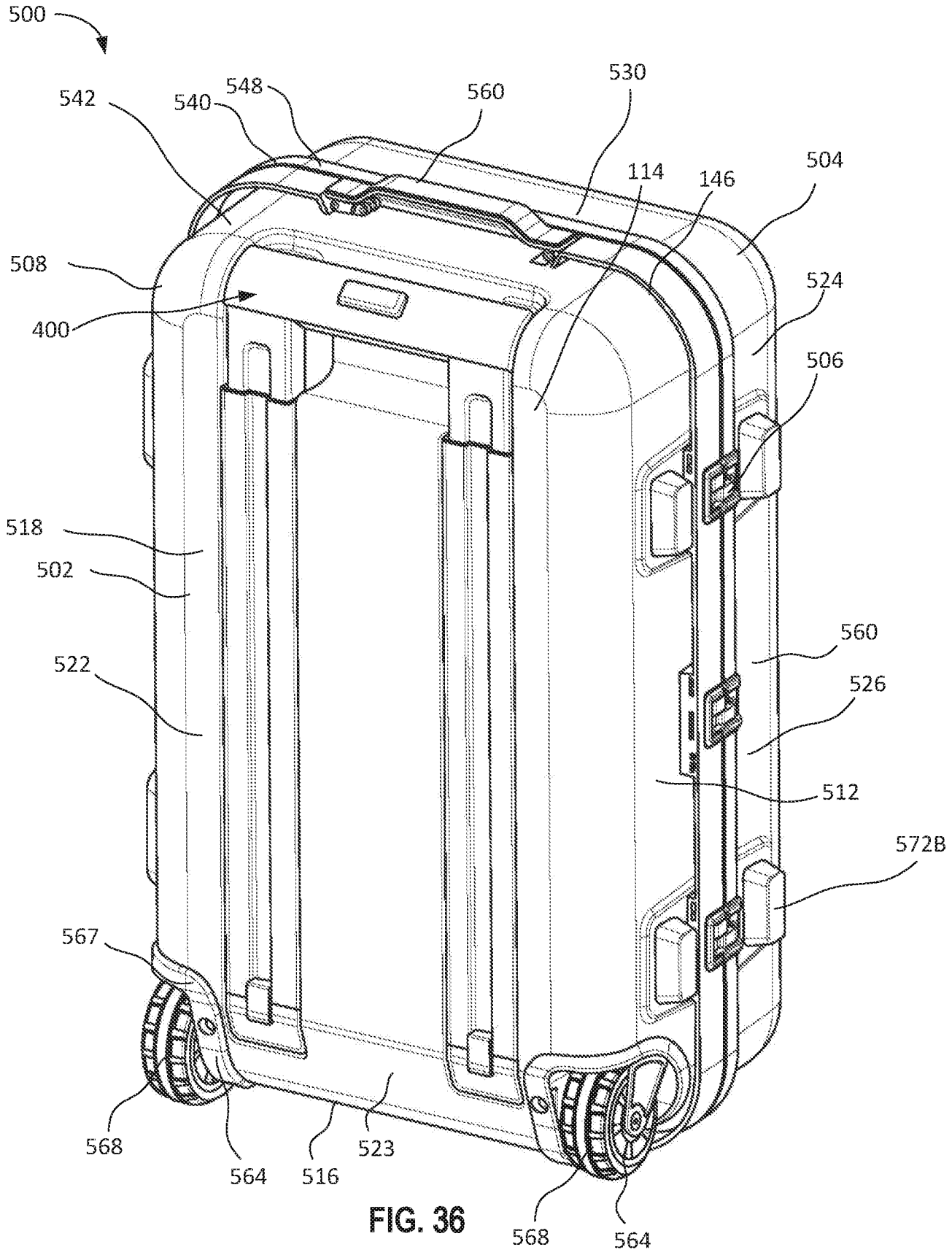
534
180
510
562
509
180
526

FIG. 35


500
542
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560
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114
146
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524
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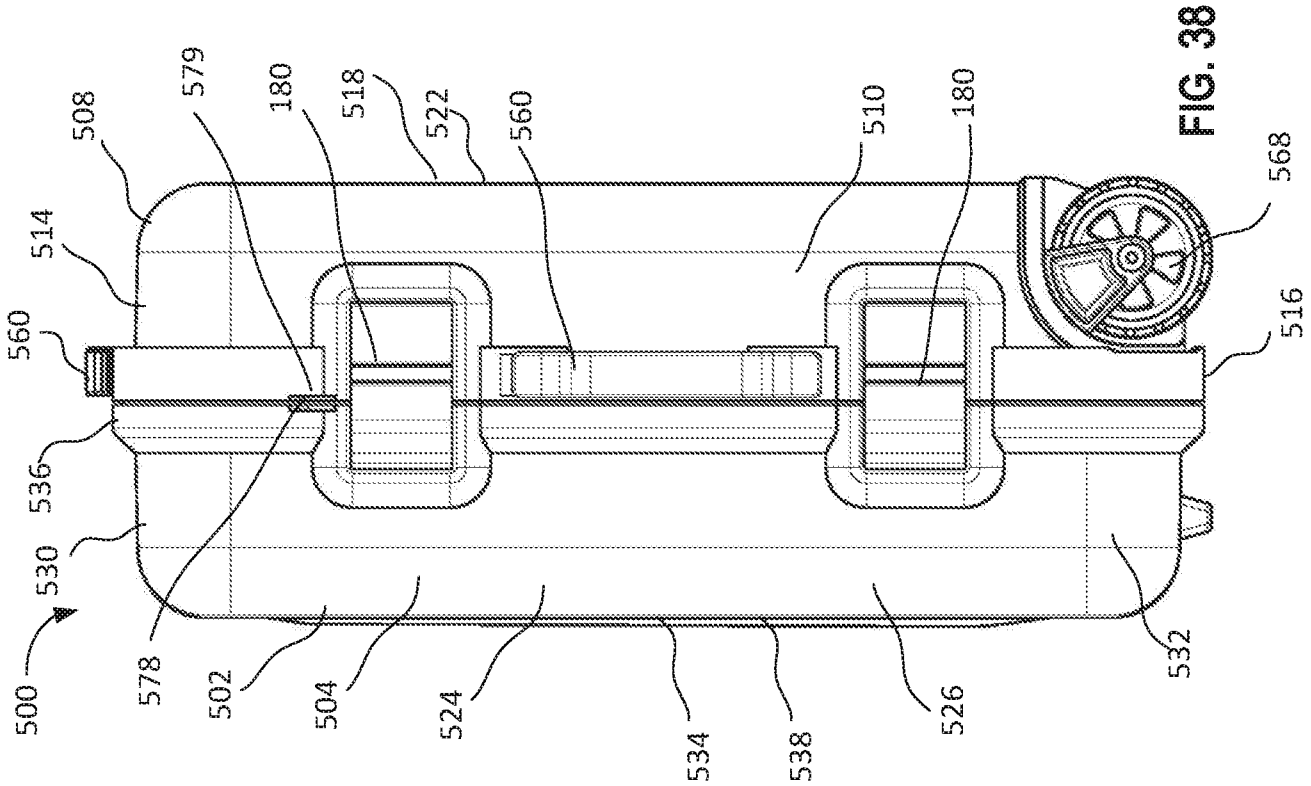
522
560
526
512
572B
567
568
564
516
523
568
564

FIG. 36


508
579
180
518
522
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510
180
568
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516
560
536
530
500
578
502
504
524
534
538
526
532

FIG. 38

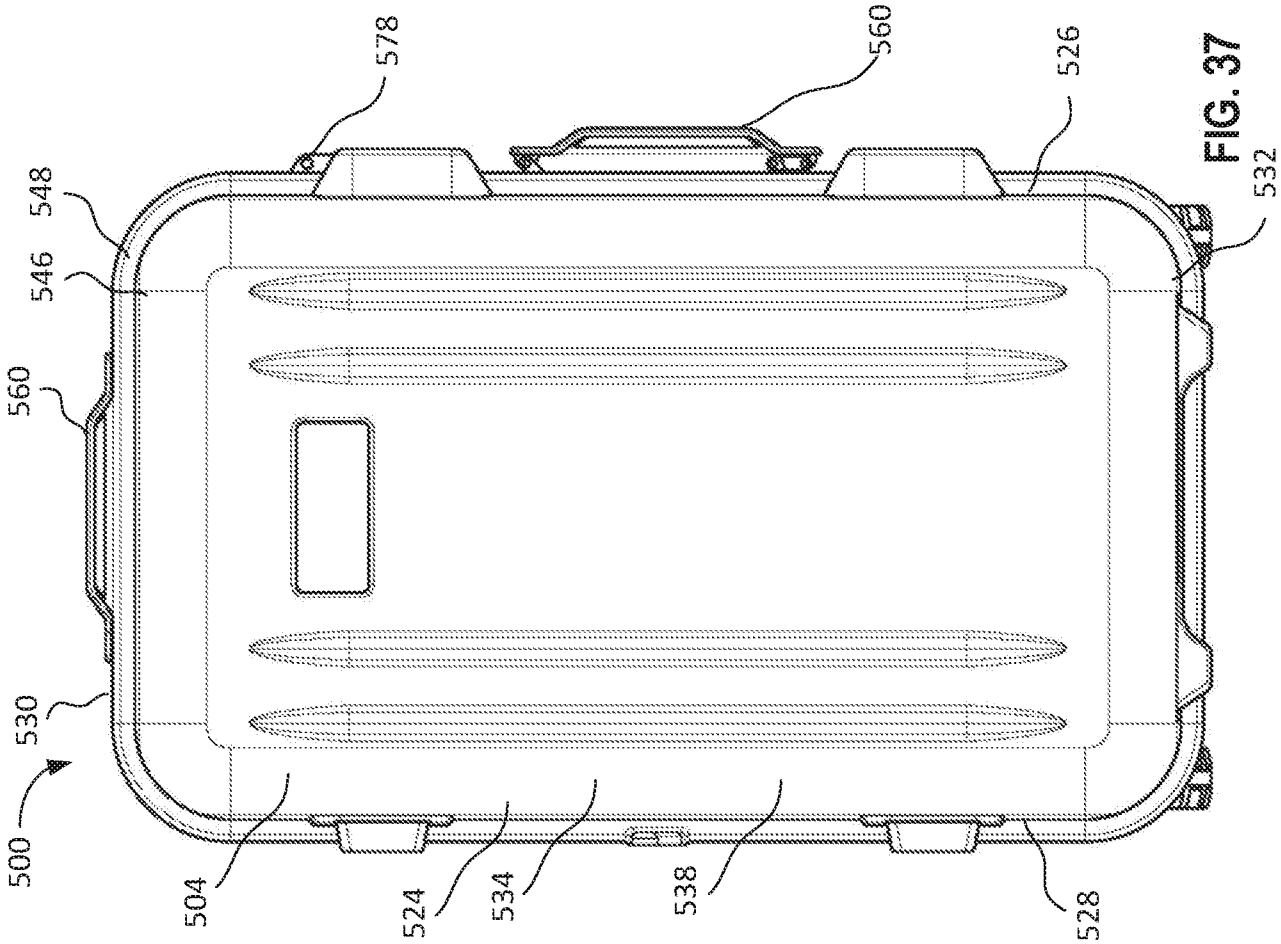

578
560
526
548
546
532
560
530
500
504
524
534
538
528

FIG. 37

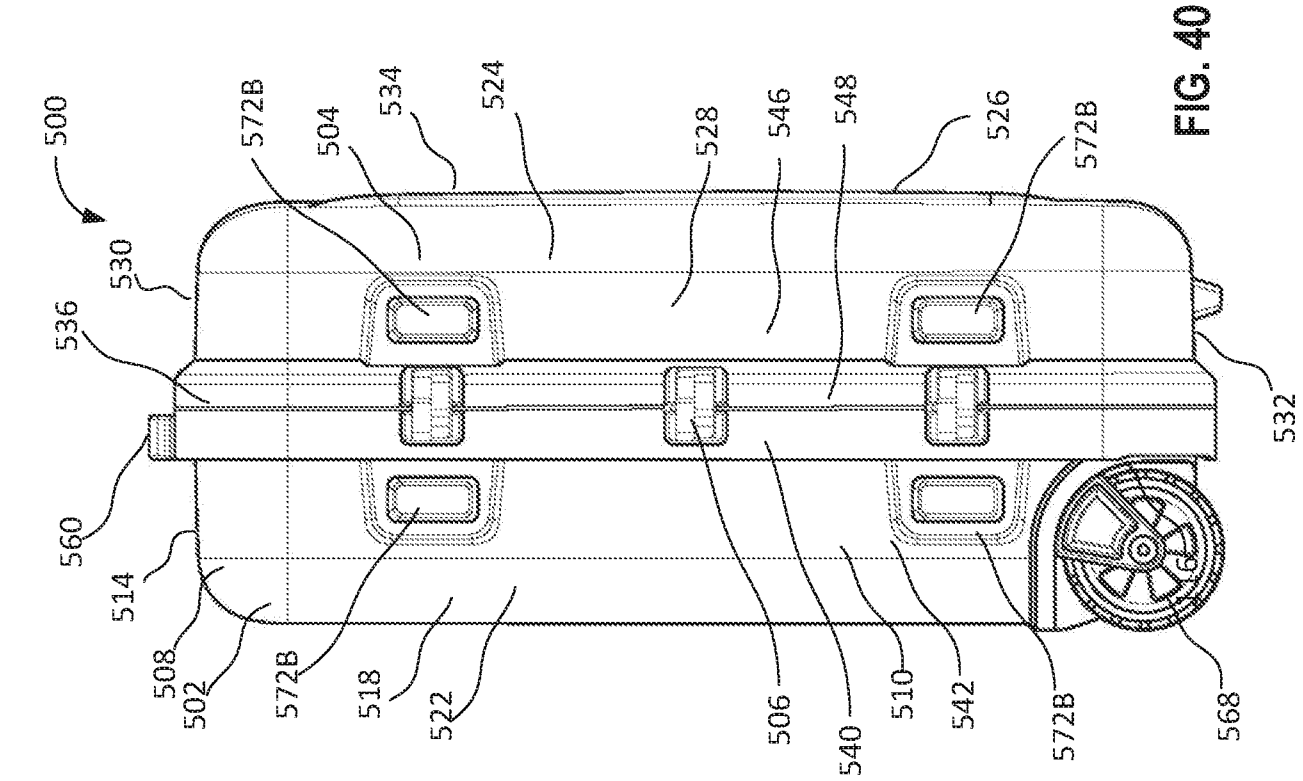
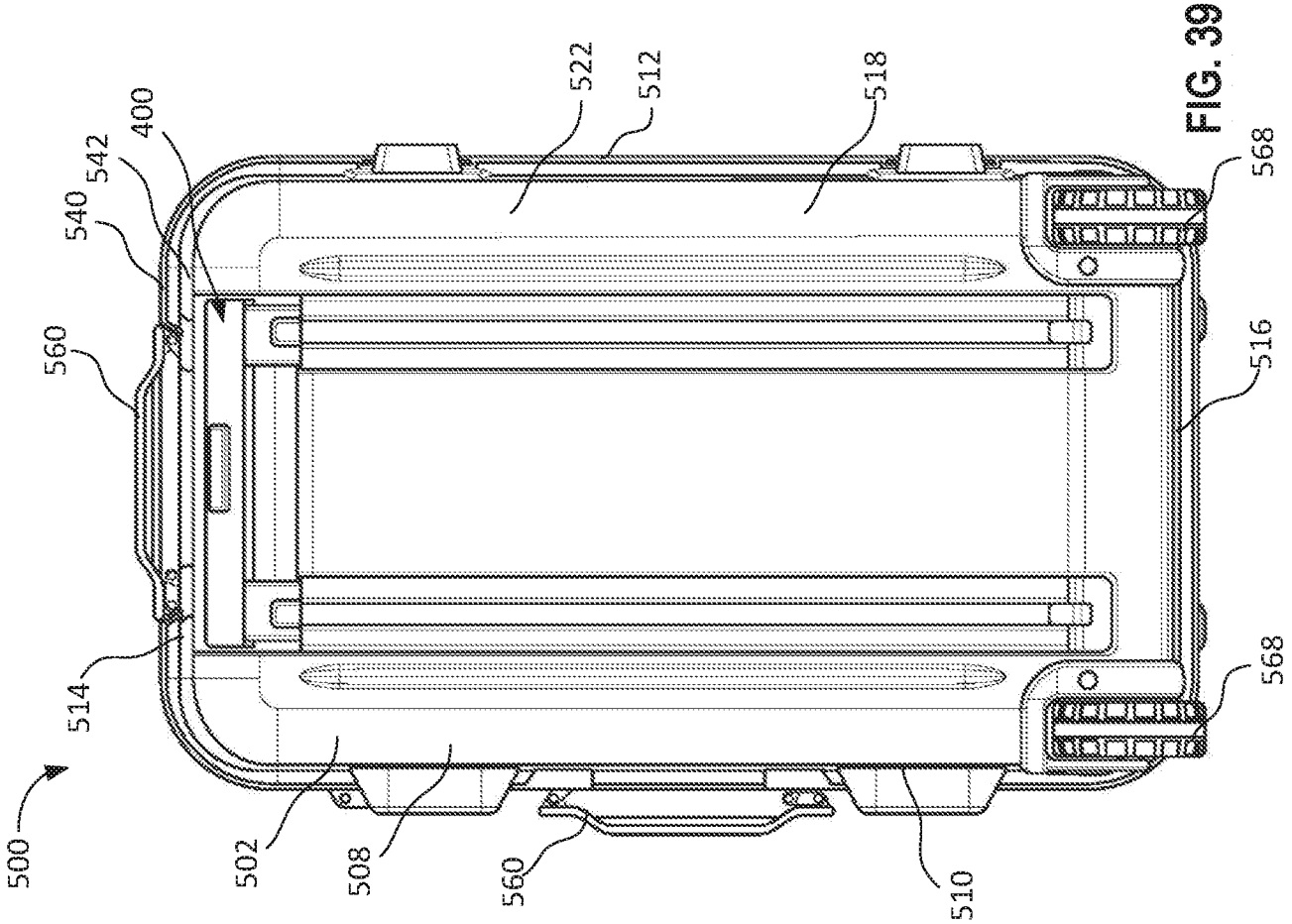

500
572B
504
534
524
528
546
548
526
572B
530
536
532
560
514
508
502
572B
518
522
506
540
510
542
572B
568

FIG. 40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512
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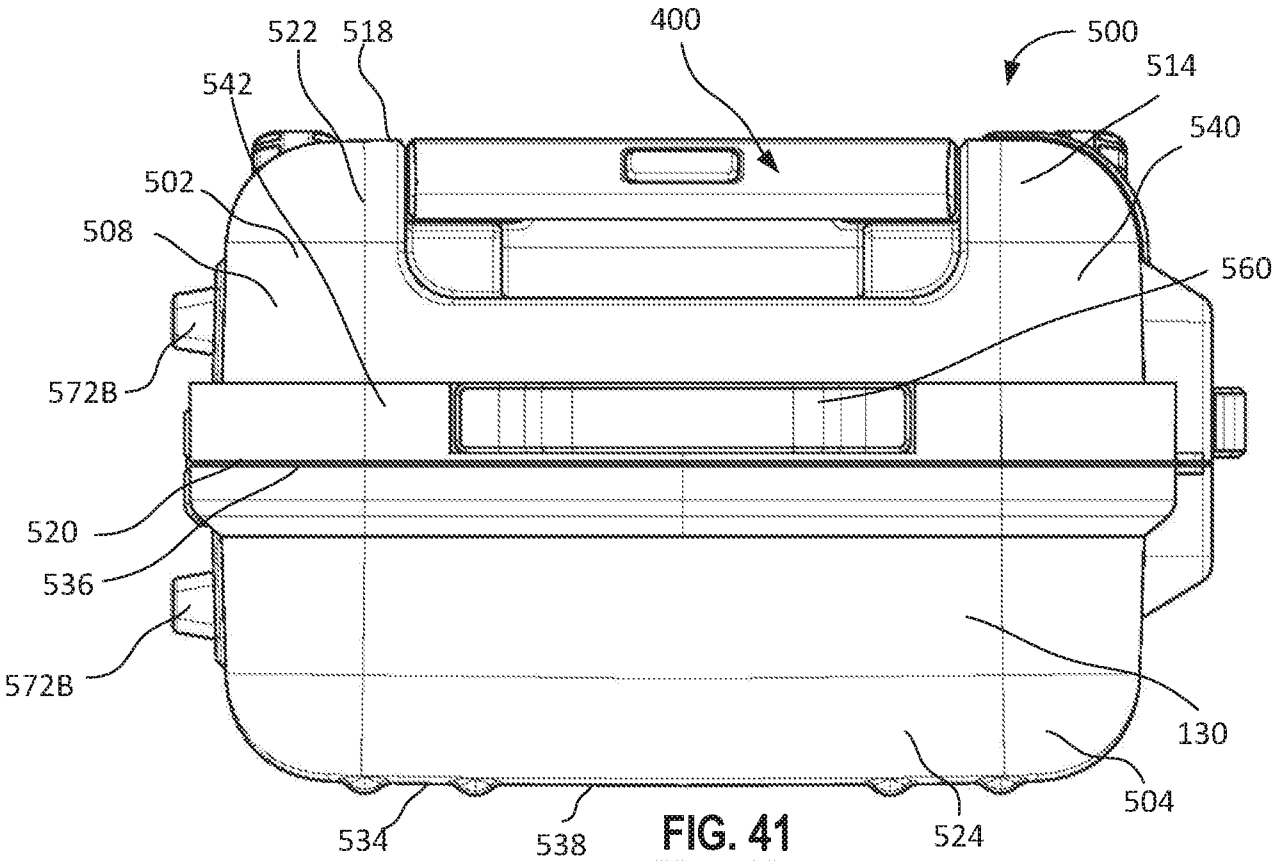
FIG. 39


522
518
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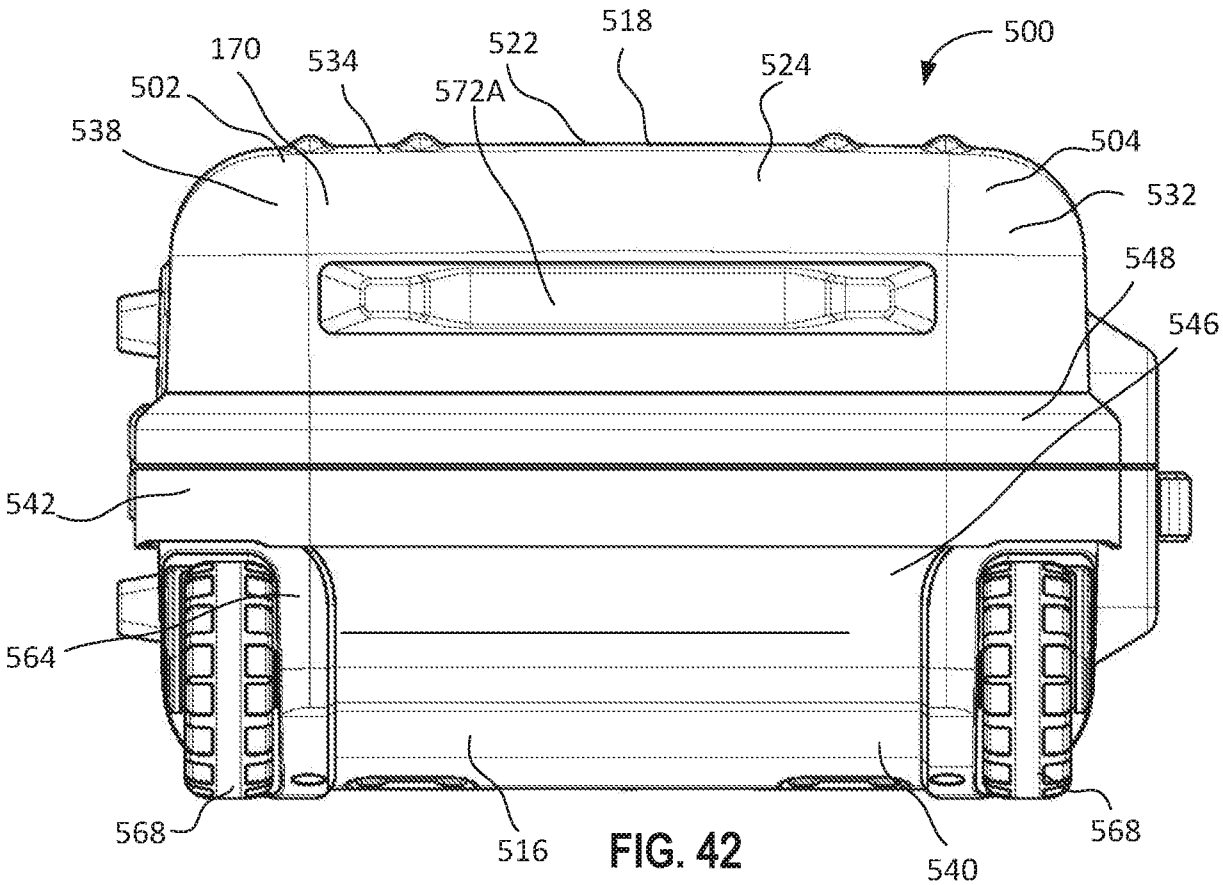
572B
520
536
572B
130
504
534
538
524

FIG. 41


170
534
522
518
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500
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572A
538
504
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548
546
542
564
568
516
540
568

FIG. 42

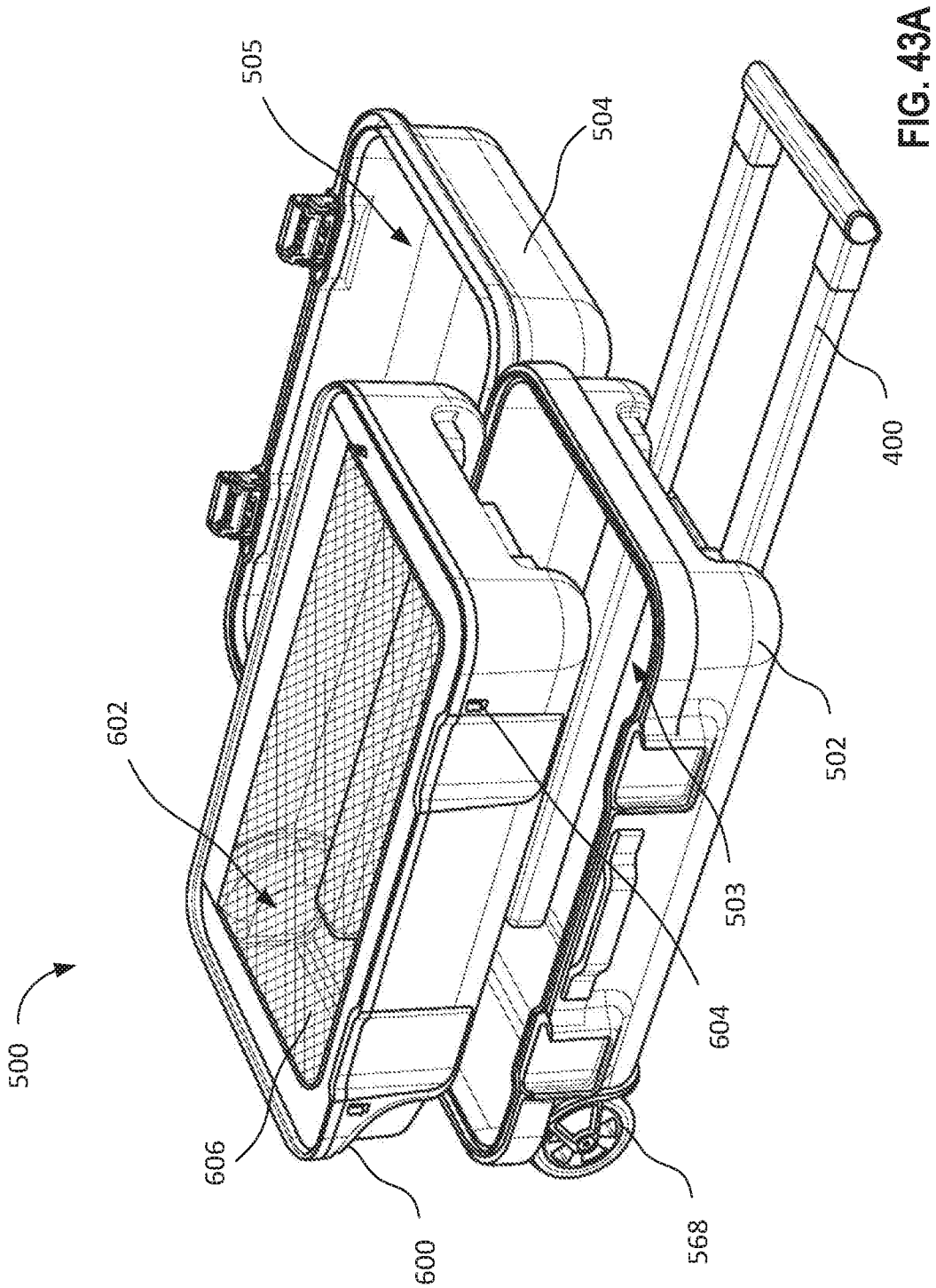


FIG. 43A

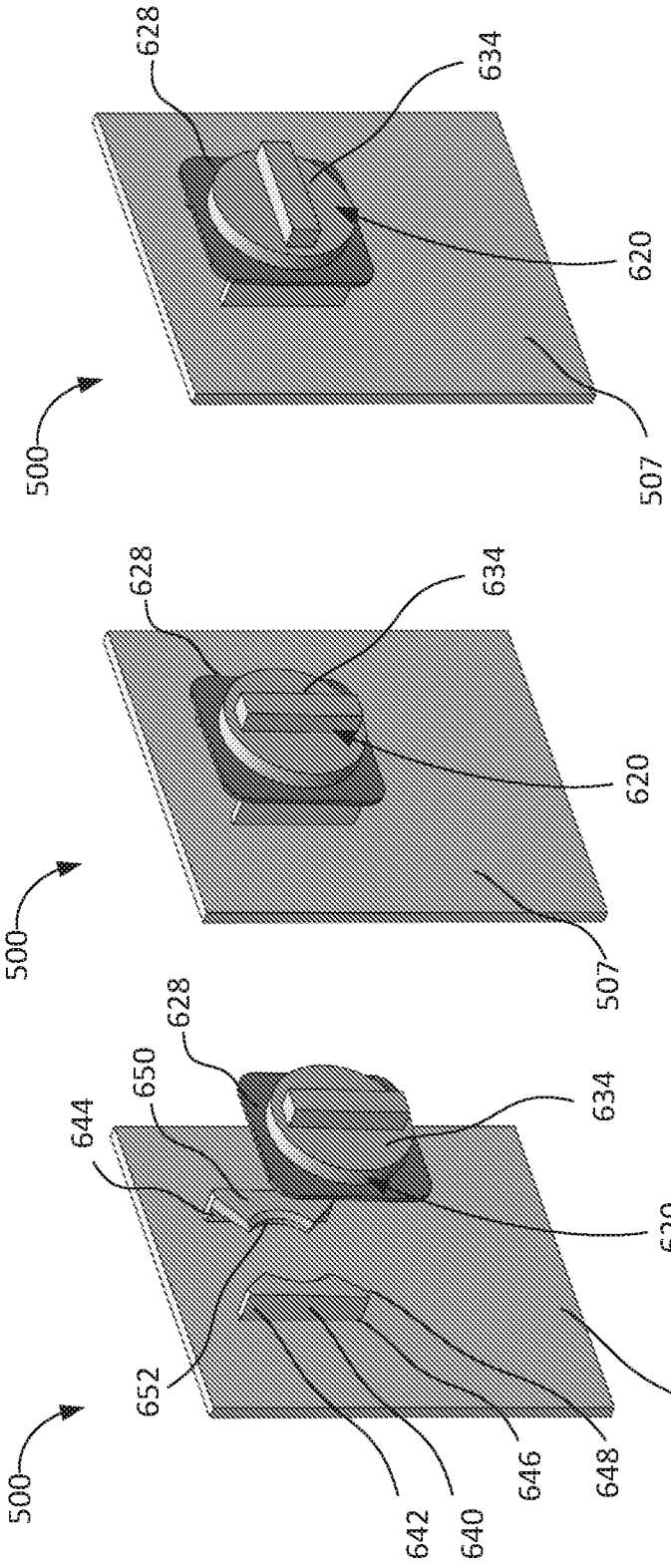


FIG. 43B




FIG. 43C




FIG. 43D

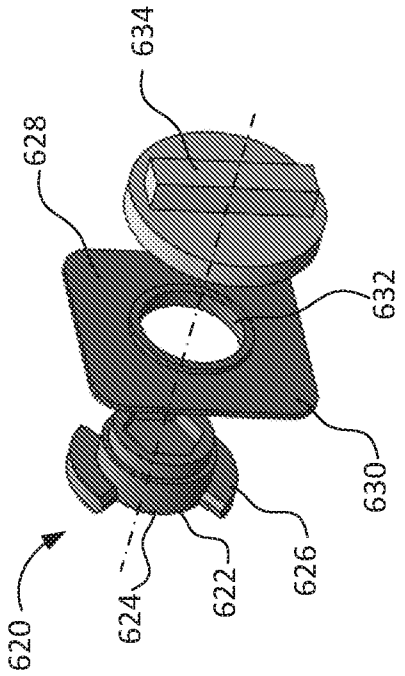


FIG. 43E

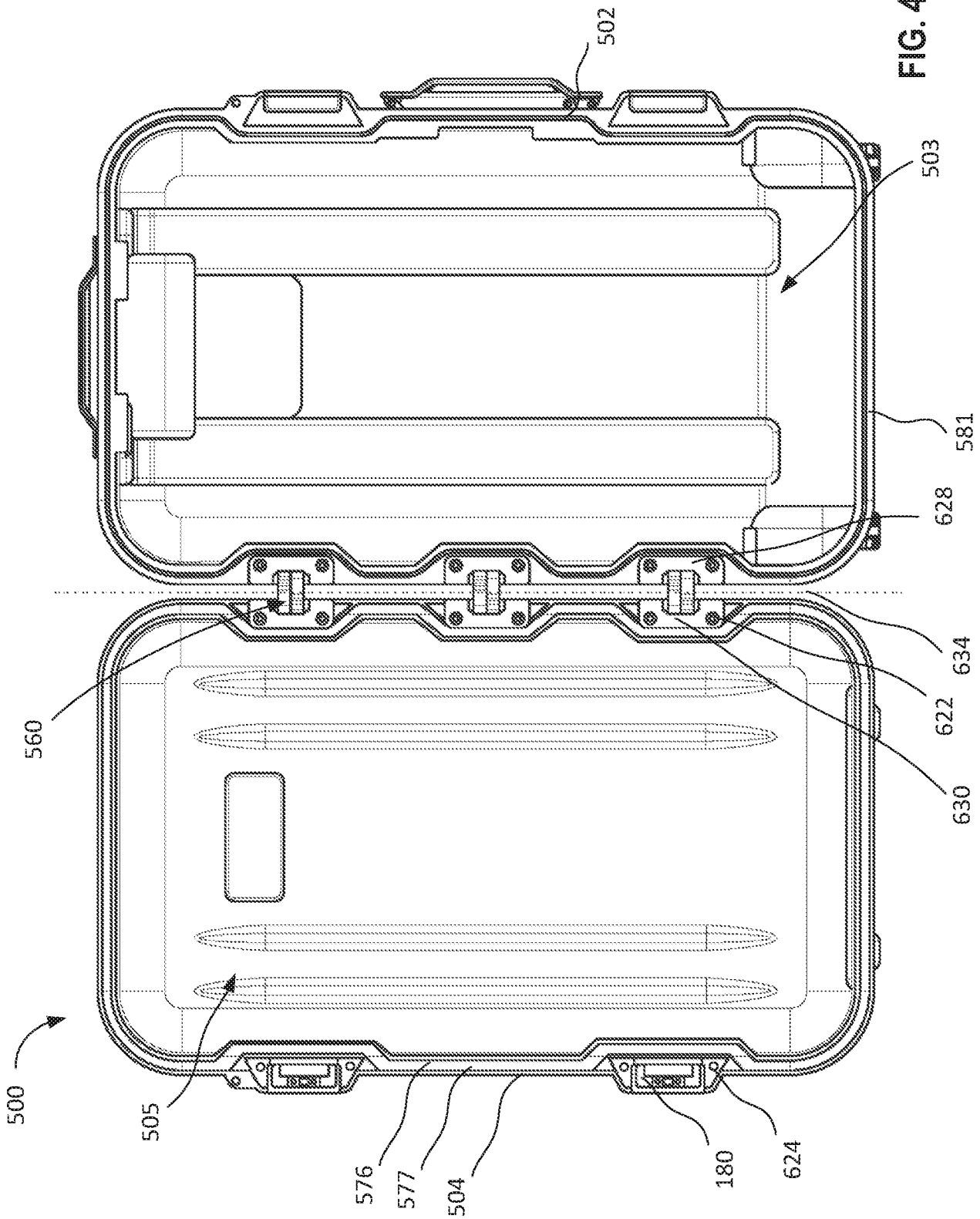


FIG. 44A

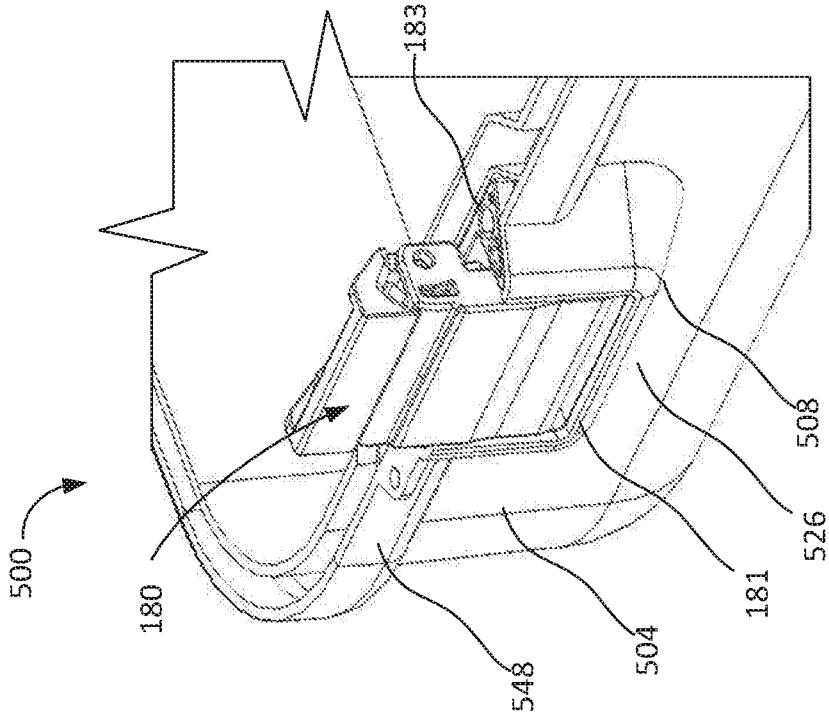


FIG. 44C

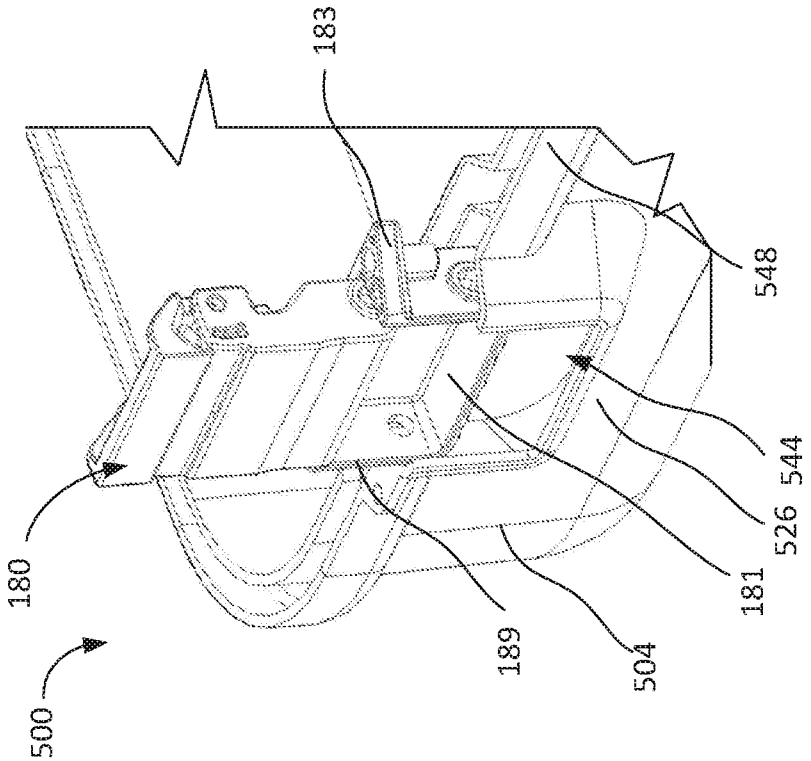


FIG. 44B

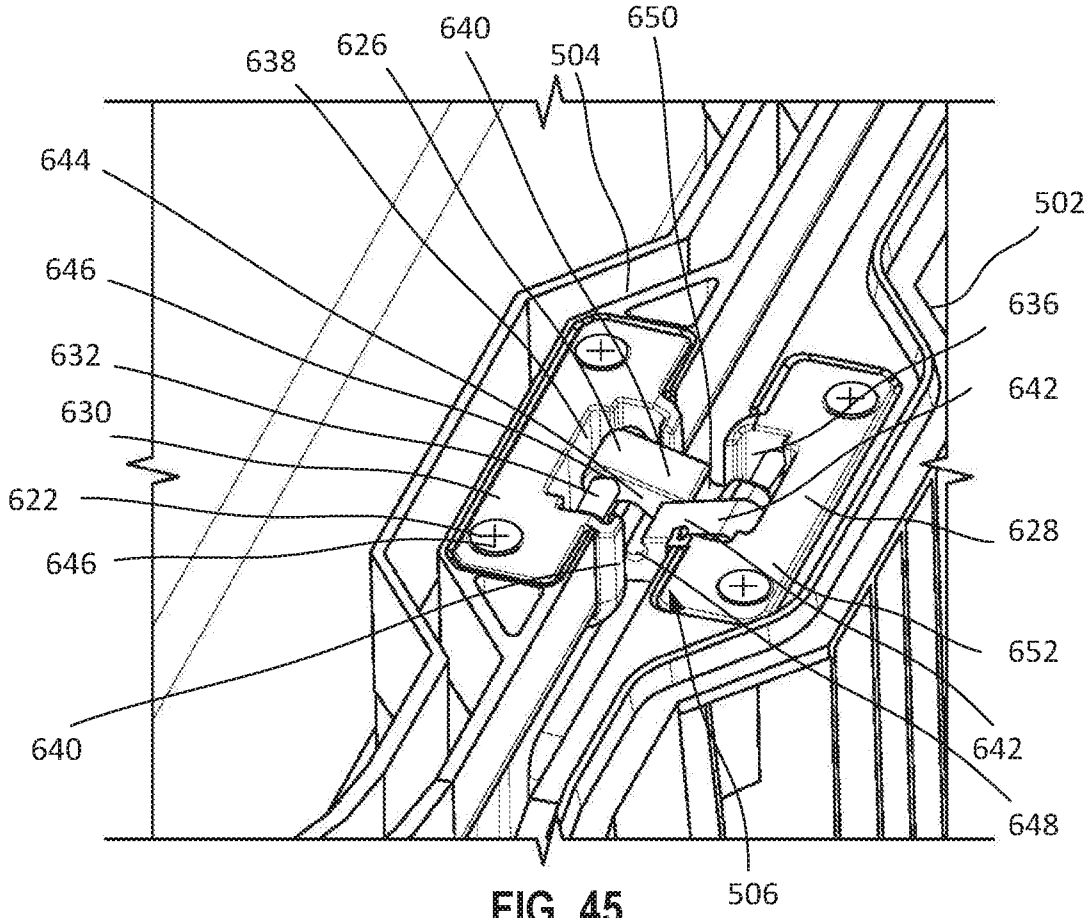
638
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FIG. 45

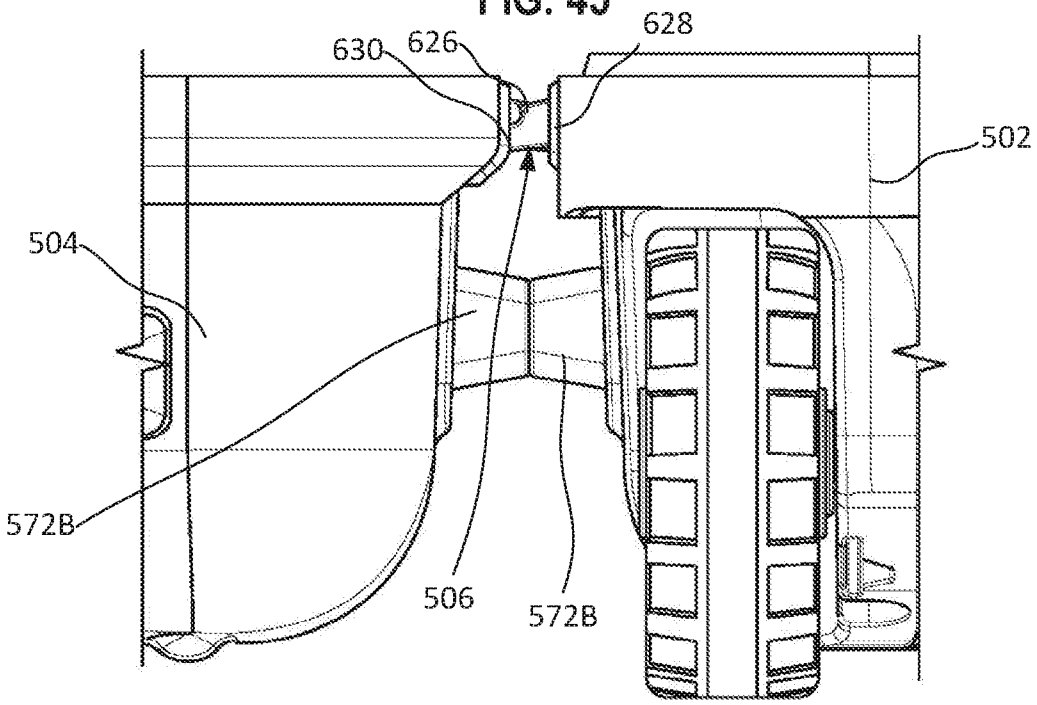
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FIG. 46

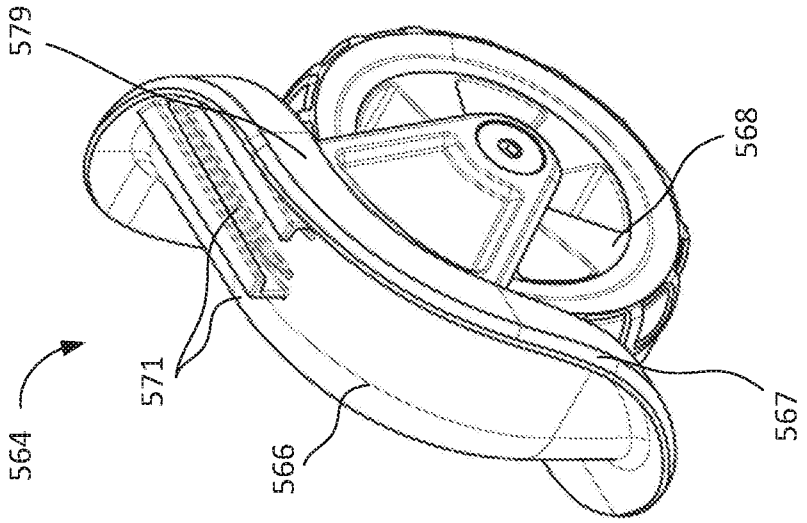
579
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FIG. 48

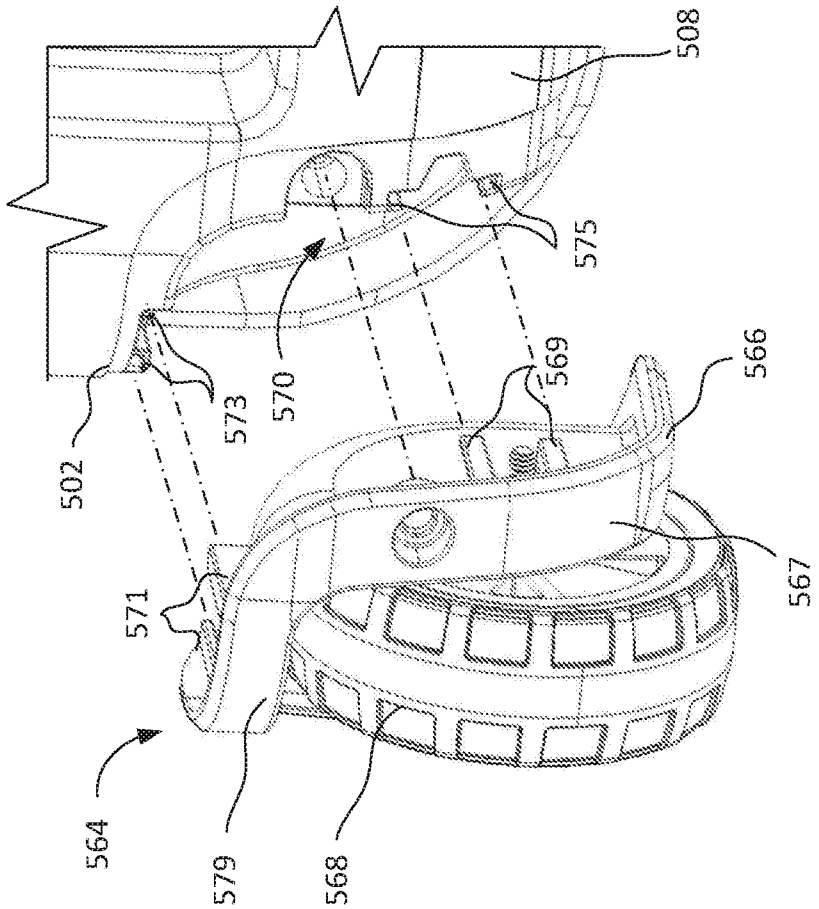
508
575
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FIG. 47

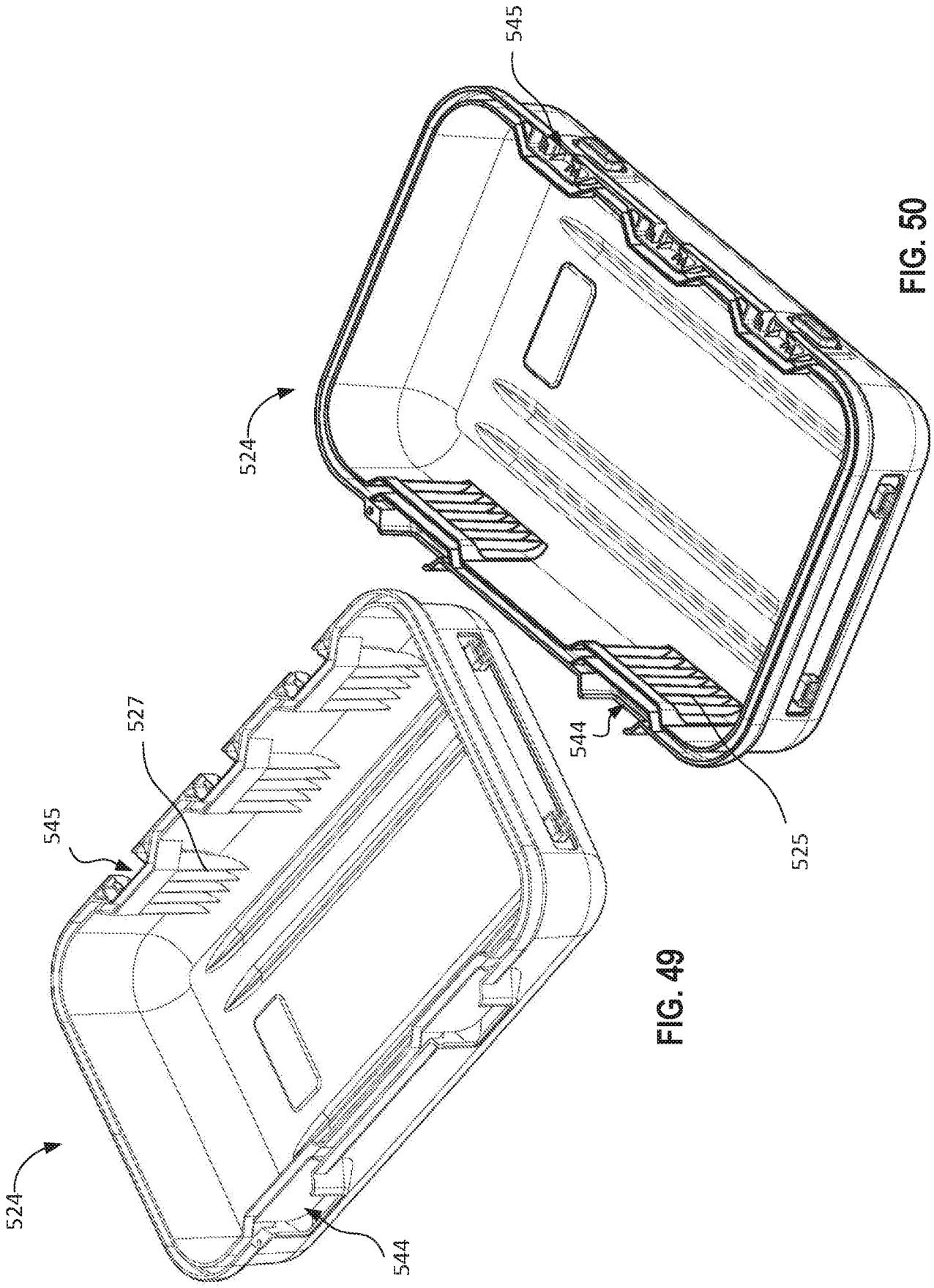


FIG. 49




FIG. 50

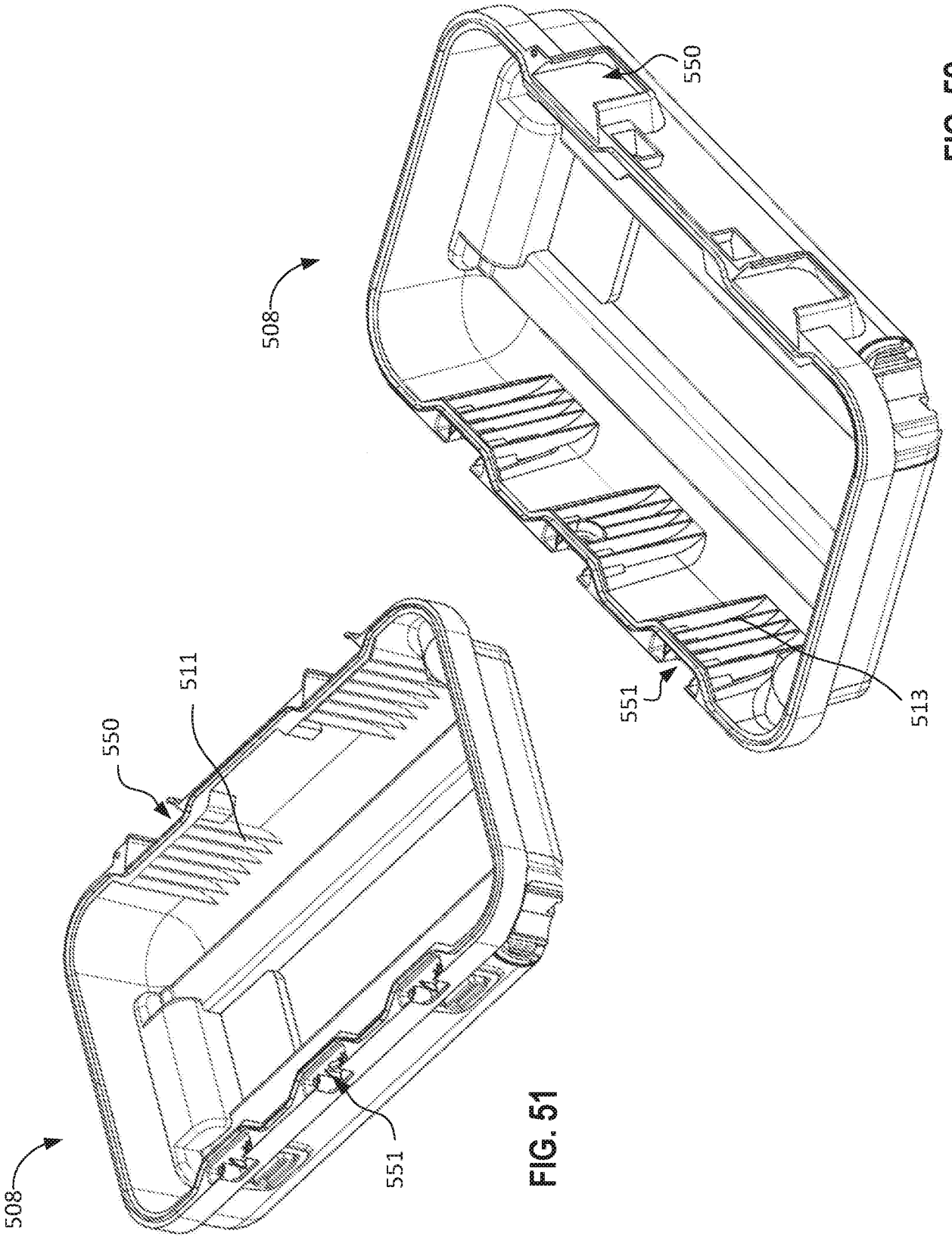


FIG. 51




FIG. 52

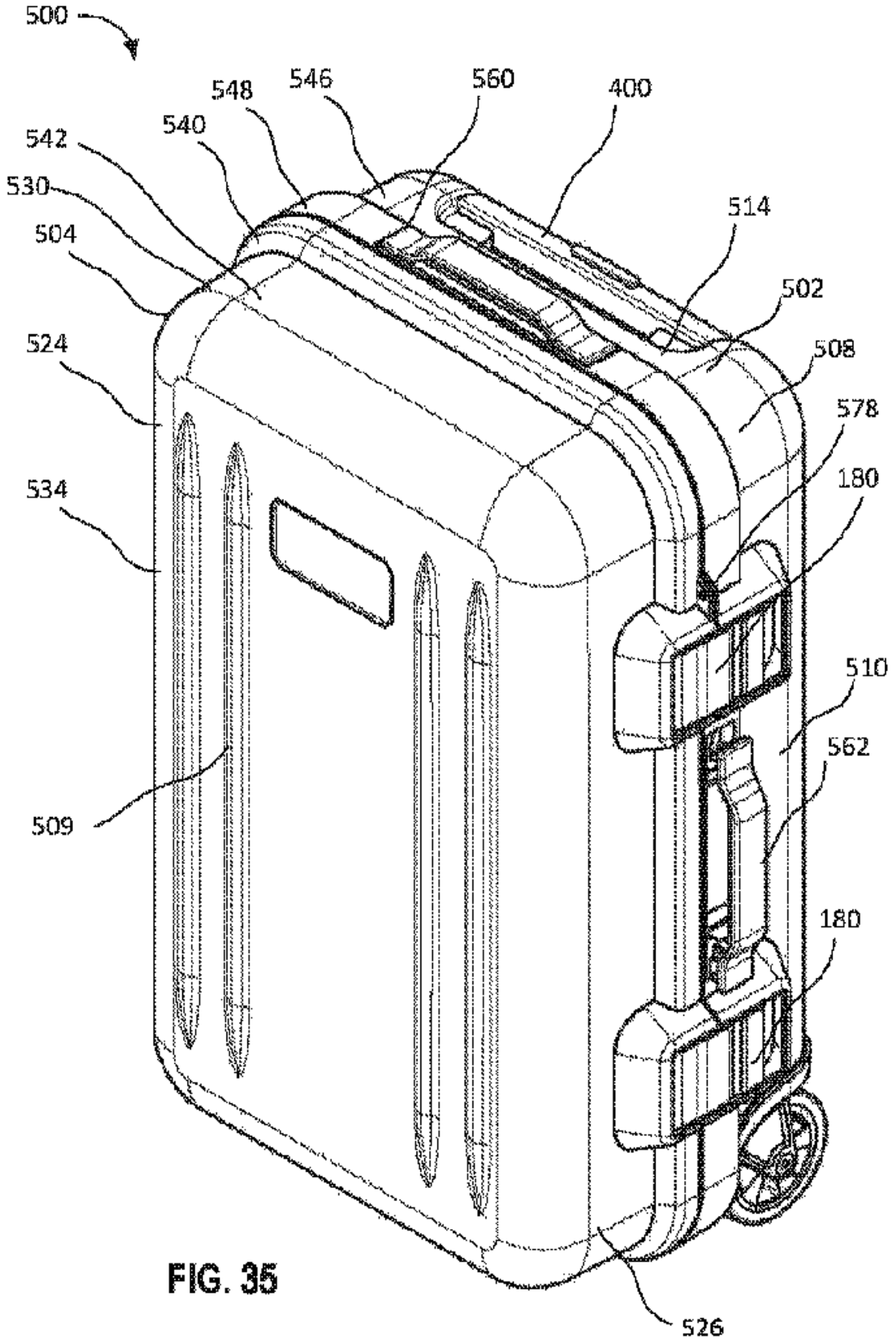
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FIG. 35