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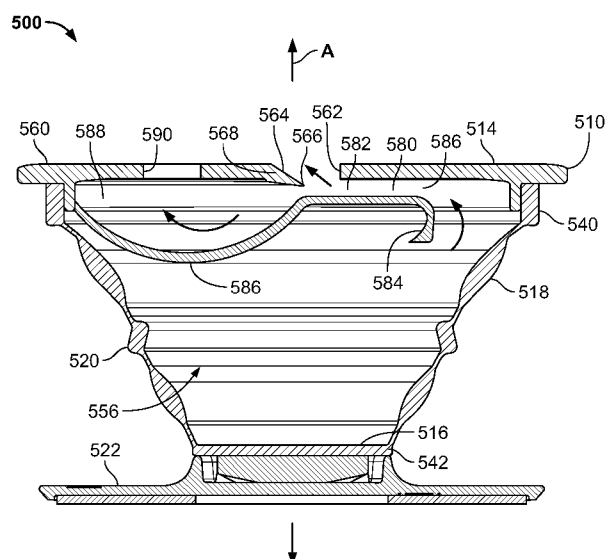


FIG. 1

(57) Abstract: Expandable devices for portable electronic device can be manipulated by a user to expand and contract. The devices provided herein utilize the expulsion of air from an interior volume of the devices resulting from this collapsing action to create sounds. The sounds can be created by reed assemblies, whistle assemblies, and combinations thereof.

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SOUND MAKER EXPANDABLE DEVICES FOR A PORTABLE ELECTRONIC DEVICE**CROSS-REFERENCE TO RELATED APPLICATION**

[0001] The present application claims priority to United States Provisional Patent Application No. 62/694,664, filed July 6, 2018, the entire contents of which are hereby incorporated by reference.

Field of the Disclosure

[0002] The present disclosure generally relates to expandable devices that can be attached to portable electronic devices or cases for portable electronic devices and used as grips, stands, or for other purposes.

Background

[0003] Portable electronic devices, such as MP3 players and smart phones, are often housed in protective covers or cases in order to protect the device from damage, provide a grip for handling the device, and/or provide a stand for propping the device on a surface. Such cases increase the effective size of the device. Expandable devices and accessories, which may be attached directly to the device or to the case protecting the device, are used for a variety of functions, including propping the device on a surface and providing an expandable grip for handling the device. The expandable devices have decorative buttons, which may display logos, decals, symbols, or other artistic renderings.

Summary

[0004] In accordance with a first aspect, an expandable device for a portable electronic device is provided that includes a body having a first end, a second end, and a longitudinal axis where the body is movable between an expanded configuration and a collapsed configuration. The expandable device further includes a button coupled to the first end of the body, an aperture extending through the button, and a sound generating member having an edge disposed adjacent to the aperture. A base is coupled to the second end of the body, such that the body, button, and base define an interior having a first volume with the body in the expanded configuration and a second, smaller volume with the body in the collapsed configuration. Further, the expandable device is configured so that moving the body from the

expanded configuration to the collapsed configuration causes air to be expelled through the aperture in the button past the edge of the sound generating member to thereby create sound.

[0005] According to some forms, the sound generating member can be a reed or an angled wall portion with a splitting edge. With versions having a reed, the reed can be received within a housing mounted to the button and, if desired, the housing can extend outwardly away from the button.

[0006] According to other forms, at least one of the body or button can include a narrowing throat that is disposed adjacent to the aperture and is configured to direct expelled air to the edge of the sound generating member. According to a further form, at least one of the body or button can include a ramp that directs air into the narrowing throat.

[0007] According to other forms, at least one of the body or button can include one or more walls that define a sound chamber disposed adjacent to the aperture and in fluid communication therewith. According to further forms, the button can include a plurality of openings that extend therethrough into the sound chamber such that the openings are selectively coverable by a user to change a pitch of the sound created by the air dispelled through the aperture.

[0008] According to additional forms, the expandable device can include a plurality of apertures that extend through the button and a plurality of sound generating members, each having an edge disposed adjacent to one of the plurality of apertures. With this form, each of the sound generating members can be configured to produce sounds with different pitches.

[0009] According to some forms, the expandable device can further include a platform that has an outer surface and a collar extending away from the outer surface and defining a cavity and a locking device that is carried by the second end of the body. At least a portion of the locking device is adapted to be removably disposed in the cavity of the platform so that the body can be releasably coupled to the platform.

[0010] In accordance with a second aspect, a method of operating an expandable device for a portable electronic device is provided that includes collapsing the expandable device from an expanded configuration to a collapsed configuration, where the expandable device includes a body that has a first end and a second end, a button coupled to the first end of the body, and a base coupled to the second end of the body. The method further includes expelling air through an aperture that extends through the button as the expandable device is collapsed and creating

sound with a sound generating member having an edge disposed adjacent to the aperture, the expelled air being driven past the edge.

[0011] In some forms, the method can include one or more of: creating sound with a reed or an angled wall portion; driving air through a narrowing throat of at least one of the body or button, where the narrowing throat is disposed adjacent to the aperture and configured to direct expelled air to the edge of the sound generating member; controlling a pitch of the sound by selectively covering one or more of a plurality of openings that extend through the button to a sound chamber disposed adjacent to the aperture and is in fluid communication therewith; or selectively expelling air through one or more of a plurality of apertures and creating sound with sound generating members disposed adjacent to each of the plurality of apertures.

[0012] In other forms, the method can further include rotatably coupling the body to a platform via a locking device disposed between the body and the platform and removing the body from the platform.

Brief Description of the Drawings

[0013] The above needs are at least partially met through provision of the embodiments described in the following detailed description, particularly when studied in conjunction with the drawings, wherein:

[0014] Fig. 1 is a cross-sectional view of a first example expandable device constructed in accordance with the teachings of the present disclosure;

[0015] Fig. 2 is a perspective view of a second example expandable device constructed in accordance with the teachings of the present disclosure showing the device in an expanded configuration;

[0016] Fig. 3 is a perspective view of the expandable device of Fig. 2 showing the device in a collapsed configuration;

[0017] Fig. 4 is a perspective view of a third example expandable device constructed in accordance with the teachings of the present disclosure showing the device in an expanded configuration;

[0018] Fig. 5 is a perspective view of the expandable device of Fig. 4 showing the device in a collapsed configuration;

[0019] Fig. 6 is a perspective view of a fourth example expandable device constructed in accordance with the teachings of the present disclosure showing the device in a collapsed configuration;

[0020] Fig. 7 is a perspective view of the expandable device of Fig. 6 showing the device in an expanded configuration;

[0021] Fig. 8 is a perspective view of the expandable device of Fig. 6 showing the device in a curved expanded configuration;

[0022] Fig. 9 is an isometric view of a fifth example expandable device constructed in accordance with the teachings of the present disclosure;

[0023] Fig. 10 is an exploded view of the expandable device of Fig. 9, including an example button, an example body including an example disk, an example hub, and an example platform;

[0024] Fig. 11 is a front, cross-sectional view of the expandable device taken at I-I of Fig. 9;

[0025] Fig. 12 is a side, cross-sectional view of the expandable device taken at II-II of Fig. 9;

[0026] Fig. 13 is a front, cross-sectional view of the expandable device of Fig. 9 in a collapsed configuration;

[0027] Fig. 14 is a bottom view of the button of Fig. 9;

[0028] Fig. 15 is a top view of the connecting disk of Fig. 9;

[0029] Fig. 16 is a side view of the connecting disk of Fig. 15;

[0030] Fig. 17 is a isometric view of the hub of Fig. 9;

[0031] Fig. 18 is a bottom view of the hub of Fig. 17;

[0032] Fig. 19 is a top view of the platform of Fig. 9;

[0033] Fig. 20 is a side, cross-sectional view of the platform taken at III-III of Fig. 17;

[0034] Fig. 21 is a front, cross-sectional view of the platform taken at IV-IV of Fig. 17;

[0035] Fig. 22 is a front, cross-sectional view of a sixth example expandable device constructed in accordance with the teachings of the present disclosure;

[0036] Fig. 23 is a side, cross-sectional view of the expandable device of Fig. 22;

[0037] Fig. 24 is a top view of a second example connector of the expandable device of Fig. 22; and

[0038] Fig. 25 is an isometric view of a case for a portable electronic device having an integrated expandable device constructed in accordance with the teachings of the present disclosure.

[0039] Skilled artisans will appreciate that elements in the figures are illustrated for simplicity and clarity and have not necessarily been drawn to scale. For example, the dimensions and/or relative positioning of some of the elements in the figures may be exaggerated relative to other elements to help to improve understanding of various embodiments of the present invention. Also, common but well-understood elements that are useful or necessary in a commercially feasible embodiment are often not depicted in order to facilitate a less obstructed view of these various embodiments. It will further be appreciated that certain actions and/or steps may be described or depicted in a particular order of occurrence while those skilled in the art will understand that such specificity with respect to sequence is not actually required. It will also be understood that the terms and expressions used herein have the ordinary technical meaning as is accorded to such terms and expressions by persons skilled in the technical field as set forth above except where different specific meanings have otherwise been set forth herein.

DETAILED DESCRIPTION

[0040] Expandable devices of the present disclosure can be manipulated by a user to expand and contract. The devices described herein utilize the expulsion of air from an interior volume of the devices resulting from this collapsing action to create sounds. The influx of air into the interior volume of the devices resulting from an expansion of the device can also be utilized to create sounds. The sounds can be created by reed assemblies, whistle assemblies, and combinations thereof.

[0041] Example expandable devices that are configured to create sounds while being collapsed and/or expanded are shown in Figs. 1-8. A sound assembly 500 for an example expandable device 510 is shown. The expandable device 510 includes a body 518, a button 514 attached to a first end 540 of the body 518, a base 516 attached to a second end 542 of the body 518, and a platform 522 that is attachable to a portable electronic device 523 (Fig. 6), a case for a portable electronic device, or other desired component.

[0042] When the button 514 is attached to the first end 540 of the body 518, a wall 520 of the body 518, the base 516, and the button 514 define an interior chamber 556. As with the above forms, the body 518 is movable between an expanded configuration and a collapsed configuration. The chamber 556 has a first volume with the body 518 in the expanded configuration and a second, smaller volume with the body 516 in the collapsed configuration. Accordingly, when a user collapses the body 516, the volume of the chamber 556 is decreased and when a user expands the body 516, the volume of the chamber 556 is increased.

[0043] The body 518 can be symmetrical about a longitudinal axis A and have any desired cross-section, including circular as shown in Figs. 1-5 or rectangular/square as shown in Figs. 6-8. Further, the body 518 can have a tapered configuration so that the second end 542 is relatively smaller than the first end 540. With the circular cross-section, the body 518 can have a frusto-conical configuration and with the square cross-section, the body 518 can have a pyramid configuration.

[0044] To create sound while the body 518 is collapsed and/or expanded, the button 514 includes a planar end wall 560 and an aperture 562 extending through the end wall 560. A sound generating member 564 is coupled to the expandable device 510, such as to the button 514 and/or body 518, so that an edge 566 of the sound generating member 564 is disposed adjacent to the aperture 562. So configured, when the body 518 is moved to the collapsed configuration and the volume of the chamber 556 is decreased, air is expelled through the aperture 562. The sound generating member 564, which can be a whistle configuration with an angled wall 568 having a splitting edge 566 as shown in Fig. 1 or a reed 572 as shown in Figs. 2 and 3, is positioned so that the expelled air is driven past the edge 566, creating sound. Although the sound generating members 564 of the various embodiments are shown in configurations to create sounds as air is expelled from the chamber 556, it will be understood that the sound generating members 564 can also be positioned and configured to create sounds as air is drawn into the chamber 556. If desired, the embodiments described herein can be configured to create sounds with both expansion and contraction using one or more sound generating members 564.

[0045] With versions having the reed 572, as shown in Figs. 2 and 3, the reed 572 can be disposed within a housing 574 that funnels air driven therethrough past the reed 572. Advantageously, the housing 574 can be sized to fit within the aperture 562 and can be secured thereto by friction, adhesive, etc. In a first form, the housing 574 can be mounted in the aperture 562 to extend outwardly away from the end wall 560 of the button 514. In a second form, the

button 514 can include a sidewall 576 that extends downwardly from edges of the end wall 560 to define an interior volume for the button 514. Advantageously, the sidewall 576 can have a height that generally corresponds to the housing 574 so that the housing 574 and reed 572 therein can be disposed within the expandable device 510. Further, the sidewall 576 allows the body to be moved to the collapsed configuration without the housing 574 interfering with the movement.

[0046] With versions having the angled wall 568, as shown in Fig. 1, the splitting edge 566 of the angled wall 568 provides an edge of the aperture 562 with the angled wall 568 extending outwardly therefrom. Further, the expandable device 510 can include a narrowing throat 580 with an outlet 582 oriented to direct air to the splitting edge 566. The throat 580 can advantageously extend generally parallel to the end wall 560 so that the body 518 can be collapsed in a compact configuration. Further, the expandable device 510 can include a ramp 584 disposed at an inlet 586 of the throat 580 to funnel expelled air into the throat 580. The throat 580 and ramp 584 can be formed by the body 518, the button 514, or combinations thereof.

[0047] In a further form as shown in Fig. 1, the expandable device 510 can include one or more walls 586 defining a sound chamber 588 that is disposed downstream of the aperture 562 and in fluid communication therewith. One or more apertures 590 can extend through the end wall 560 of the button 514 to the sound chamber 588. As commonly understood, selectively covering one or more of the apertures 590 to the sound chamber 588 changes a pitch of the note caused by the air blowing over the splitting edge 566. In the illustrated form, the apertures 562 can have different sizes.

[0048] Alternatively, or in combination, the other apertures 590 can be utilized to provide additional sound generating members 564, which can be reeds 572 or angled walls 568 as discussed above. Each of the sound generating members 564 can be configured to create different pitches and allow a user to selectively cover the apertures 562, 590 to obtain a desired pitch. The apertures 590 can also be utilized for sound generating members to selectively create sound with one of expansion or contraction of the device 510 so that a user can cover individual ones of the apertures 590 to create sounds during both expansion and contraction.

[0049] The expandable device 510 of this form can also be removable from the platform 522. This allows a user to utilize the expandable device 510 to conveniently hold and/or stand the portable electronic device, among other uses, but also create sounds with the expandable device 510 both mounted to and removed from the portable electronic device.

[0050] The above sound assemblies and expandable devices 510 can be incorporated into and/or incorporate some of the additional example structures for expandable devices described below with references to Figs. 9-25. For example, the below embodiments describe locking devices 24, 224, 424, which can be incorporated into the above devices 510 so that the expandable device 510 can be removably coupled to a portable electronic device.

[0051] In Figs. 9-13, a fifth exemplary expandable device 10 is constructed in accordance with the teachings of the present disclosure. The expandable device 10 includes a button 14, a body 18 attached to the button 14, and a platform 22 that is attachable to a portable electronic device (not shown), a case for a portable electronic device, or other desired component. The body 18 is movable between an expanded configuration, as shown in Figs. 9-12, and a collapsed configuration, as shown in Fig. 13. A locking device 24, which is hidden from view in Fig. 9 and is shown in Fig. 10, is disposed between the body 18 and the platform 22 to rotatably and releasably couple the body 18 to the platform 22. The locking device 24 is movable between an unlocked configuration, in which the body 18 is removable from the platform 22, and a locked configuration, in which the body 18 is secured to the platform 22. When the body 18 is in the expanded configuration, the body 18 may rotate freely about a longitudinal axis A relative to both the platform 22 and the locking device 24. The body 18 is configured to rotate with the locking device 24, and therefore move the locking device 24 from a locked configuration to an unlocked configuration, for example, only when the body 18 is in the collapsed configuration. As shown in Figs. 11-13, an engaging member 30 carried by an inner surface 34 of the button 14 is configured to engage with a mating surface 38 of the locking device 24 when the device 10 is in the collapsed configuration. When the button 14 and body 18 rotate about the longitudinal axis A in the collapsed configuration, the engaging member 30 of the button 14 engages the locking device 24 such that the locking device 24 is rotatable relative to the platform 22 between an unlocked configuration, in which the body 18 is removable from the platform 22, and a locked configuration, in which the body 18 is secured to the platform 22. The locking device 24 also rotates about the axis A relative to the platform 22 from the locked configuration to the unlocked configuration.

[0052] As shown in Fig. 10, the locking device 24 includes a hub 26 and a connecting disk 28 rotatably connected to the body 18. In the locked configuration, the body 18 is rotatable relative to the locking device 24 and therefore rotatably coupled to the platform 22 by way of the locking device 24. The platform 22 has a mounting surface 39 that may include an adhesive adapted to

attach the platform 22 to the portable device or the case for the portable device. The mounting surface 39 secures the platform 22 relative to the device to facilitate unlocking and locking the locking device 24. The hub 26, the connecting disk 28, the button 14, the body 18, and the platform 22 are aligned relative to the longitudinal axis A when the expandable device 10 is in the locked configuration.

[0053] The body 18 can include an accordion-like structure 18 having a collapsible wall 20. The body 18 is movable between the expanded configuration, as shown in Figs. 9-12, and collapsed configuration, as shown in Fig. 13. The body 18 is symmetrical about the longitudinal axis A, and includes a first end 40 distal to the platform 22 and a second end 42 proximate to the platform 22. When the button 14 is attached to the first end 40 of the body 18, the wall 20 of the body 18 and the button 14 define a chamber 56. The body 18 includes an aperture 58 formed in the second end 42 of the body 18 such that the locking device 24 may be partially disposed both internally and externally relative to the body 18. At the second end 42 of the body 18, the chamber 56 has a volume sized to receive the connecting disk 28. The body 18 can be made of a flexible material, such as polyester-based thermoplastic polyurethane elastomer, that may be formed by injection molding, thermoforming, or compression molding, or may be any equivalently functional material suitable for its intended purpose. In some instances, the body 16 of the current disclosure may include, at least in part, a Popsocket™ and/or an extending body for a portable media player as disclosed in U.S. Patent No. 8,560,031, U.S. Application No. 15/729,260, filed October 10, 2017, U.S. Application No. 15/864,402, filed January 8, 2018, and U.S. Application No. 15/864,509, filed January 8, 2018, the entire disclosures of which are incorporated herein by reference.

[0054] As illustrated in Figs. 11 through 13, the connecting disk 28 of the locking device 24 carried by the second end 42 of the body 18 and is disposed in the chamber 56 of the body 18 adjacent to the second end 42. In this configuration, the mating surface 38 of the connecting disk 28 faces the inner surface 34 of the button 14, and a second mating surface 60 extends through the aperture 58 of the second end 42 of the body 18 for coupling to the hub 26. The connecting disk 28 is disposed within the body 18 and is rotatable relative to the body 18. The connecting disk 28 rotates with the body 18 when the button 14 is attached to the first end 40 of the body 18 and engages with the first mating surface 38 of the connecting disk 28.

[0055] The engaging member 30 of the button 14 is particularly suited to connect with the mating surface 38 of the connecting disk 28. As such, locking device 24 of the device 10 is

beneficially constructed so that the body 18 does not easily detach from the platform 22 when the device 10 is in use. The button 14 of the device 10 acts as a key to unlock or lock the body 18 from or to the platform 22 when the button 14 engages the locking device 24.

[0056] As shown in Fig. 13, the engaging member 30 of the button 14 and the first mating surface 38 of the locking device 24 are arranged so that the engaging member 30 and the first mating surface 38 interlock (e.g., mesh, overlap, engage, mate, couple) when the inner surface 34 of the button 14 is adjacent to the mating surface 38. The inner surface 34 of the button 14 is shown in greater detail in Fig. 14. The engaging member 30 includes a plurality of protrusions 44 (e.g., teeth, ribs, studs, pegs, etc.) separated by a plurality of spaces 48 (e.g., grooves, notches, dimples, etc.), which may be arranged in a predetermined pattern or configuration that corresponds to the mating surface 38 of the connecting disk 28. In this example, the engaging member 30 includes a plurality protruding teeth 44 evenly spaced by the plurality of openings or grooves 48 in the shape of a ring. The engaging member 30 is disposed about the longitudinal axis A, and is symmetrical such that the button 14 may easily mesh with the first mating surface 38 of the connecting disk 28.

[0057] Fig. 15 shows the mating surface 38 of the connecting disk 28 is arranged in a pattern of protruding teeth 52 (e.g., protrusions, ribs, studs, pegs, etc.), which are evenly spaced by a plurality of grooves 54 (e.g., spaces, notches, dimples, etc.). The first mating surface 38 is symmetrical about the longitudinal axis A such that the button 14 may easily mesh with the first mating surface 38 of the connecting disk 28. Turning back to Figs. 11-13, the plurality of protrusions 52 of the connecting disk 28 are aligned, and sized to fit, within the spaces 48 of the engaging member 30 of the button 14. Likewise, the plurality of grooves 54 are aligned, and sized to receive, the plurality of protrusions 44 of the button 14. Thus, when the body 18 is in the collapsed configuration, the plurality of protrusions 44, 52 of the button 14 and the mating surface 38 of the locking device 24 are interlocked and positioned to engage when the button 14 is rotated about the longitudinal axis A. In another example, the mating surface 38 and the engaging member 30 interlock or otherwise engage via a different locking configuration.

[0058] In Fig. 16, the second mating surface 60 of the connecting disk 28 is shown. The second mating surface 60 includes a flat area 62, a protruding portion 63 surrounded by the flat area 62 and extending axially away from the flat area 62 of the disk 28. The flat area 62 is configured to lay flat against an interior surface of the second end 42 of the body 18 and the protruding portion 63 is configured to at least partially extend through the aperture 58 of the

body 18. The flat area 62 includes a smooth surface to reduce friction between the disk 28 and the body 18 such that the connecting disk 28 is free to rotate relative to the body 18 when the disk 28 is disposed within the chamber 56. A distal end 64 of the protruding portion 63 includes a plurality of angled tips. The angled tips 64 may be configured to flex, bend, or otherwise deform to mate with the hub 26. Once the protruding portion 63 engages the hub 26, the hub 26 and the connecting disk 28 may be fixed (e.g., welded, fused, etc.) together to move as a unitary locking device 24. Alternatively, the hub 26 and connecting disk 28 can be integrally formed. Unlike the flat area 62, the distal end 64 may be a textured material configured to frictionally engage with the hub 26 so that the connecting disk 28 rotates the hub 26 when the disk 28 and hub 26 are engaged.

[0059] In Figs. 17 and 18, the hub 26 is shown in greater detail. The hub 26 includes a body 65 and first and second radial wings 66 and 68 that extend outwardly from the body 65. The wings 66 and 68 are disposed on opposing sides of the body 65, and may be a resilient material such that the wings 66 and 68 may deform (e.g., bend, flex) when the wings 66 and 68 engage the platform 22. The body 65 includes a first surface 70 and a second surface 72 opposite the first surface 70. The first surface 70 is configured to mate with the second mating surface 60 of the connecting disk 28. More particularly, an opening 71 formed in the first surface 70 is sized and shaped to receive the protruding portion 63 of the second mating surface 60 of the connecting disk 28. As shown in Fig. 18, the hub 26 includes first and second curved notches or ramps 73, 74 formed in the second surface 72 to facilitate disengagement between the platform 22 and the hub 26 when the locking device 24 rotates relative to the platform 22. Specifically, the notches 73, 74 are formed to slide against protrusions 76, 78 extending from the platform 22 when the locking device 24 rotates a quarter turn (i.e., 90 degrees) about the longitudinal axis A. First and second detents 84, 86 are formed in the second surface 72 of the hub 26 and are shaped to engage with first and second protrusions 76, 78 of the platform 22 when the locking device 24 is in the locked configuration. In another example, the second surface 72 of the body 65 may have only one notch 73 or 74 or no notches. In the case where the hub 26 provide only one notch 73, the portion of the second surface 72 opposite disposed from the notch 73 may be flat or coplanar with the second surface 72. This configuration may facilitate removal of the body 18 from the platform 22. For example, as the locking device 24 is rotated out of locking engagement with the platform 22, the protrusion 76 or 78 of the platform 94 may bias the second surface 72 of the hub 26 upward and away from the platform 22.

[0060] The hub 26 and the platform 22 are arranged to rotatably couple to lock the body 18 to the platform 22. The first and second wings 66 and 68 are deformable such that they may deflect from their original position when the wings 66 and 68 engage first and second shelves 80, 82 of the platform 22 as the locking device 24 moves from the unlocked configuration to the locked configuration. The detents 84, 86 formed in the second surface 72 of the hub 26 are configured to engage with the platform 22 in the locked configuration. Specifically, each detent 84, 86 is partially formed in one of the two wings 66, 68. It will be appreciated that the second shelf 82 is substantially similar to the first shelf 80 and the wing 68 is substantially similar to the wing 66, such that any details of the first shelf 80 and the first wing 66 discussed below apply equally to the second shelf 82 and the second wing 68, respectively. In the illustrated expandable device 10, the locking device 24 includes two wings 66 and 68 and the platform 22 includes two shelves 80 and 82 corresponding to the wings 66 and 68 of the locking member 24. However, in another example device, the locking device 24 may have one wing or more than two wings, and the platform 22 may have the same number of corresponding shelves. Likewise, the platform 22 includes two protrusions 76, 78 and the hub 26 includes two detents 84, 86 corresponding to the protrusions 76, 78. However, in another example device, the hub 26 may include one detent or more than two detents, and the platform may have the same number of corresponding protrusions. The hub 26 is preferably made of a durable plastic, such as polyethylene, or a harder plastic, such as polycarbonate, that may be formed by injection molding, thermoforming, or compression molding, but may instead be formed of any other suitable and durable material including thermoplastic polyurethane, metal, fiberglass, or any combination of these materials, or any equivalently functional materials suitable for its intended purpose.

[0061] As shown in Figs. 11-13, the hub 26 is coupled to the platform 22 when the locking device is in the locked configuration. The platform 22 includes an outer surface 87 and a collar 88 extending away from the surface 87. The collar 88 defines a cavity 90. The second shelf 82 oppositely disposed from the first shelf 80 is configured to slidably receive one of the wings 66 and 68 of the hub 26. The shelves 80 and 82 are configured to engage one of the wings 66 and 68 of the locking member 24 when the locking member 24 is in the locked configuration. A surface of each shelf 80 and 82 inhibits axial movement of the locking device 24 relative to the platform 22 when the locking device 24 is in the locked configuration. The first and second wings 66 and 68 move out of engagement with the shelves 80 and 82 when the hub 26 is rotated.

[0062] As illustrated in Figs. 19 through 21, the first exemplary platform 22 includes the first shelf 80 extending radially inwardly from the collar 88 and into a cavity 90 formed in the platform 22. At least a portion of the locking device 24 is adapted to be removably disposed in the cavity of the platform 22 for releasably coupling the body 18 to the platform 22. The cavity 90 is partially defined by a non-circular opening 92, as shown in Fig. 19, and is shaped to receive the first and second wings 66 and 68 of the hub 26. In particular, the opening 92 is defined by first and second opposing shelves 80, 82, and an interior wall 100 of the collar 88. The platform 22 also includes a base 94 that is recessed from the collar 88 and defines a lower boundary of the cavity 90 of the platform 22. The base 94 is connected to an inner wall 100 of the platform 22 such that the base 94 may be co-planar with the mounting surface 39 of the platform 22, as shown in Fig. 20. The base 94 also includes first and second protrusions 76, 78 extending axially into the cavity 90 and spaced radially inwardly relative to the shelves 80, 82, respectively. The base 94 is connected to the inner wall 100 at opposing ends, which are 90 degrees offset from the first and second shelves 80, 82. Above the opposing ends of the base 94, the collar 88 defines a radially recessed inner wall 100, providing a clearance for the hub 26. So configured, the radial wings 66, 68 of the hub 28 may slide into the opening 92 until the radial wings 66, 68 are beneath a reference plane on which the shelves 80, 82 are disposed. The base 94 is disconnected from the inner wall 100 directly below the first and second shelves 80, 82 such that the base 94 may flex downward relative to the shelves 80, 82 when the second surface 72 of the hub 26 engages the base 94.

[0063] As shown in Figs. 20 and 21, the first shelf 80 of the platform 22 includes a first surface 104 that faces the second end 42 of the body 18, and a second surface 108 that engages with one of the first and second wings 66 and 68 of the locking member 24 when the locking member 24 moves from the unlocked configuration to the locked configuration. The platform 22 is preferably made of a durable plastic, such as polyethylene, or a harder plastic, such as polycarbonate, that may be formed by injection molding, thermoforming, or compression molding, but may instead be formed of any other suitable and durable material including thermoplastic polyurethane, metal, fiberglass, or any combination of these materials, or any equivalently functional materials suitable for its intended purpose.

[0064] To couple the locking member 24 to the platform 22, the hub 26 is disposed through the opening 92 and into the cavity 90 of the platform 22 such that the locking member 24 is at least partially disposed below first and second shelves 80, 82. The locking member 24 is rotated

(e.g., 90 degrees) in either the clockwise or counterclockwise direction about the longitudinal axis A. As the locking member 24 is rotated, the first wing 66 of the hub 26 of the locking member 24 slides against the shelf 80 of the platform 22 until the protrusion 76 of the base 94 snaps into the detent 84 of the second surface 72 of the hub 26. Additionally, the hub 26 may deflect or displace the base 94 until the protrusion 76 and the detent 84 are engaged. The base 94 may be a resilient material such that the base 94 may deform (e.g., bend, flex) when engaged by the hub 26. In one example, the base 94 may bend or flex along a flexible hinge formed in the base 94 extending between opposing sides of the inner wall 100 (i.e., where the base 94 connects to the platform 22). It will be appreciated that the second shelf 82 is substantially similar to the first shelf 80, the second wing 68 is substantially similar to the first wing 66, the second detent 86 is substantially similar to the first detent 84, and the second protrusion 78 is substantially similar to the first protrusion 76, such that any details of the first shelf 80, first wing 66, first detent 84, and the first protrusion 76 discussed above apply equally to the second shelf 82, the second wing 68, the second detent 86, and the second protrusion 78, respectively.

[0065] The mating relationships between the button 14 and the connecting disk 28, the connecting disk 28 and the hub 26, and the hub 26 and the platform 22 may be configured to provide any number of different mating engagements. For example, the hub 26 may include one or more protrusions extending from its second surface 72 to couple to one or more detents formed in the base 94 of the platform 22. In another example, the second mating surface 60 of the connecting disk 28 may not extend through the aperture 58 formed in the second end 42 of the body 18, but instead, the first surface 70 of the hub 26 may include a portion that extends into the aperture 58 of the body 18 to couple with the second mating surface 60 of the connecting disk 22. Non-limiting examples of the configuration or mating relationship between the locking member 24 and the platform 22 and/or other components of the device 10 are disclosed in U.S. Application No. 15/864,402, filed January 8, 2018, and U.S. Application No. 15/864,509, filed January 8, 2018, the entire disclosures of which are incorporated herein by reference.

[0066] The expandable device 10 may be moved from the locked configuration to the unlocked configuration by overcoming the frictional forces between the mating surfaces of the locking device 24 and the platform 22. Generally speaking, a user of the expandable device 10 may rotate the locking device 24 from the locked configuration to the unlocked configuration by

collapsing the expandable device 10 such that the button 14 engages with the connecting disk 28 of the locking device 24, and then by grabbing or grasping the button 14 or body 18 and moving, e.g., rotating or twisting, the button 14 or body 18 a quarter turn (i.e., 90 degrees) in either the clockwise or counterclockwise direction about the longitudinal axis A. The button 14 engages with the locking device 24 to rotate the locking device 24 with the button 14 and body 18. In turn, the connecting disk 28 transfers the rotational motion from the button 14 to rotate the hub 26 of the locking device 24 out of engagement with the platform 22. Once the locking member 24 is in the unlocked configuration, the user may pull the body 18 away and out of the cavity 90 and through the opening 92 of the platform 22 to lock the body 17 to the platform 22.

[0067] The device 10 may be assembled by connecting the connecting disk 28 to the second end 42 of the body 18 by disposing the connecting disk 28 into the chamber 56 of the body 18. The second mating surface 60 is coupled to the first surface 70 of the hub 26 such that the hub 26 and the connecting disk 28 form a unitary locking device 24. The body 18 may be coupled to the platform 22 by disposing the hub 26 into the cavity 90 of the platform 22.

[0068] Figs. 22 and 23 illustrate a sixth exemplary device 210 constructed in accordance with the teachings of the present disclosure. The second exemplary device 210 is similar to the device 10 of Figs. 9-13. Thus, for ease of reference, and to the extent possible, the same or similar components of the second exemplary device 210 will retain the same reference numbers as outlined above with respect to the first exemplary device 10, although the reference numbers will be increased by 200. However, the second exemplary device 210 is different from the device 10 in the manner described below.

[0069] A button 214 of the second exemplary device 210 includes an engaging member 230 having a non-circular cross-sectional shape. The engaging member 230 includes a plurality of sides 231 configured to engage with a corresponding opening 248 or indentation formed in a first mating surface 238 of a locking device 224. As shown in Fig. 24, a connecting disk 228 of the locking device 224 includes the first mating surface 238 having a non-circular shape sized to receive the engaging member 230 of the button 214 when the device 210 is in a collapsed configuration. A body 218, a platform 222, and a hub 226 may be substantially similar to the body 18, platform 22, and hub 26 of the first exemplary device 10 previously described with reference to Figs. 9-21. The mating surface 238 of the locking device 224 and the engaging member 230 of the button 214 may be any number of shapes and structures that facilitate engagement between the locking device 224 and the button 214.

[0070] Fig. 25 illustrates a third exemplary device 410 constructed in accordance with the teachings of the present disclosure. The third exemplary device 410 of Fig. 25 is an example of how either the platform 22 of the first exemplary expandable device 10 or the platform 222 of the third exemplary expandable device 210 may be integrally formed or permanently attached to a case body 412 of a portable device 410. Thus, for ease of reference, and to the extent possible, the same or similar components of the third exemplary device 410 will retain the same reference numbers as outlined above with respect to the first exemplary device 10, although the reference numbers will be increased by 400. As shown in Fig. 25, the quick-release expandable device 410 is a protective case integrated with a platform 422 such that a body 418 of the expandable device 410 is removably coupled to a case body 412 by way of the integrated platform 422. The platform 422 may be embedded with an outer wall 416 of the case body 412, and may be formed with the case body 412 by injection molding, thermoforming, compression molding, or other techniques, such as additive manufacturing techniques. In another example, the case body 412 may be formed first and then the platform 422 may be permanently secured to the case body 412 such that the case body 412 and the platform 422 are inseparable. In some versions, the platform is formed integral with the case body as opposed to a separate component attached to the case body.

[0071] The quick-release expandable devices 10, 210, 410 for a portable device, such as a portable media player, constructed in accordance with the present disclosure provide a platform 22, 222, 422 that attaches directly to a portable device or to a protective case of the portable device. The platform 22, 222, 422 permits the body 18, 218, 418 to easily couple to and remove from the platform 22, 222, 422 and, if desired, replaced with a different body 18, 218, 418. The body 18, 218, 418 of the device 10, 210, 410 is coupled to the locking device 24, 224, 424 (shown in dashed lines in Fig. 25) that is removably coupled to the platform 22, 222, 422. Each of the platform 22, 222, 422, locking device 24, 224, 424 and button 14, 214, 414 may be designed in a variety of shapes and sizes to facilitate slidably locking and slidably releasing the body 18, 218, 418 to the platform 22, 222, 422.

[0072] The figures and description provided herein depict and describe preferred examples of an expandable device for purposes of illustration only. One skilled in the art will readily recognize from the foregoing discussion that alternative examples of the components illustrated herein may be employed without departing from the principles described herein. Thus, upon reading this disclosure, those of skill in the art will appreciate still additional alternative structural

and functional designs for expandable accessories. Thus, while particular examples and applications have been illustrated and described, it is to be understood that the disclosed examples are not limited to the precise construction and components disclosed herein. Various modifications, changes and variations, which will be apparent to those skilled in the art, may be made in the arrangement, operation and details of the methods and components disclosed herein without departing from the spirit and scope defined in the appended claims.

What is Claimed is:

1. An expandable device for a portable electronic device, comprising:
 - a body including a first end, a second end, and a longitudinal axis, the body movable between an expanded configuration and a collapsed configuration;
 - a button coupled to the first end of the body;
 - an aperture extending through the button;
 - a sound generating member having an edge disposed adjacent to the aperture;
 - a base coupled to the second end of the body;wherein the body, button, and base define an interior having a first volume with the body in the expanded configuration and a second, smaller volume with the body in the collapsed configuration, and moving the body from the expanded configuration to the collapsed configuration causes air to be expelled through the aperture in the button past the edge of the sound generating member to thereby create sound.
2. The expandable device of claim 1, wherein the sound generating member comprises a reed.
3. The expandable device of claim 2, wherein the reed is received within a housing mounted to the button.
4. The expandable device of claim 3, wherein the housing extends outwardly away from the button.
5. The expandable device of claim 1, wherein the sound generating member comprises an angled wall portion and the edge comprises a splitting edge.
6. The expandable device of any one of the preceding claims, wherein the button comprises a housing having an outer wall and a sidewall extending downwardly from edges of the outer wall.
7. The expandable device of any one of the preceding claims, wherein at least one of the body or button comprises a narrowing throat disposed adjacent to the aperture configured to direct expelled air to the edge of the sound generating member.

8. The expandable device of claim 7, wherein at least one of the body or button comprises a ramp directing air into the narrowing throat.

9. The expandable device of any one of the preceding claims, wherein at least one of the body or button further comprises one or more walls defining a sound chamber disposed adjacent to the aperture and in fluid communication therewith.

10. The expandable device of claim 9, wherein the button further comprises a plurality of openings extending therethrough into the sound chamber, the openings being selectively coverable by a user to change a pitch of the sound created by the air dispelled through the aperture.

11. The expandable device of any one of the preceding claims, wherein the body has a circular or rectangular cross-section.

12. The expandable device of any one of the preceding claims, wherein the aperture comprises a plurality of apertures extending through the button, and the sound generating member comprises a plurality of sound generating members, each having an edge disposed adjacent to one of the plurality of apertures.

13. The expandable device of claim 12, wherein each of the sound generating members is configured to produce sounds with different pitches.

14. The expandable device of any one of the preceding claims, further comprising:

 a platform including an outer surface and a collar extending away from the outer surface, the collar defining a cavity; and

 a locking device carried by the second end of the body, at least a portion of the locking device adapted to be removably disposed in the cavity of the platform for releasably coupling the body to the platform.

15. A method of operating an expandable device for a portable electronic device, the method comprising:

collapsing the expandable device from an expanded configuration to a collapsed configuration, the expandable device including a body having a first end and a second end, a button coupled to the first end of the body, and a base coupled to the second end of the body;

expelling air through an aperture that extends through the button as the expandable device is collapsed; and

creating sound with a sound generating member having an edge disposed adjacent to the aperture, the expelled air being driven past the edge.

16. The method of claim 15, wherein creating sound with the sound generating member comprises creating sound with a reed or an angled wall portion.

17. The method of claim 15 or 16, wherein expelling air through the aperture further comprises driving air through a narrowing throat of at least one of the body or button, the narrowing throat disposed adjacent to the aperture and configured to direct expelled air to the edge of the sound generating member.

18. The method of any one of claims 15 to 17, further comprising controlling a pitch of the sound by selectively covering one or more of a plurality of openings extending through the button to a sound chamber disposed adjacent to the aperture and in fluid communication therewith.

19. The method of any one of claims 15 to 18, wherein expelling air through the aperture comprises selectively expelling air through one or more of a plurality of apertures, and creating sound with the sound generating member comprises creating sound with sound generating members disposed adjacent to each of the plurality of apertures.

20. The method of any one of claims 15 to 19, further comprising:

rotatably coupling the body to a platform via a locking device disposed between the body and the platform; and

removing the body from the platform.

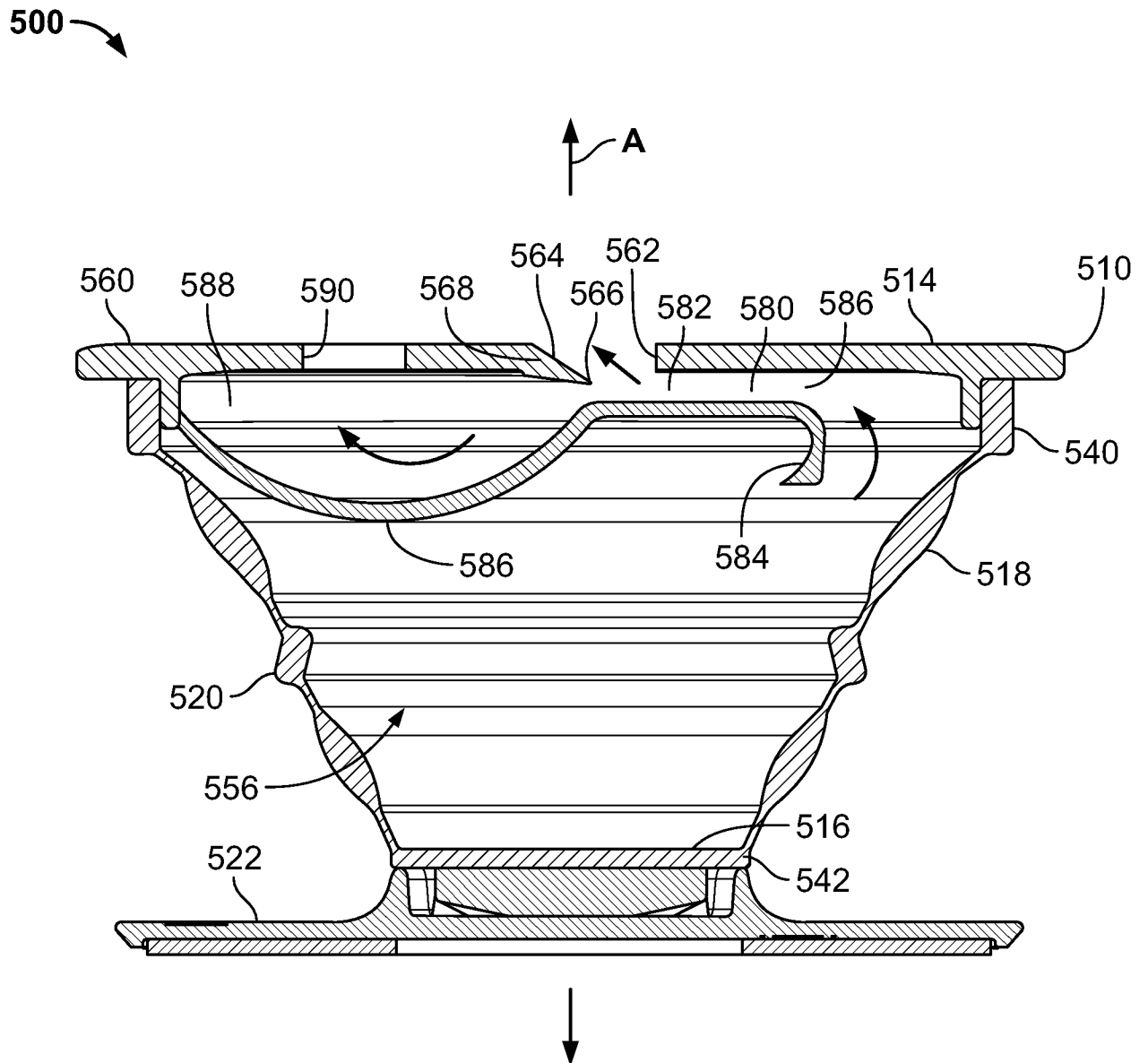
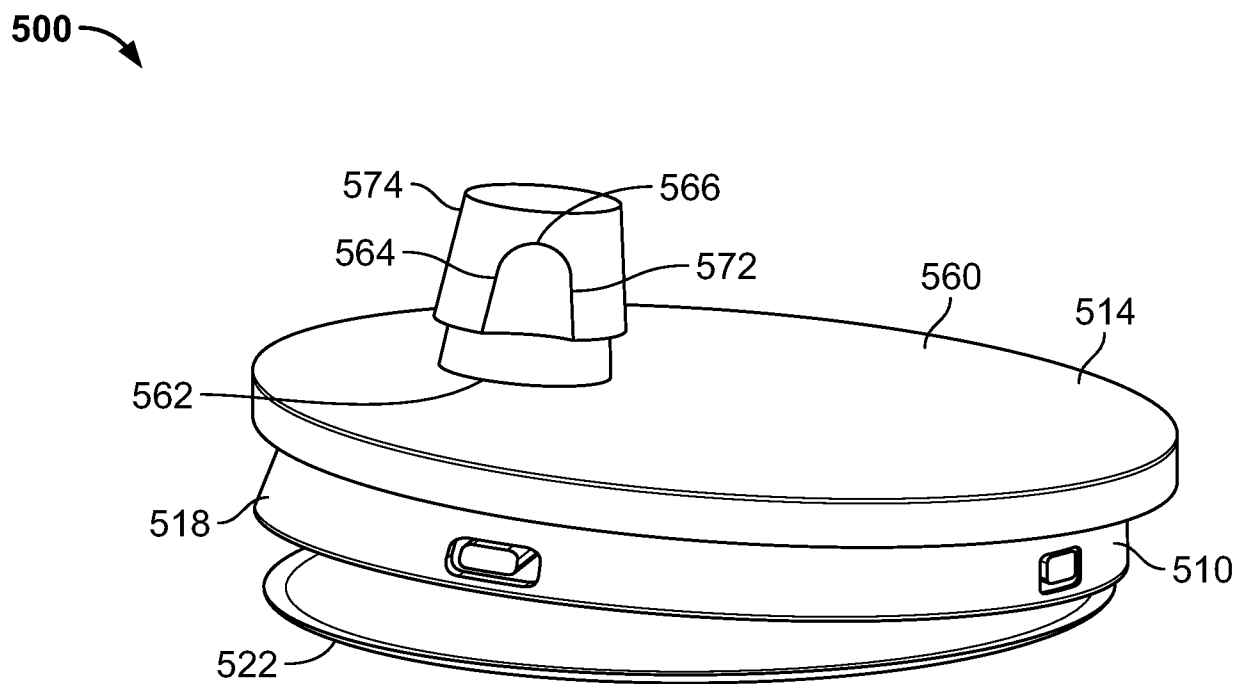
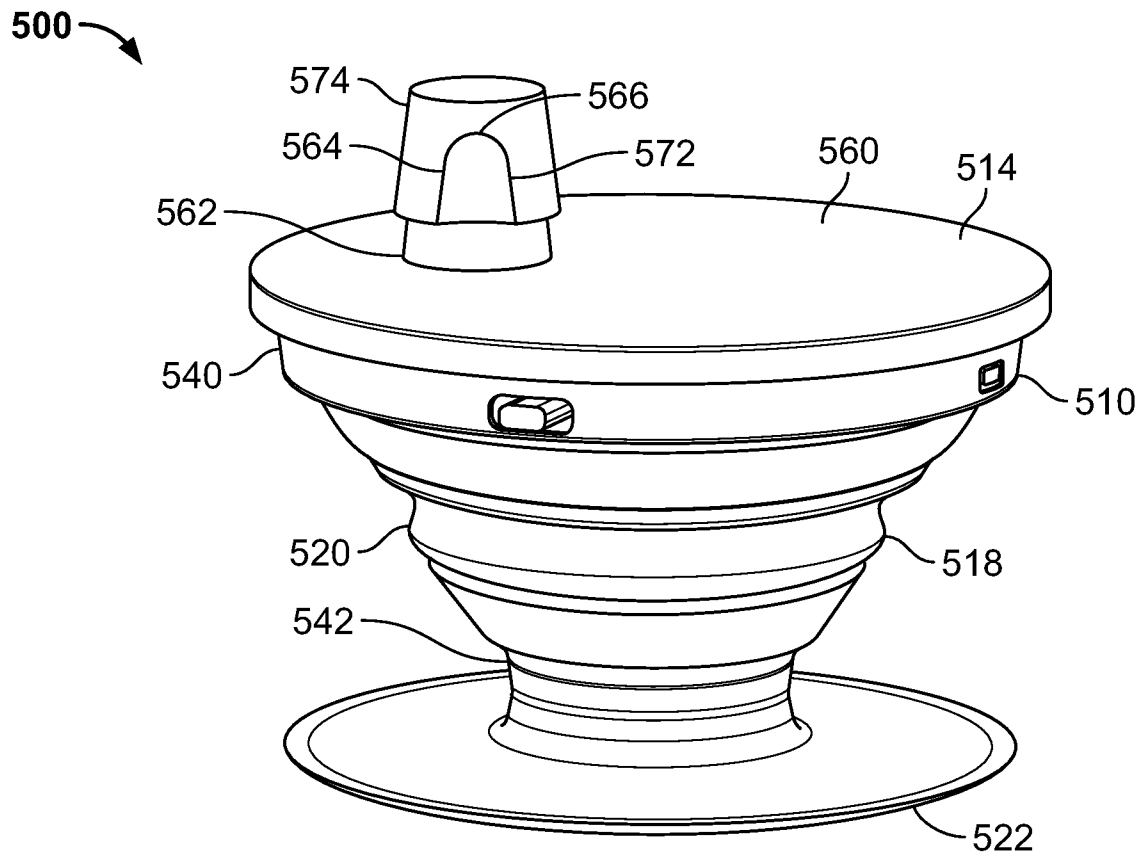


FIG. 1



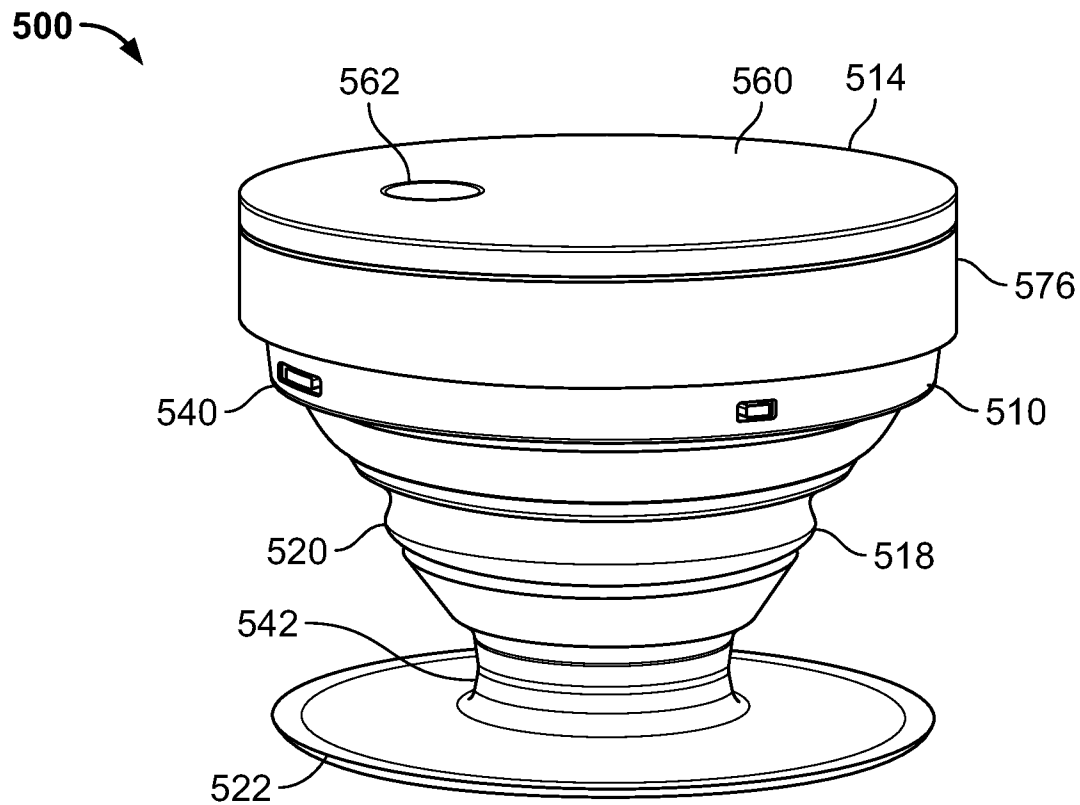


FIG. 4

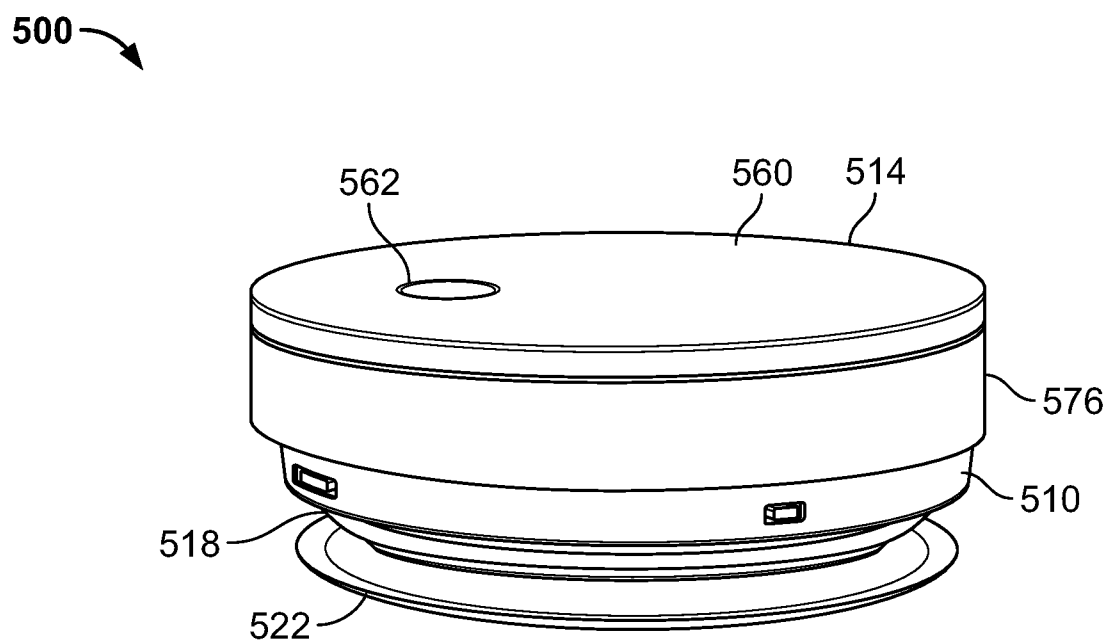


FIG. 5

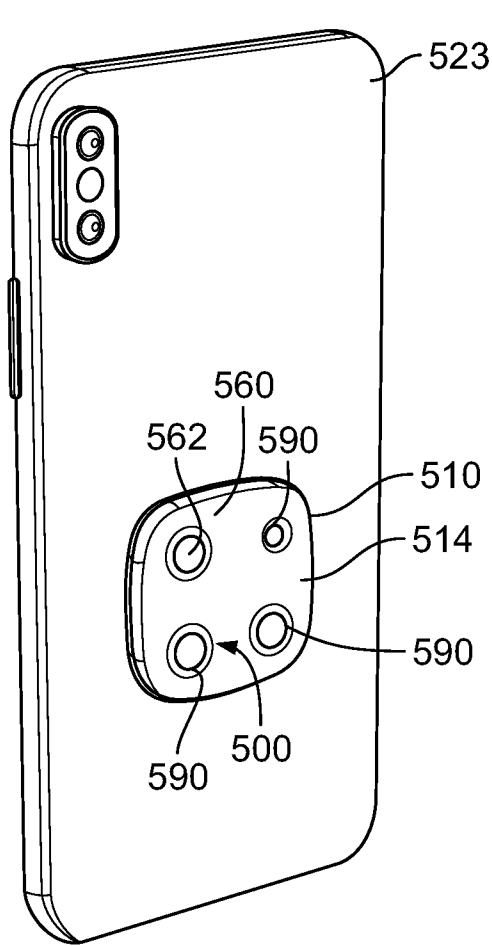


FIG. 6

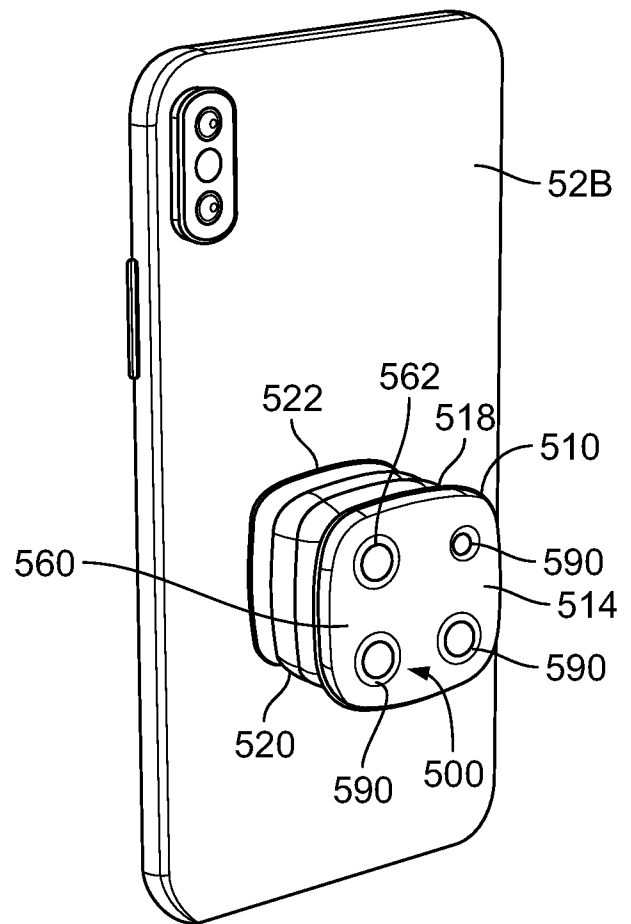


FIG. 7

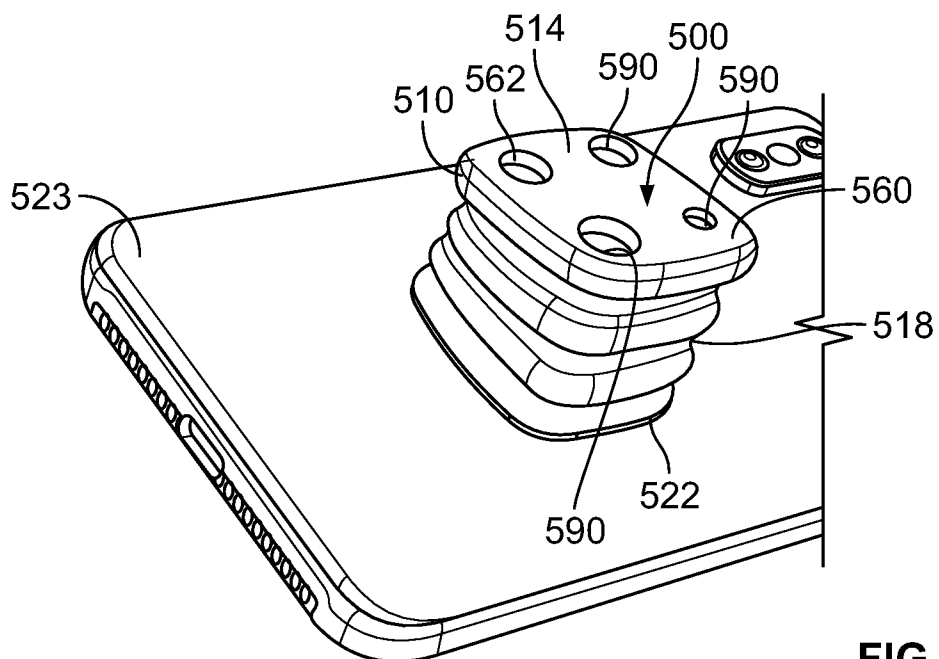


FIG. 8

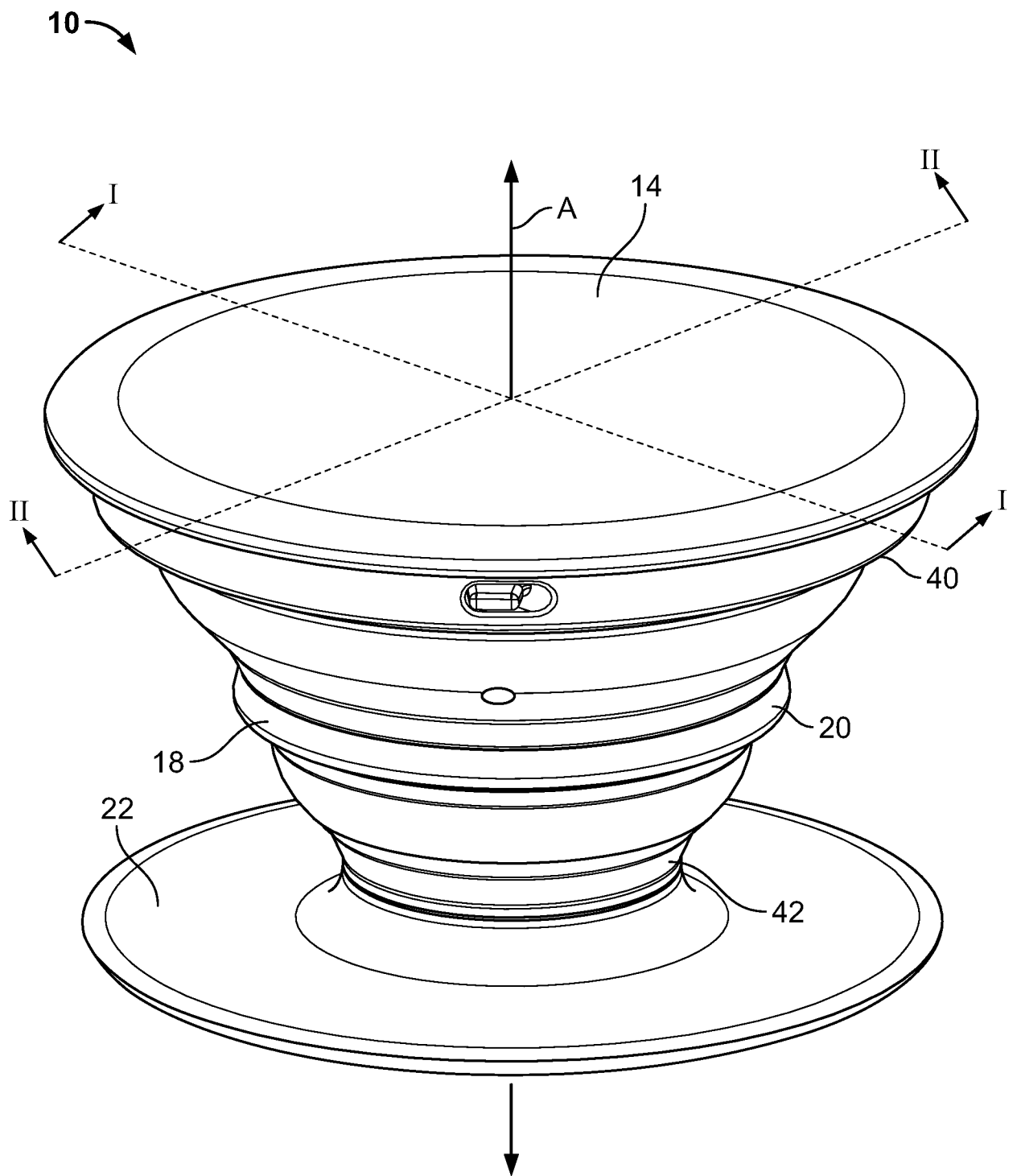


FIG. 9

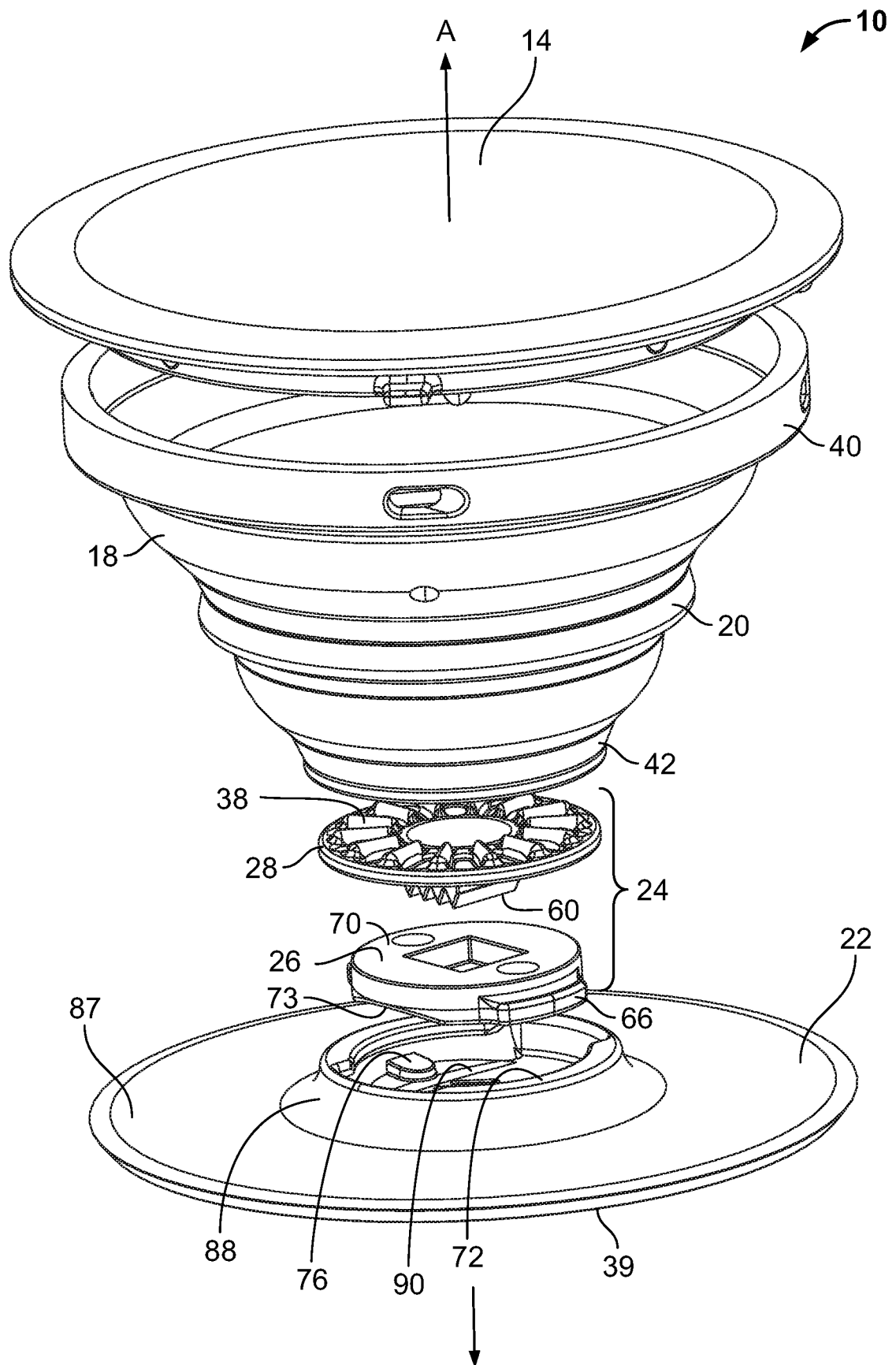


FIG. 10

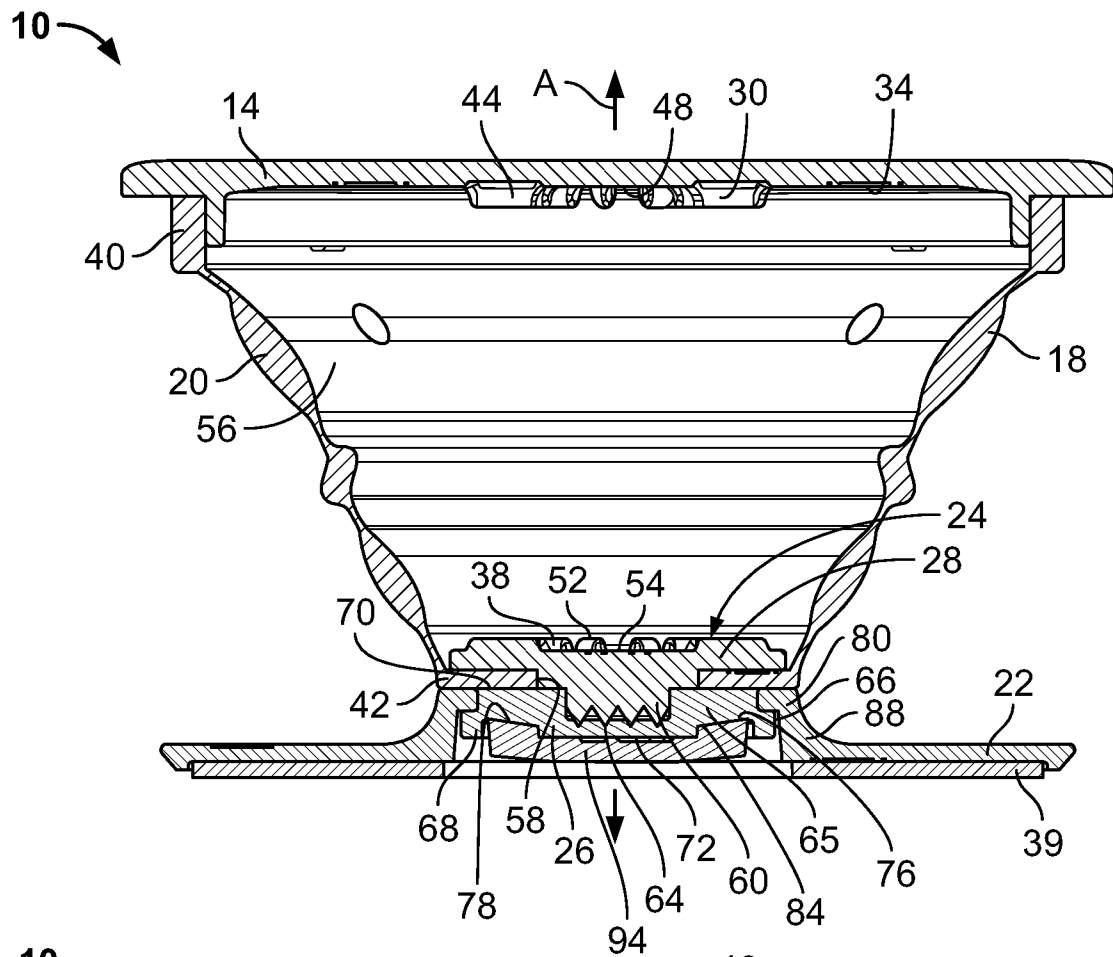


FIG. 11

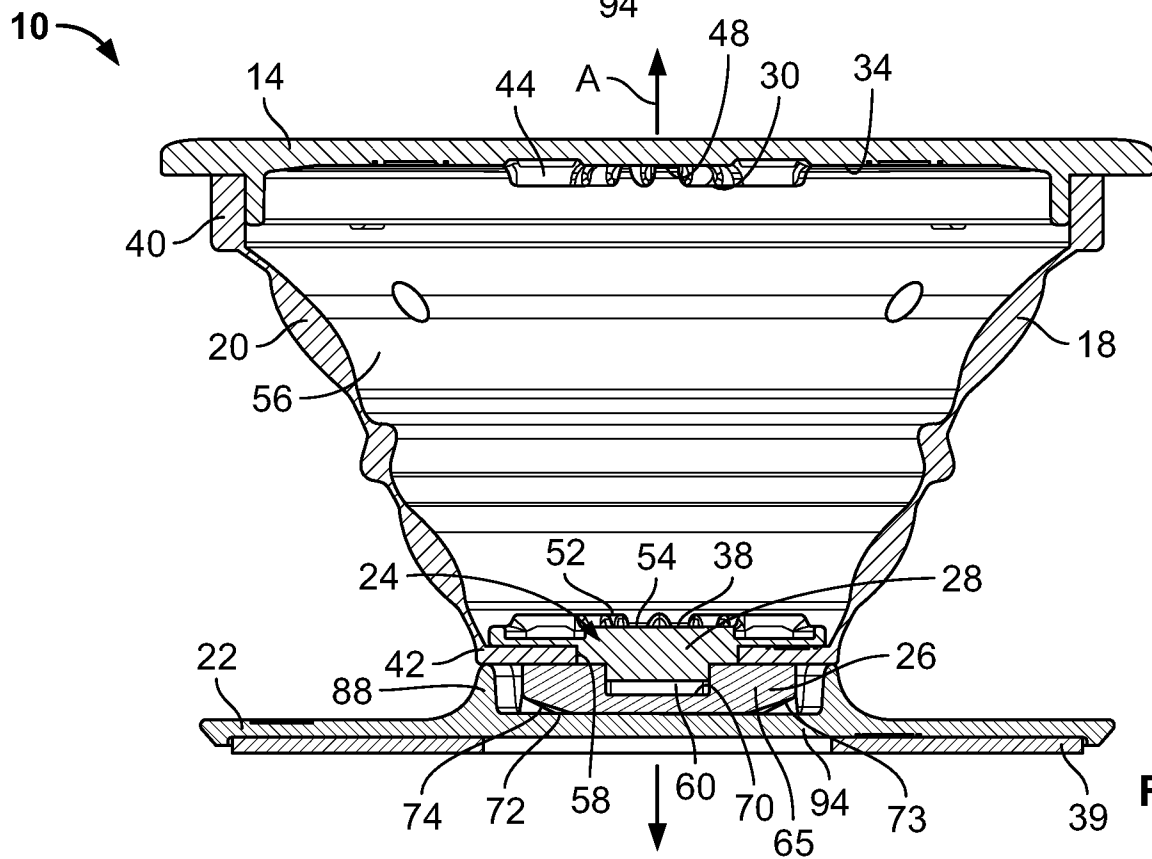


FIG. 12

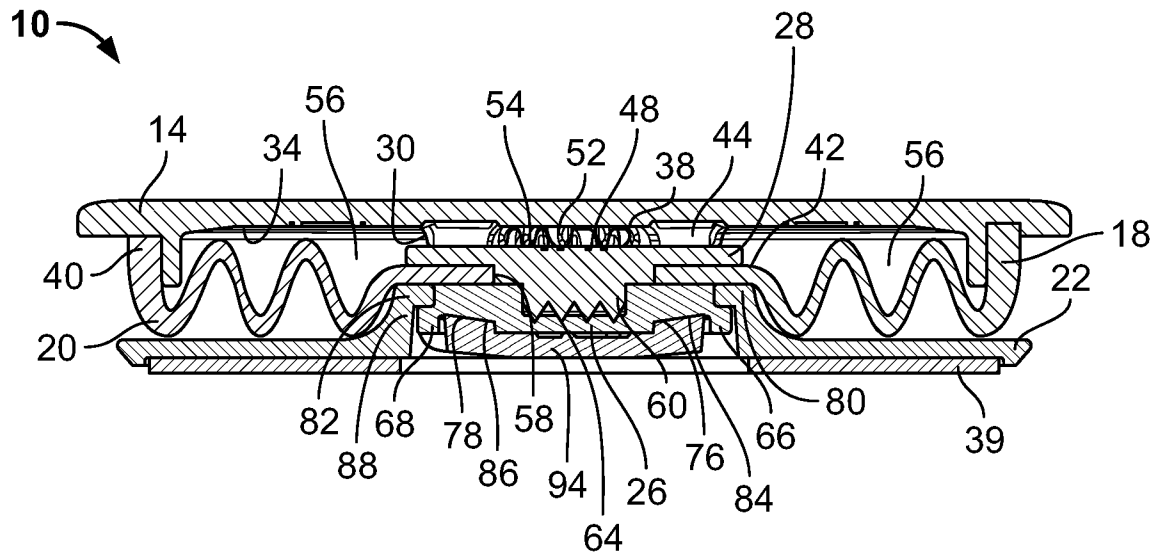


FIG. 13

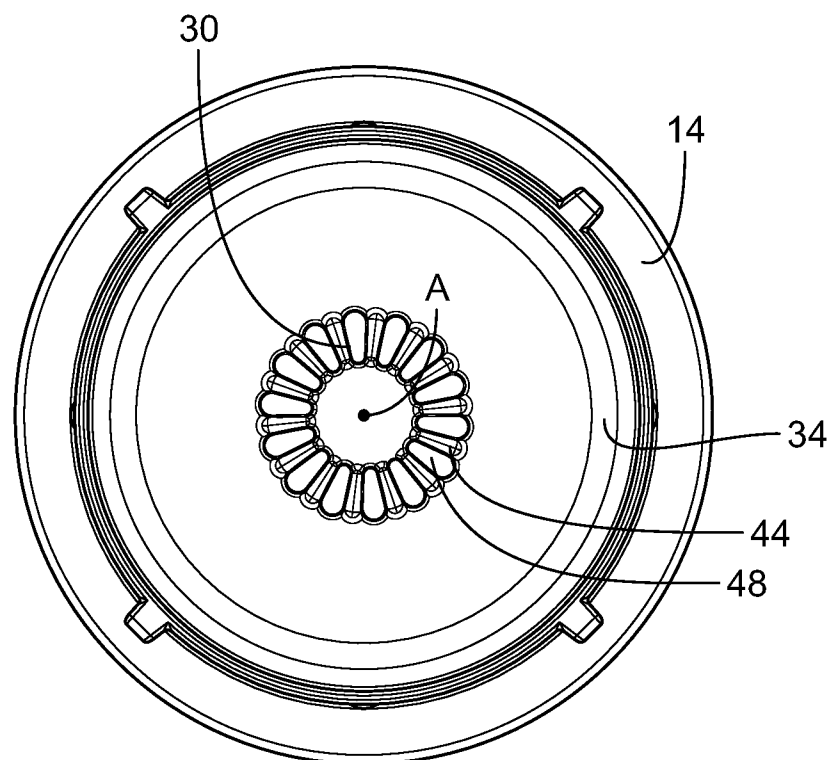


FIG. 14

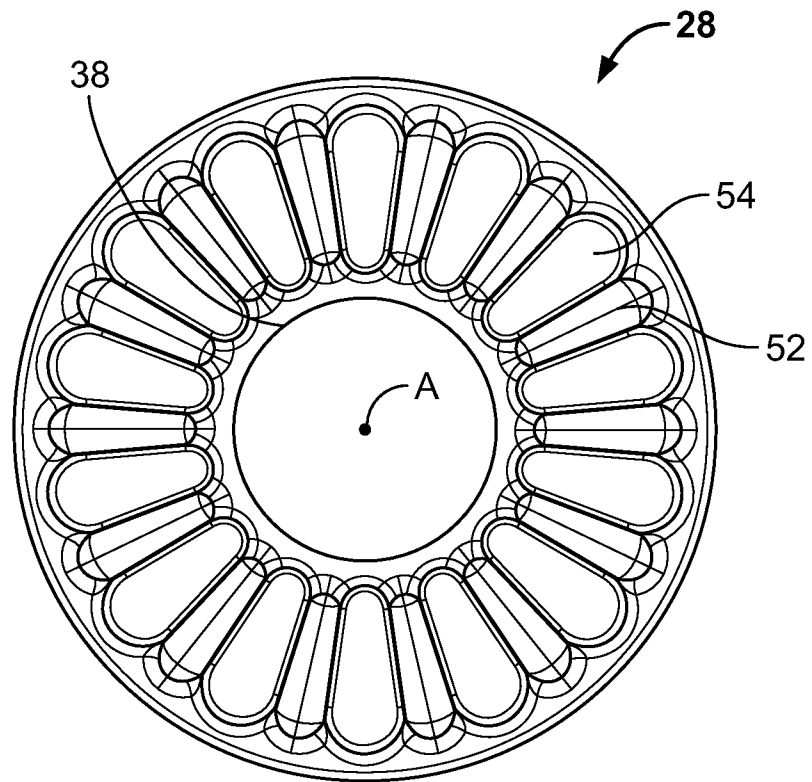


FIG. 15

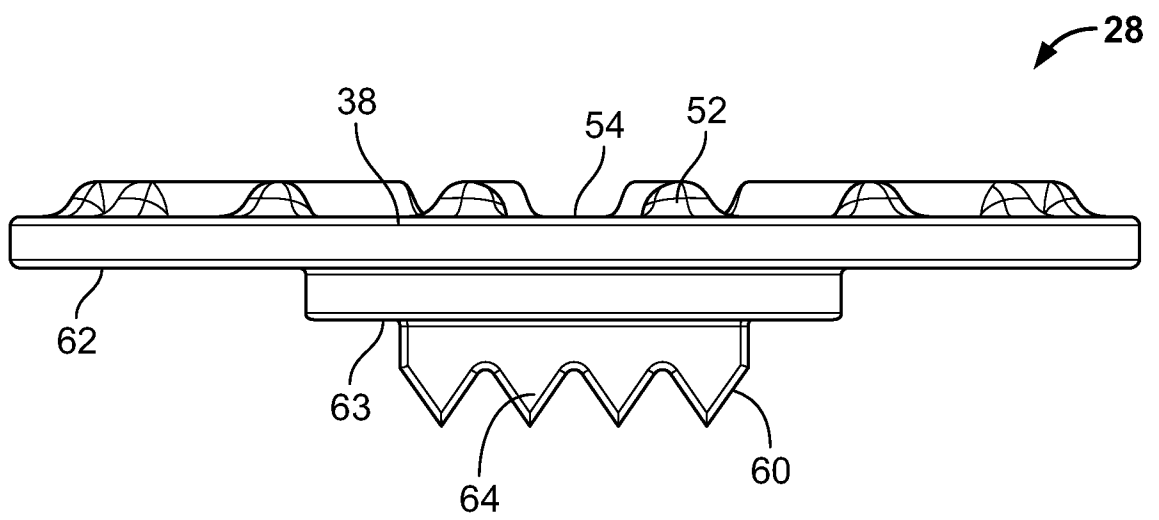


FIG. 16

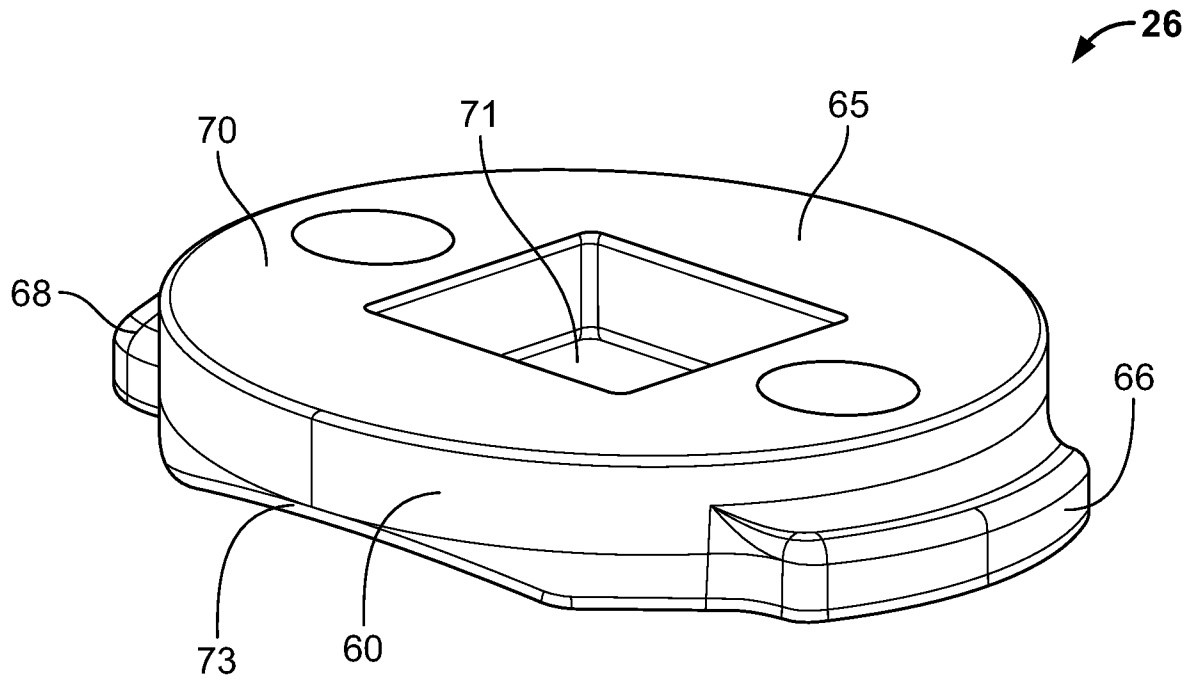


FIG. 17

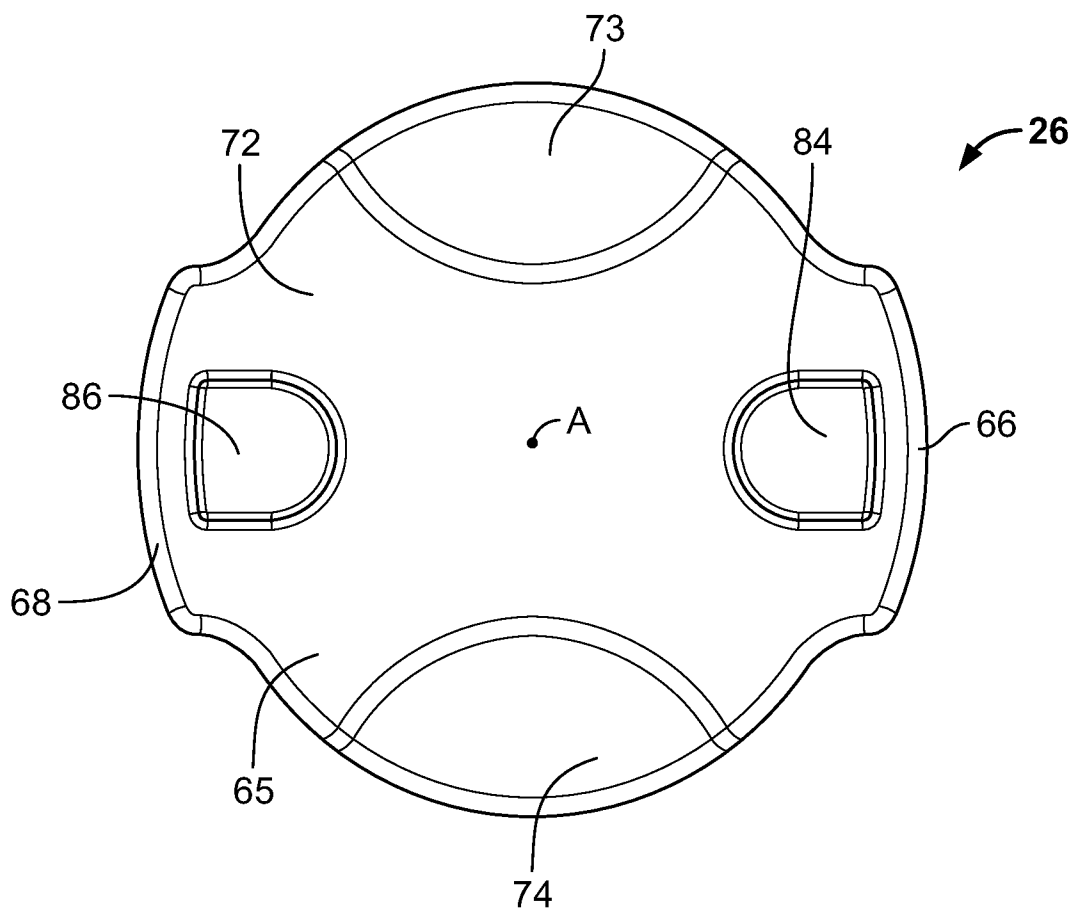


FIG. 18

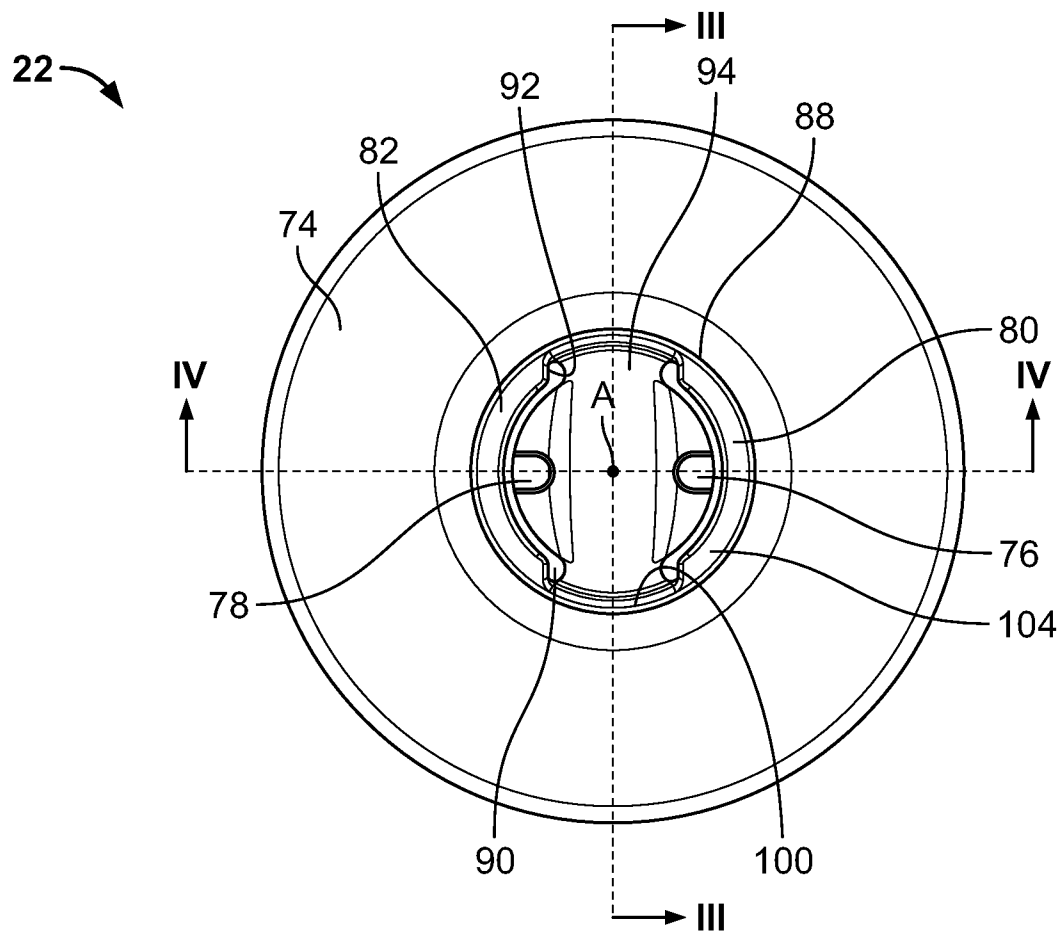


FIG. 19

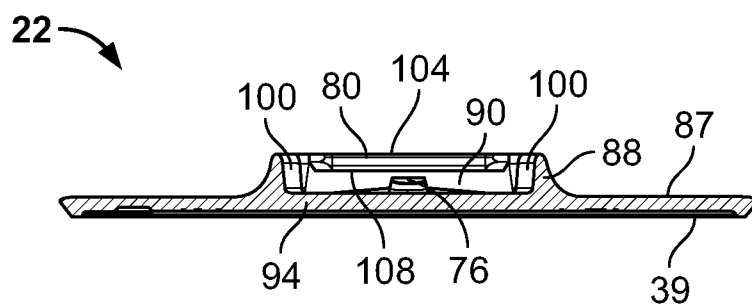


FIG. 20

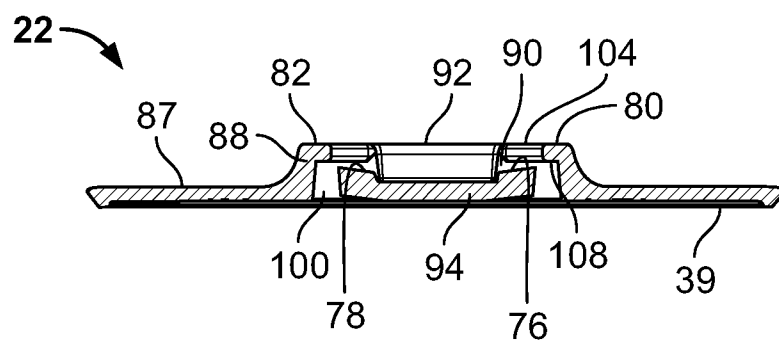


FIG. 21

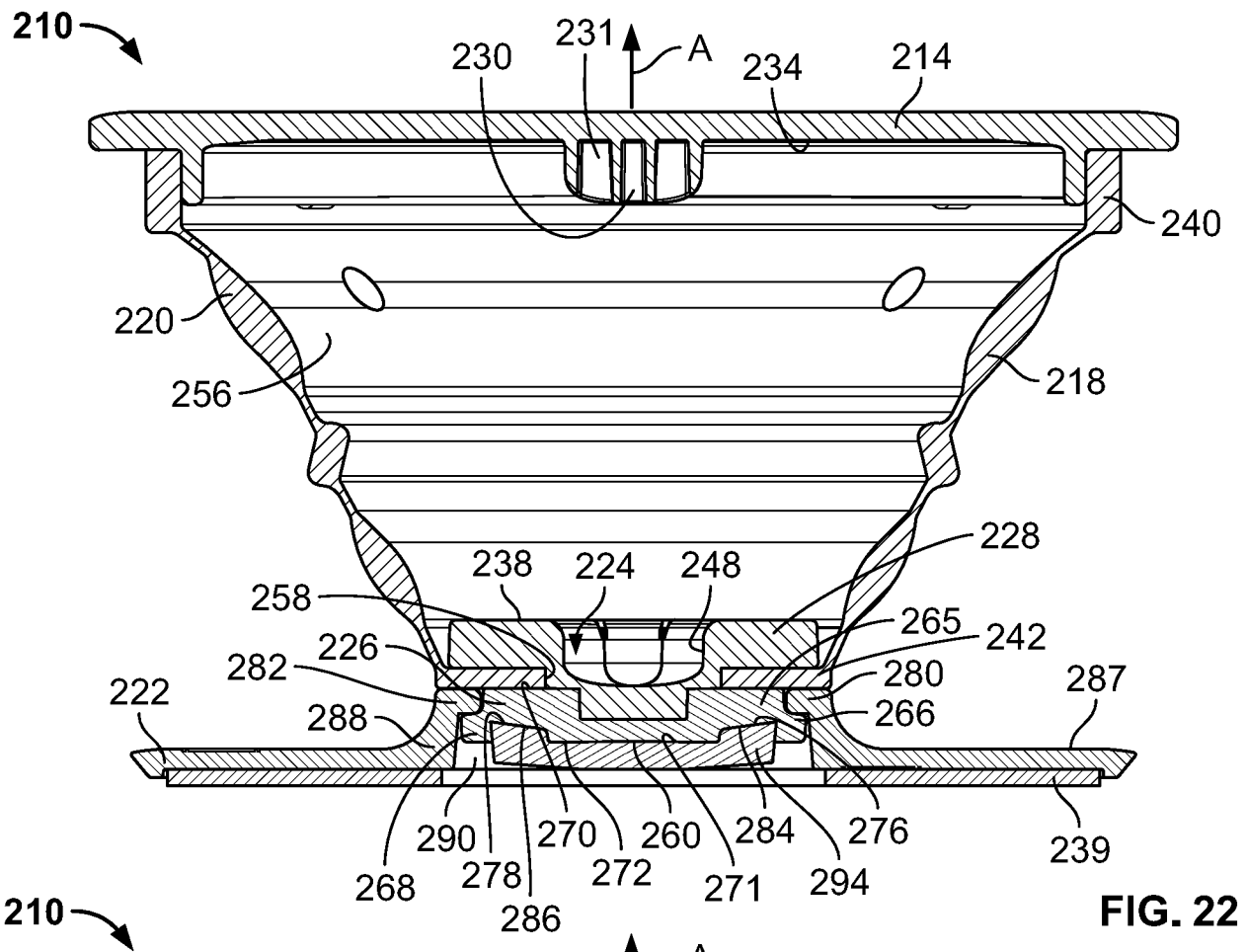


FIG. 22

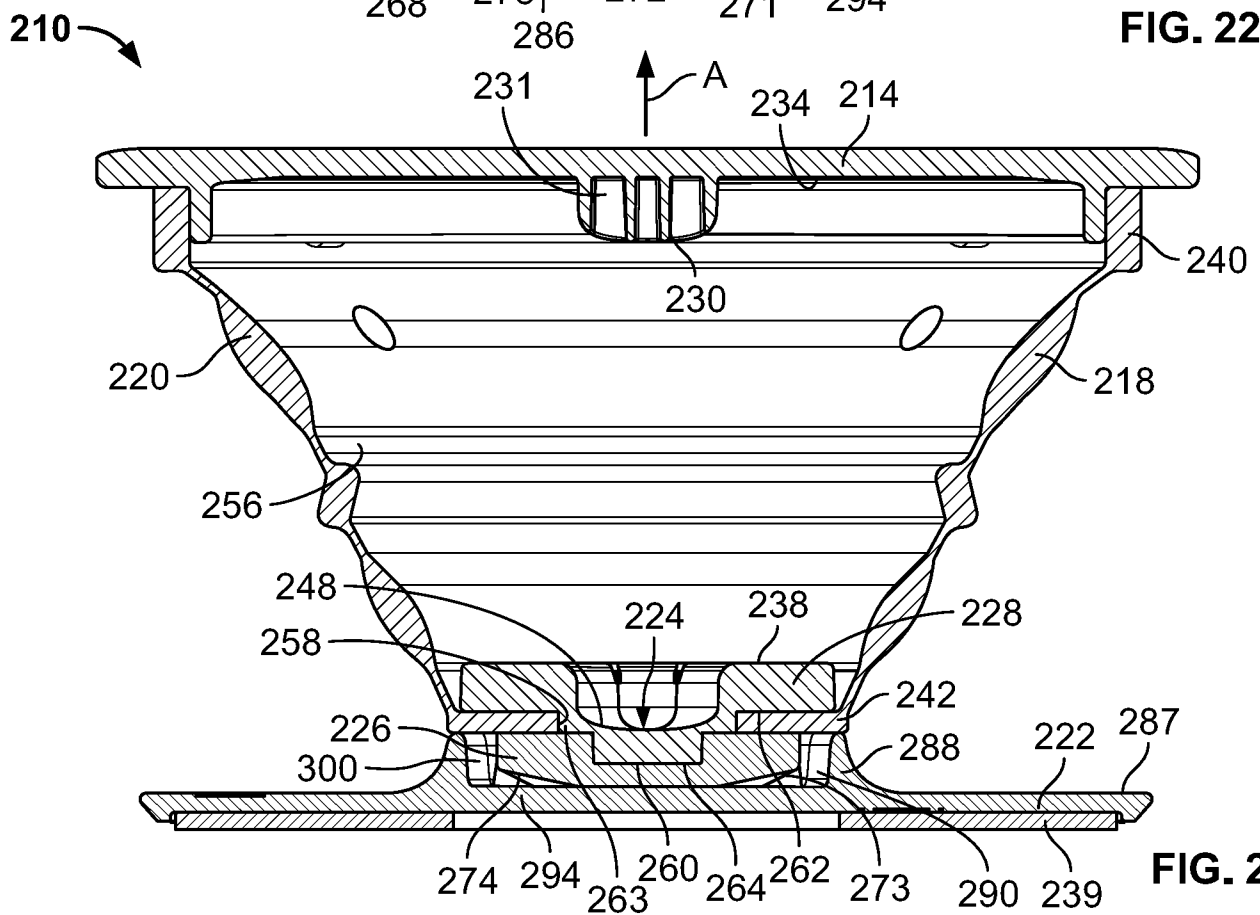


FIG. 23

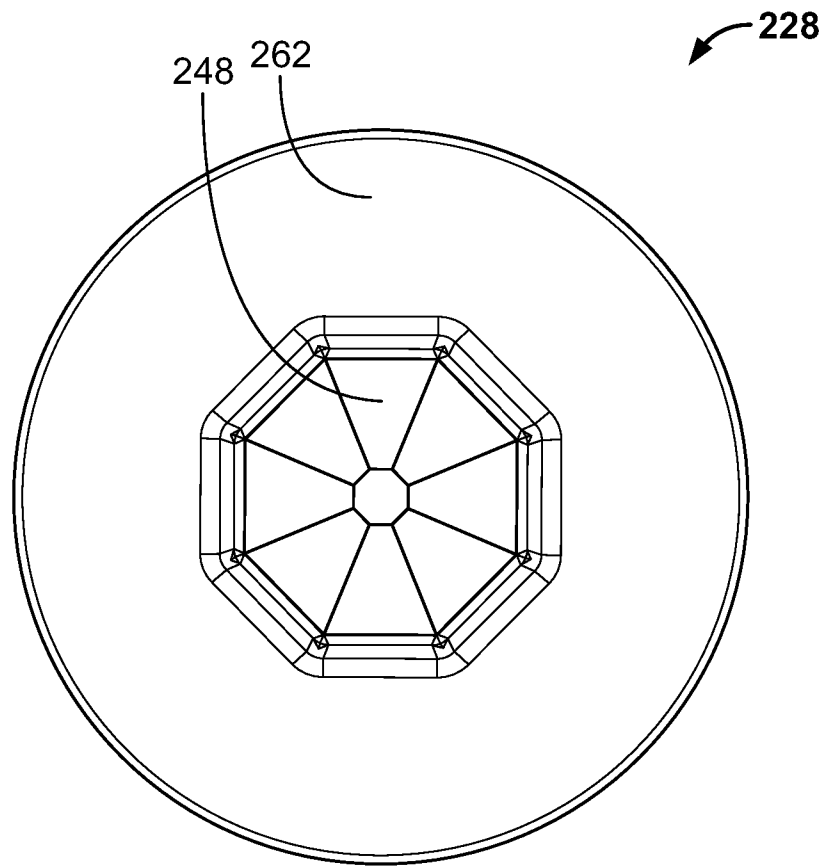


FIG. 24

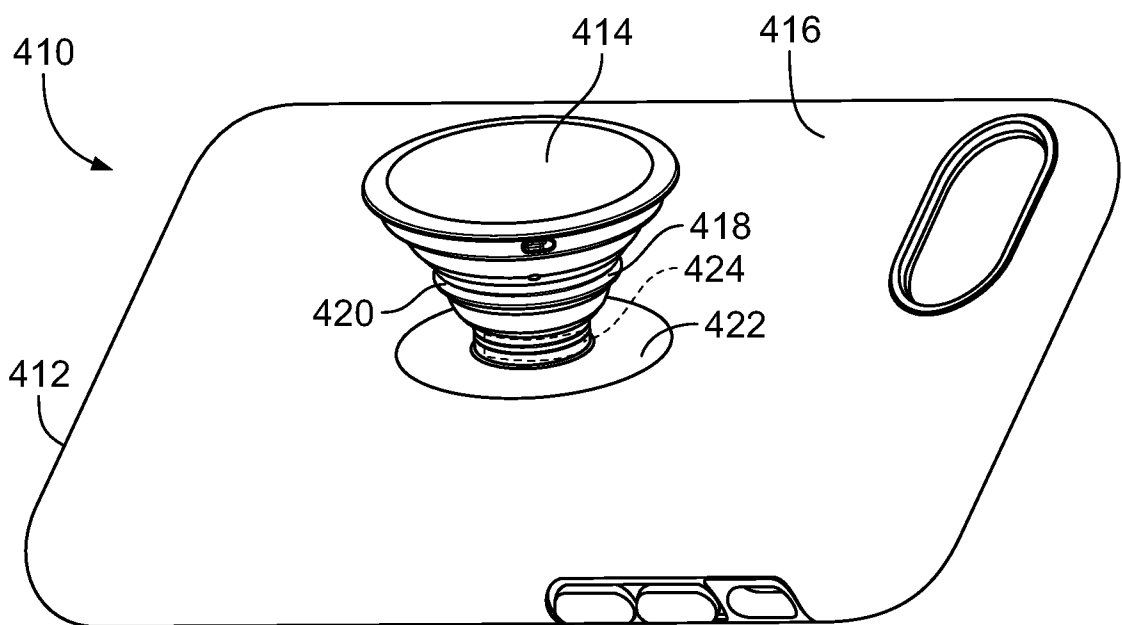


FIG. 25

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2019/038263

A. CLASSIFICATION OF SUBJECT MATTER
INV. A45F5/10 A63H5/00 F16M1/04 H04B1/3877 A45C11/00
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A45C A45F A01M A63H F16M H04B H04M F16P

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 1 898 773 A (GRUBMAN LEO J) 21 February 1933 (1933-02-21)	1-13, 15-19
Y	page 2, line 69 - page 4, line 93; figures 1-5	14,20
Y	----- EP 2 760 139 A1 (JANG DAEGYU [KR]) 30 July 2014 (2014-07-30) paragraph [0008] - paragraph [0051]; figures 1-9	14,20
X,P	----- WO 2019/094067 A1 (POPSOCKETS LLC [US]) 16 May 2019 (2019-05-16) paragraph [0008] - paragraph [0068]; figures 1-24	1,11,14, 15,20



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

18 September 2019

Date of mailing of the international search report

26/09/2019

Name and mailing address of the ISA/

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Fax: (+31-70) 340-3016

Authorized officer

Ehrsam, Sabine

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2019/038263

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