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(54) **PILL DISPENSER**

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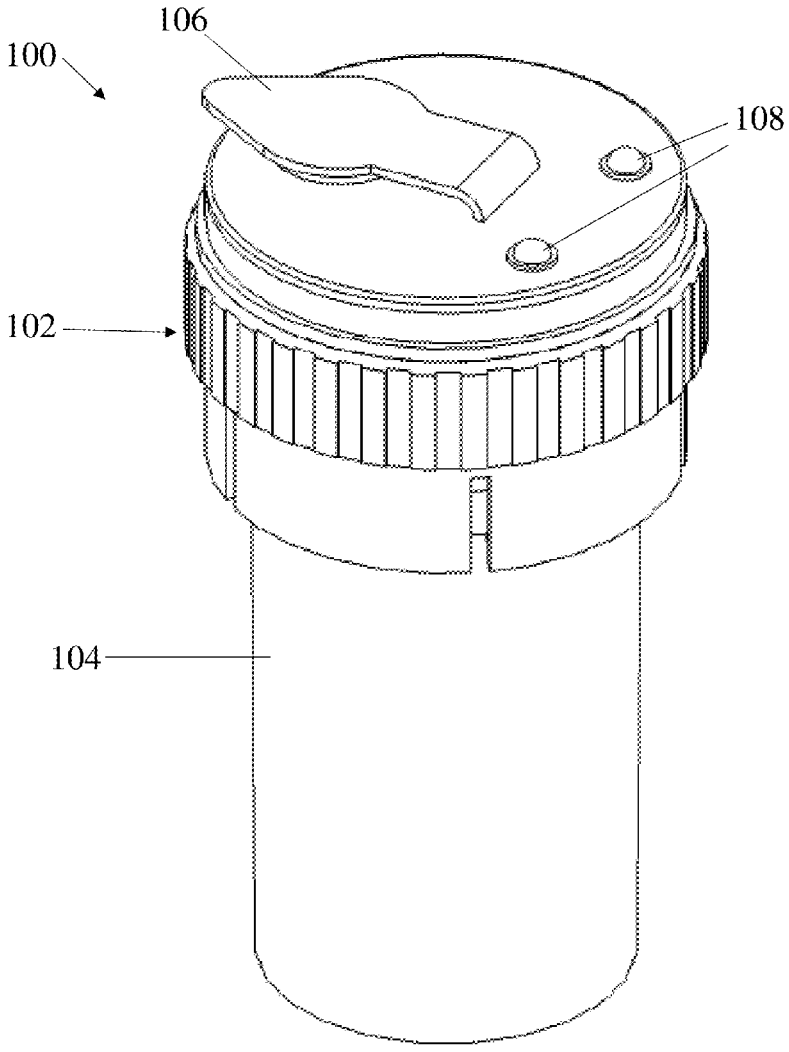
(57) **ABSTRACT**

A pill container and dispenser includes pill dispenser cap having a rotatable carousel with a pill-receiving chamber. The carousel is rotatable between a position in which the chamber receives pills from a storage component of the pill dispenser, and a position in which the pill can be dispensed from the chamber to a user. The pill dispenser includes systems for detecting the dispensing of the pill, and systems for recording and/or reporting pill dispensing events to a mobile device or remote server to allow compliance tacking. Some embodiments of the pill dispenser require a removal tool to remove a cap assembly from the storage compartment. Some embodiments including a locking ring that prevents the removal tool from removing the cap assembly. The locking ring must be damaged in some embodiments to remove the locking ring from the container.



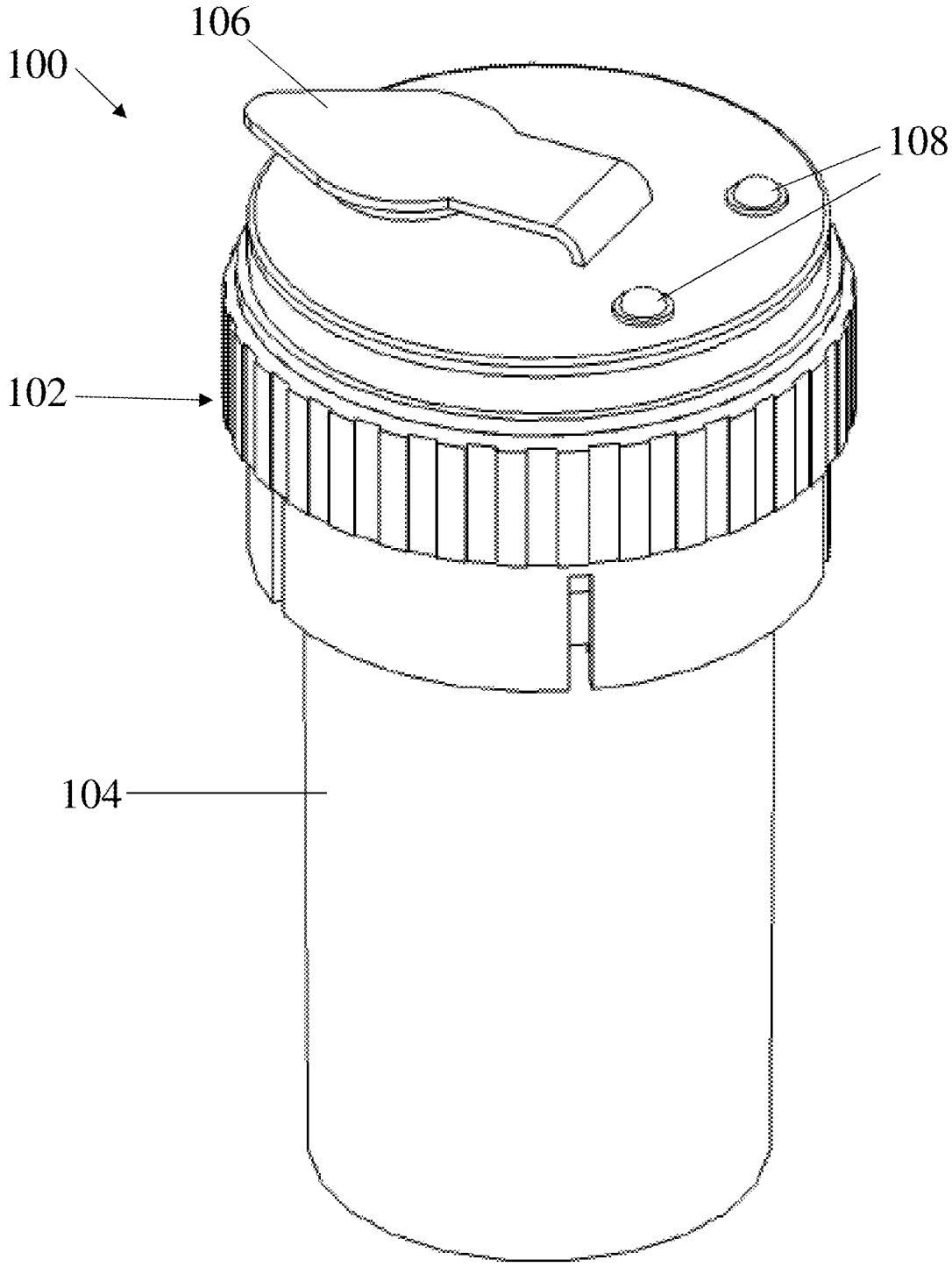


Fig. 1

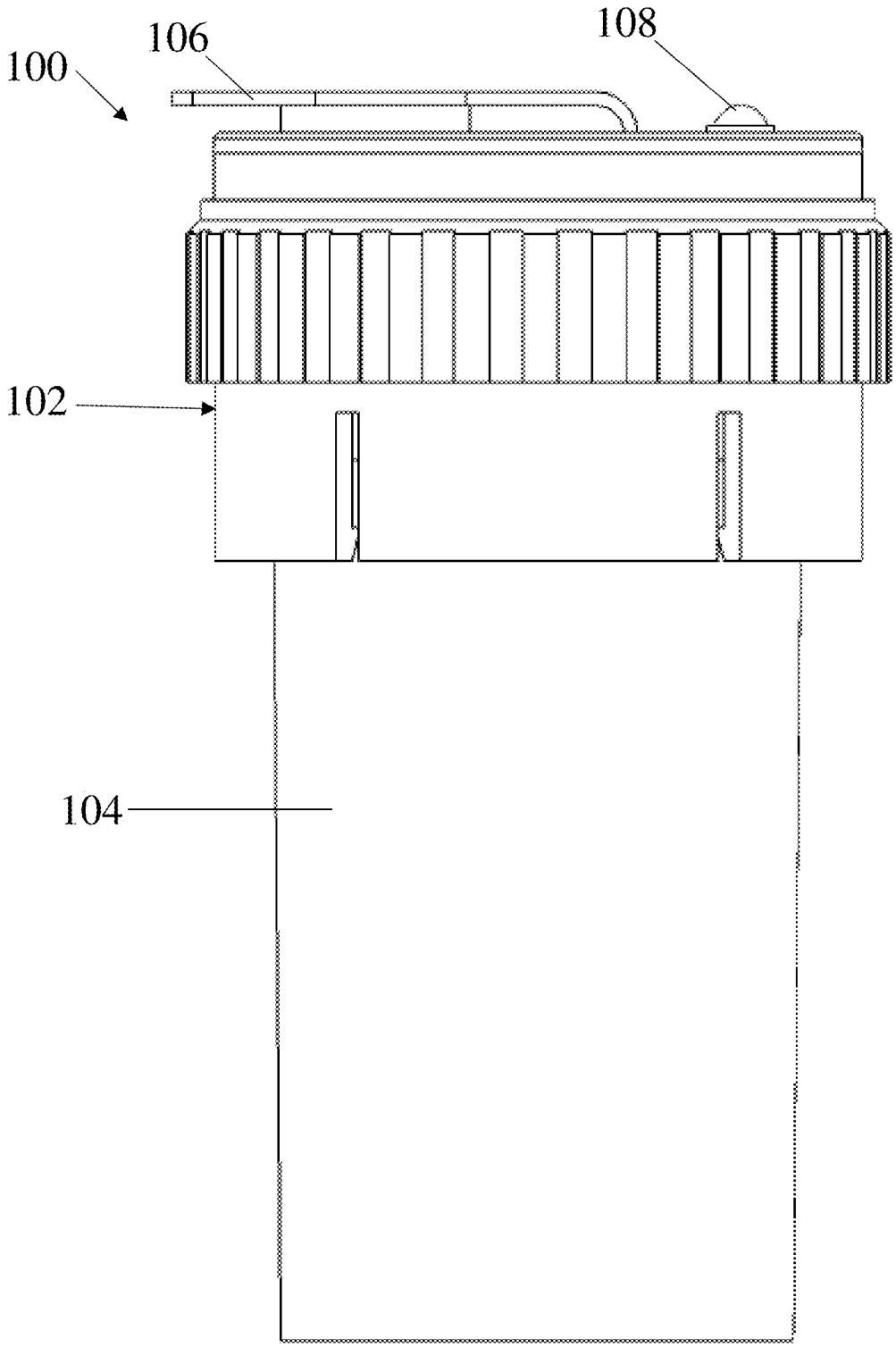


Fig. 2

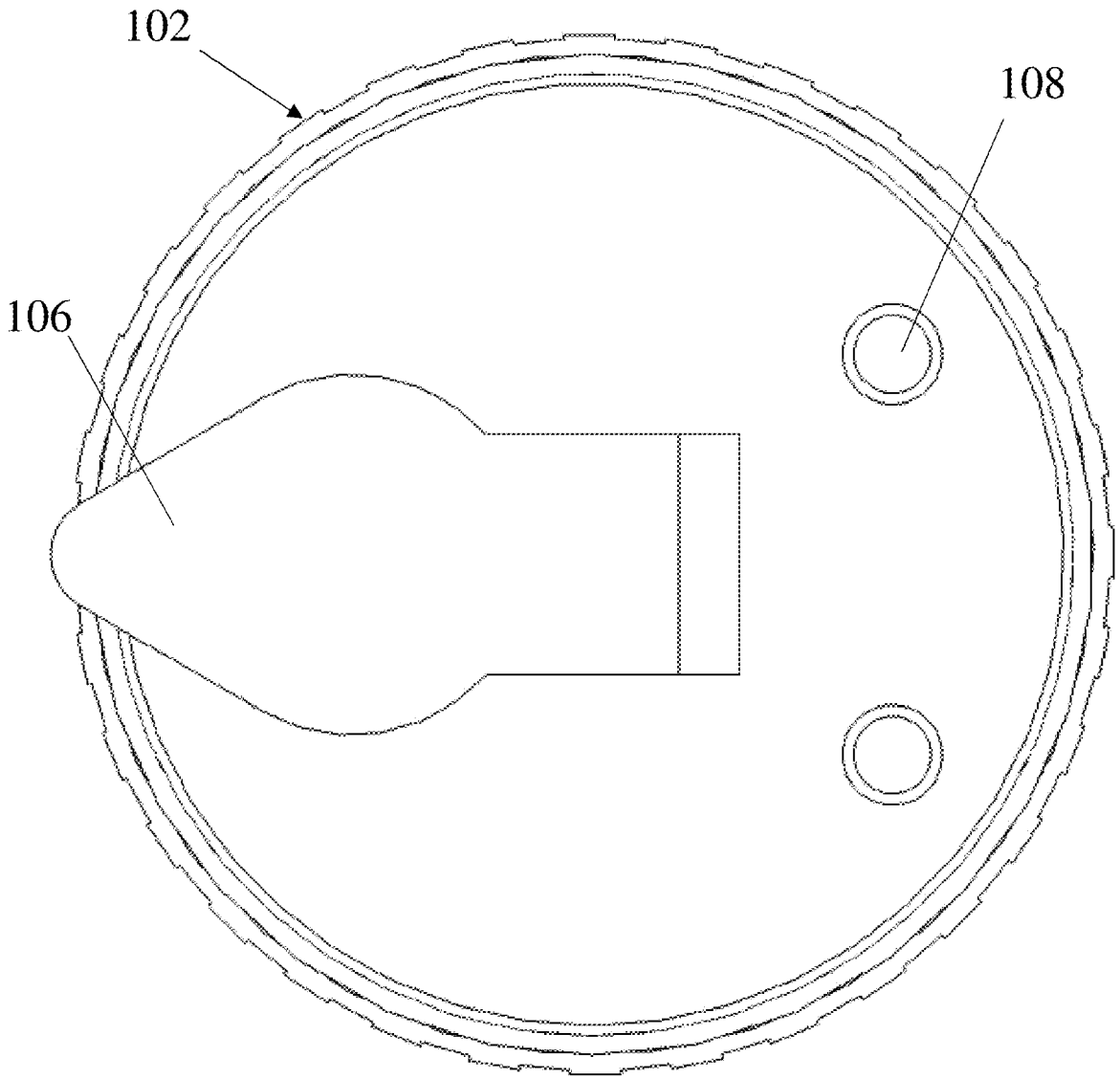


Fig. 3

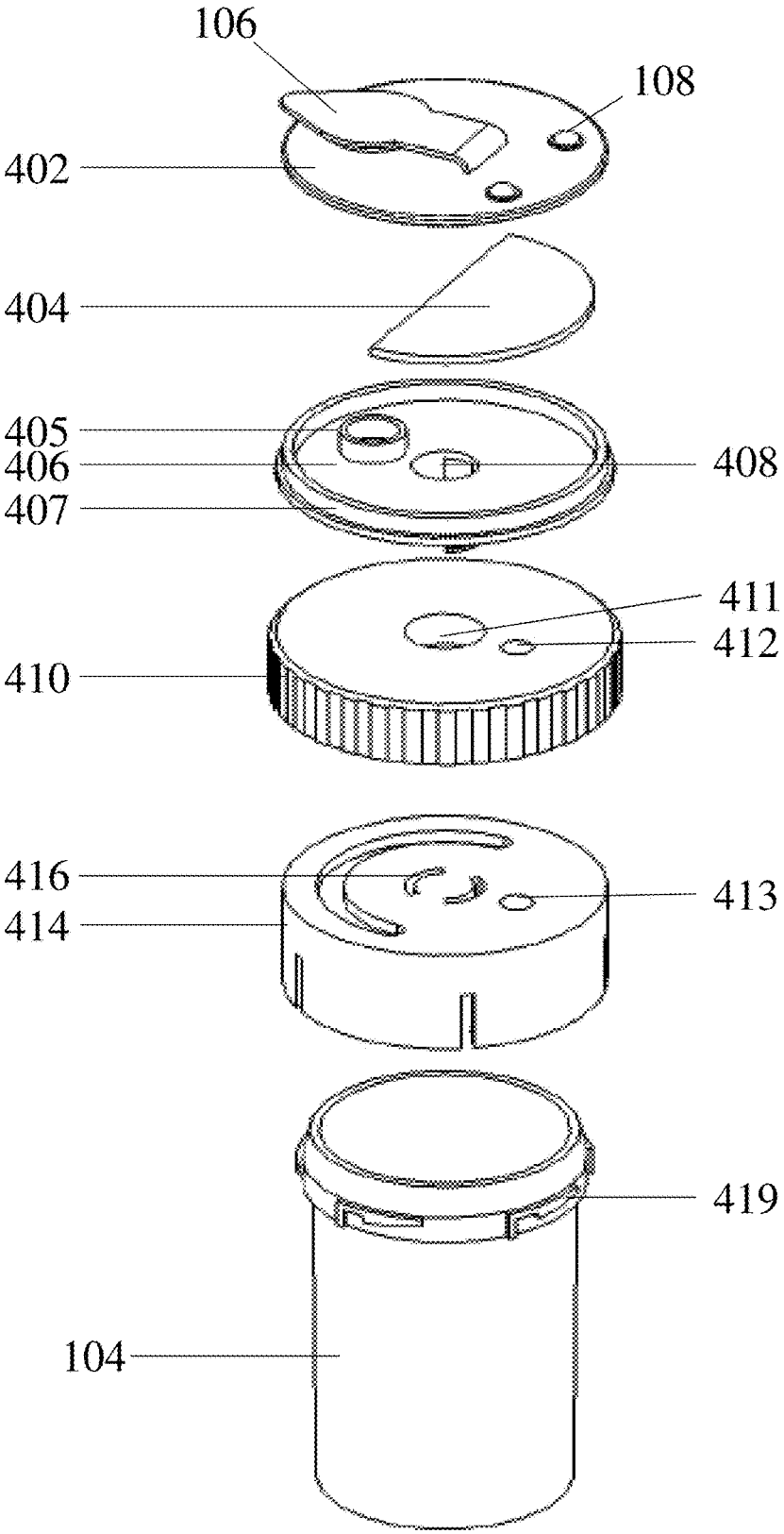
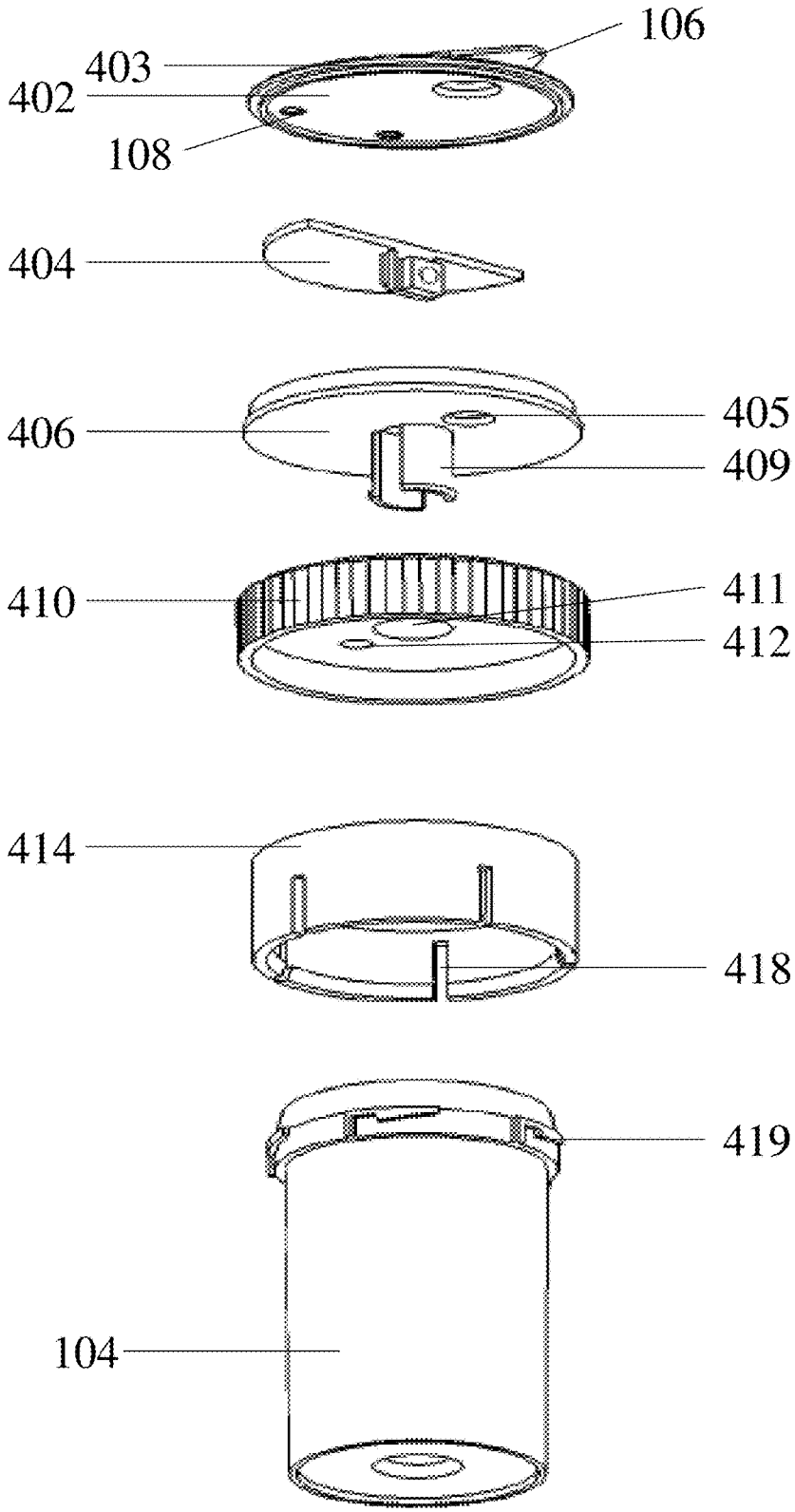


Fig. 4



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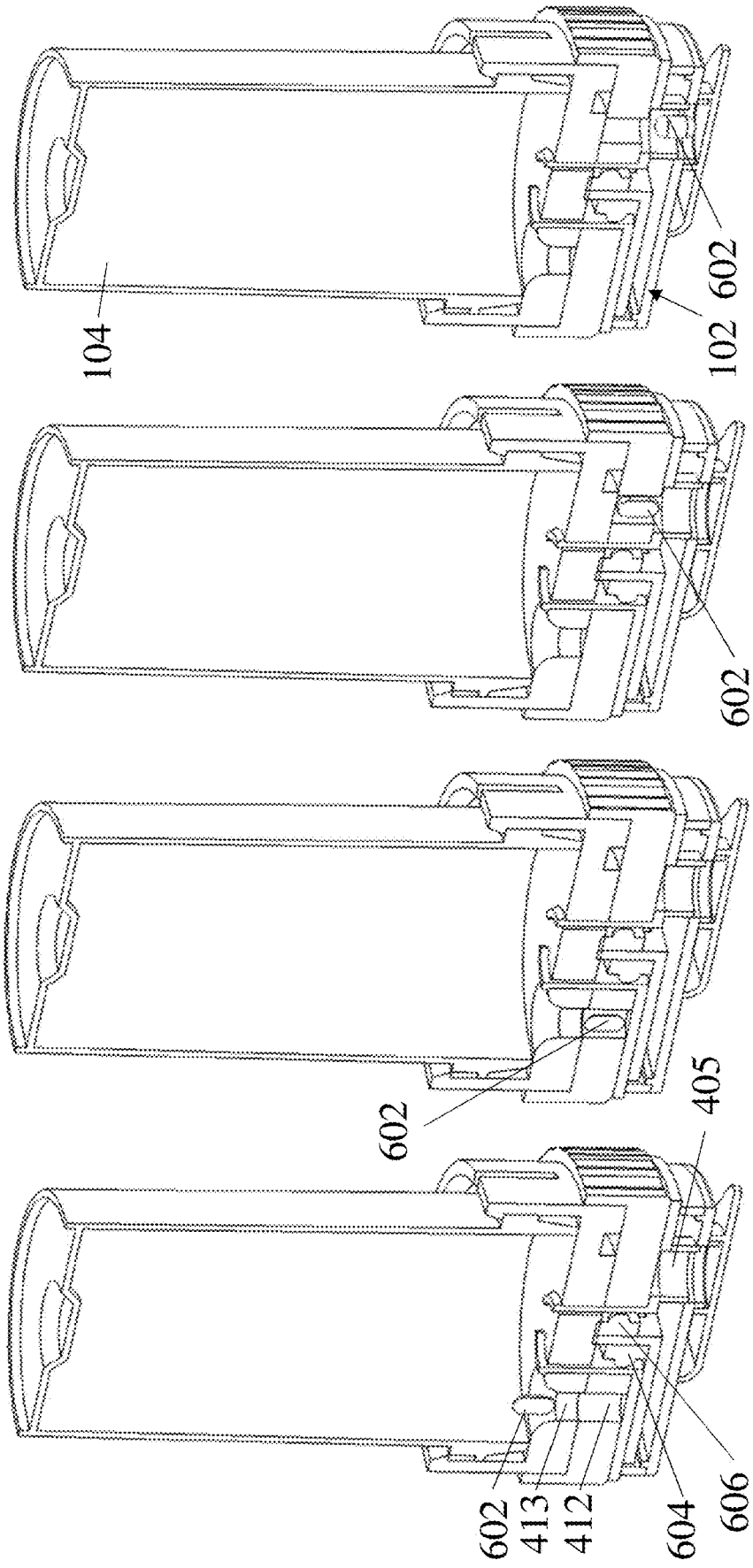
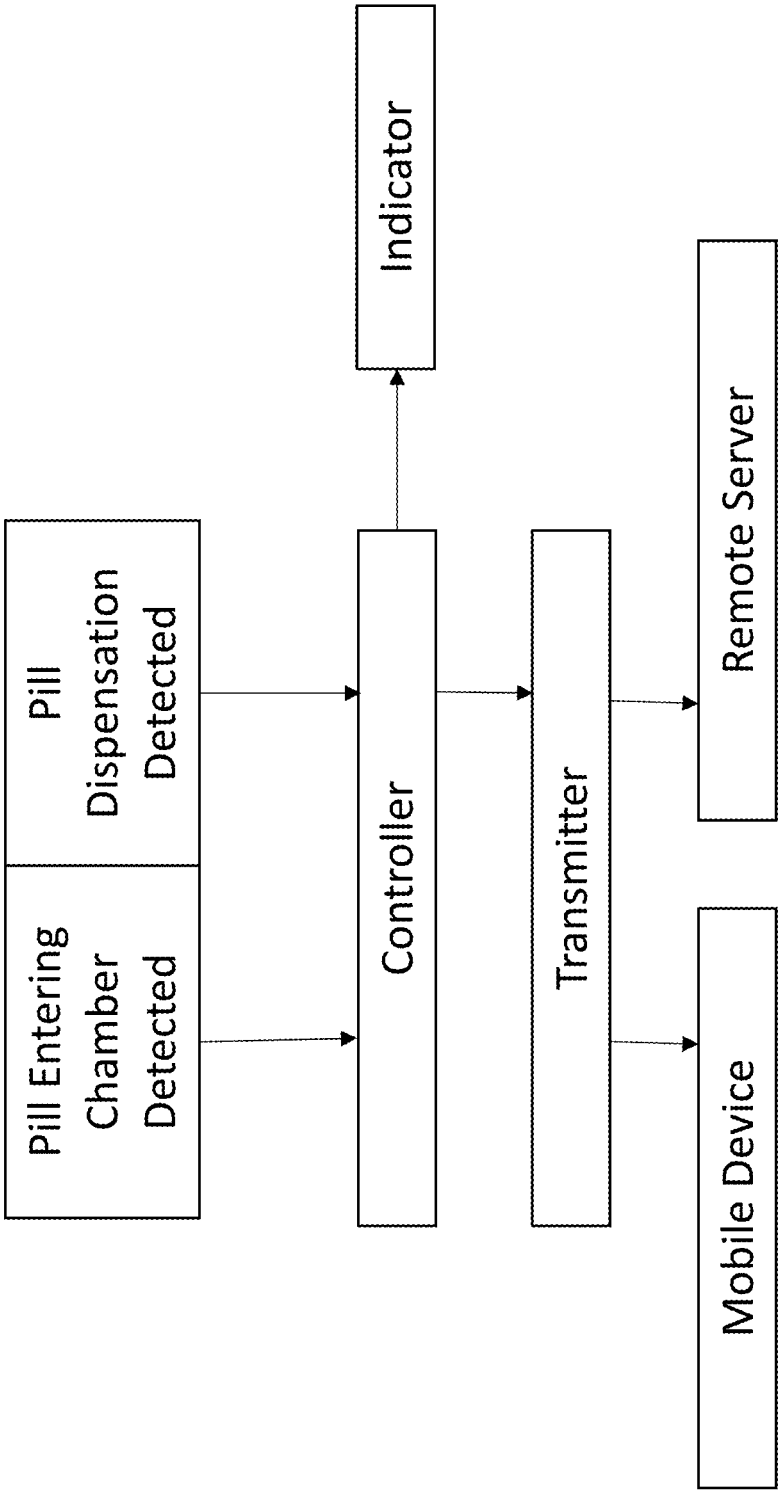


Fig. 6

Fig. 7

Fig. 8

Fig. 9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Pill Entering Chamber Detected
Controller
Indicator
Transmitter
Remote Server
Mobile Device

Fig. 10

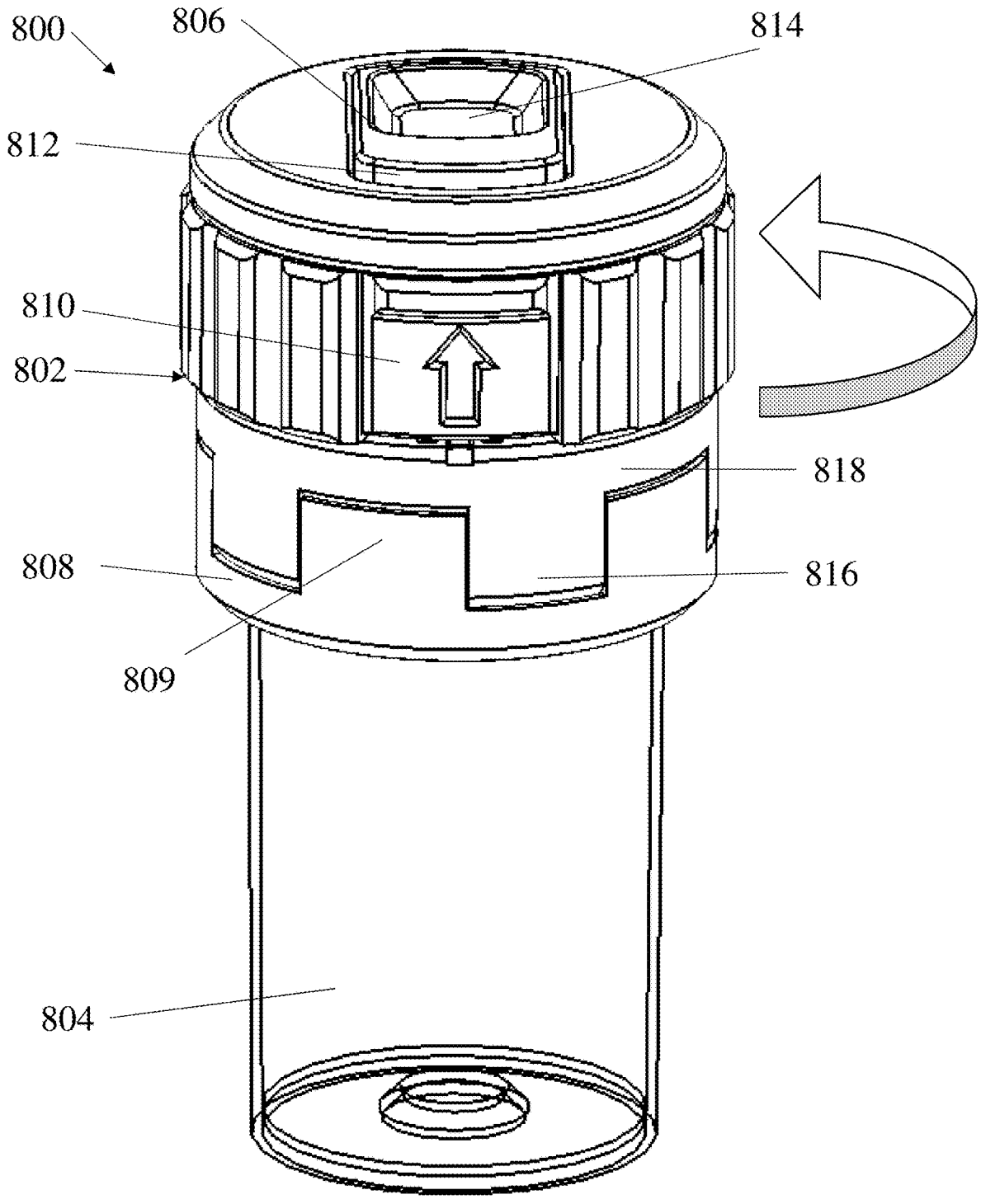
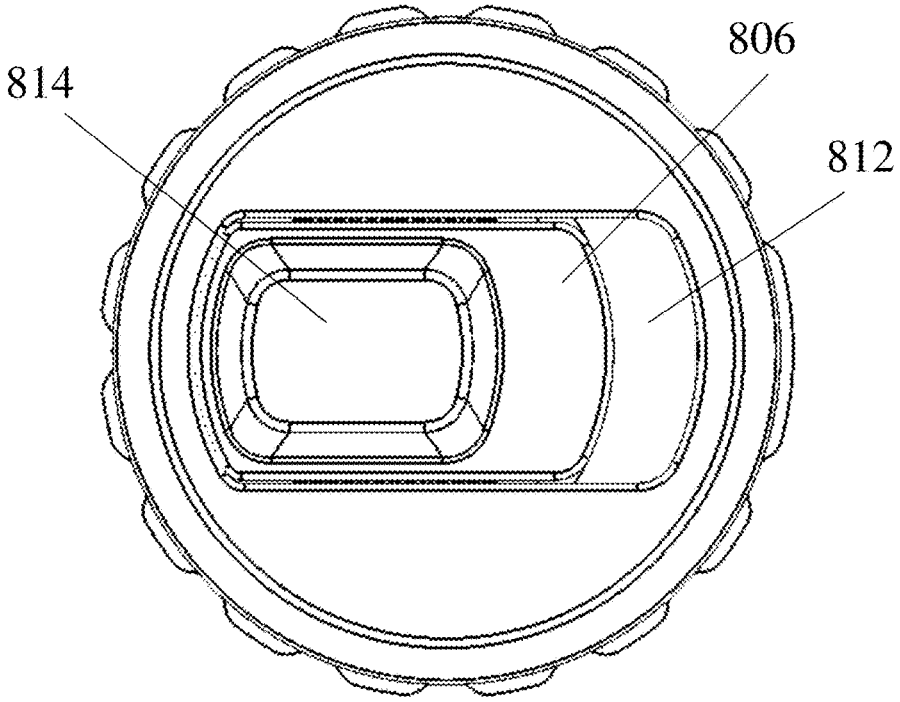


Fig. 11



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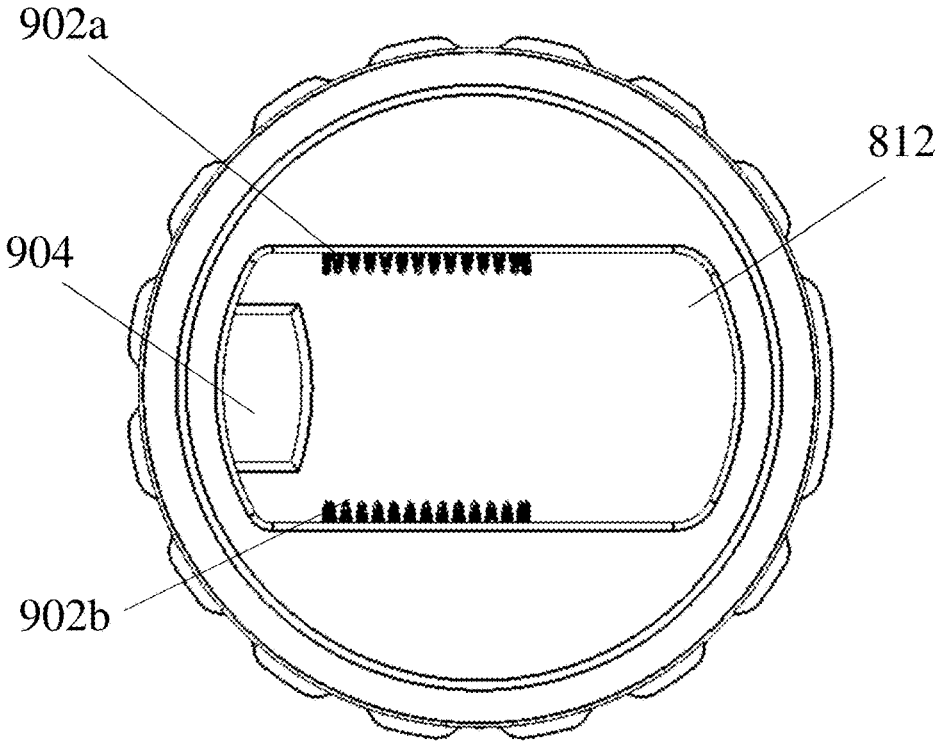

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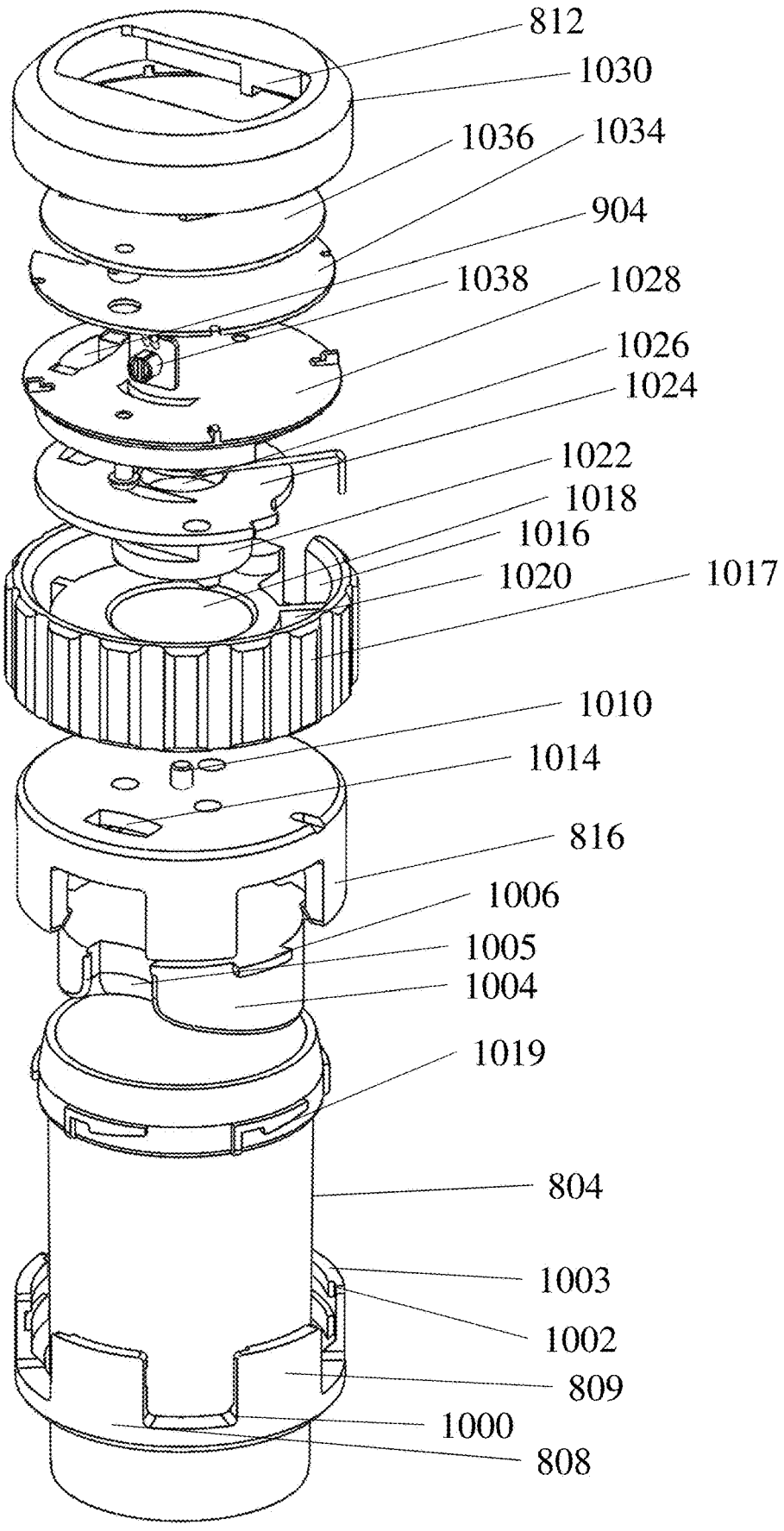
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Fig. 14

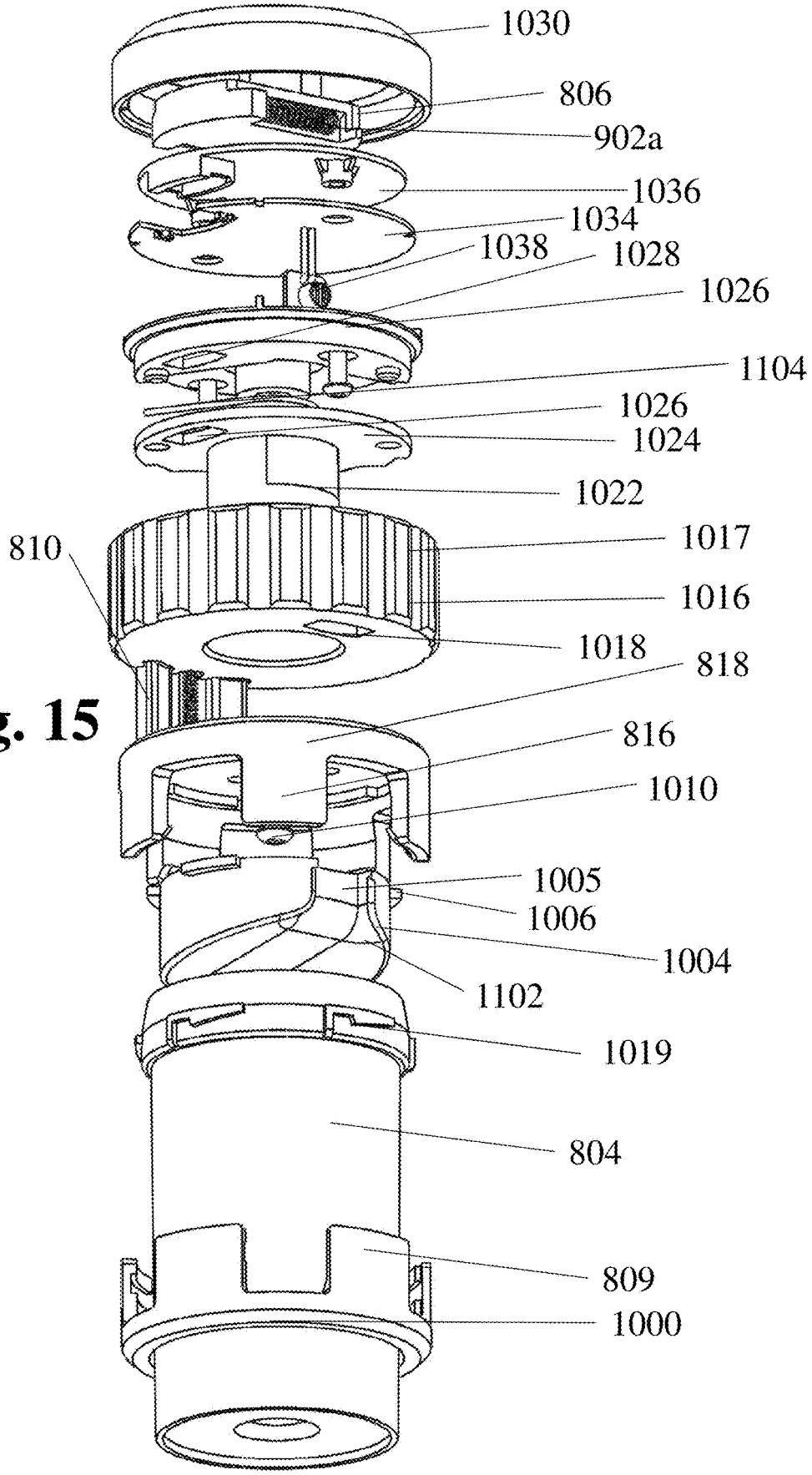
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Fig. 15

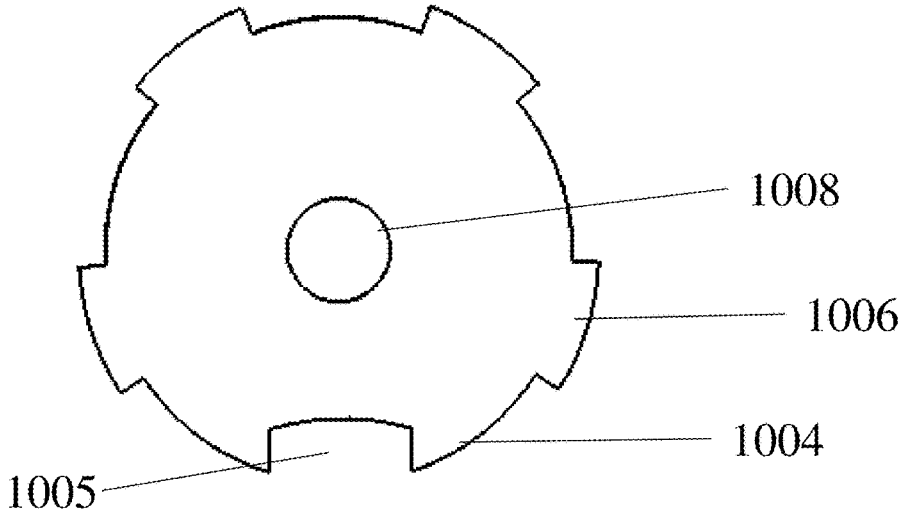


Fig. 16

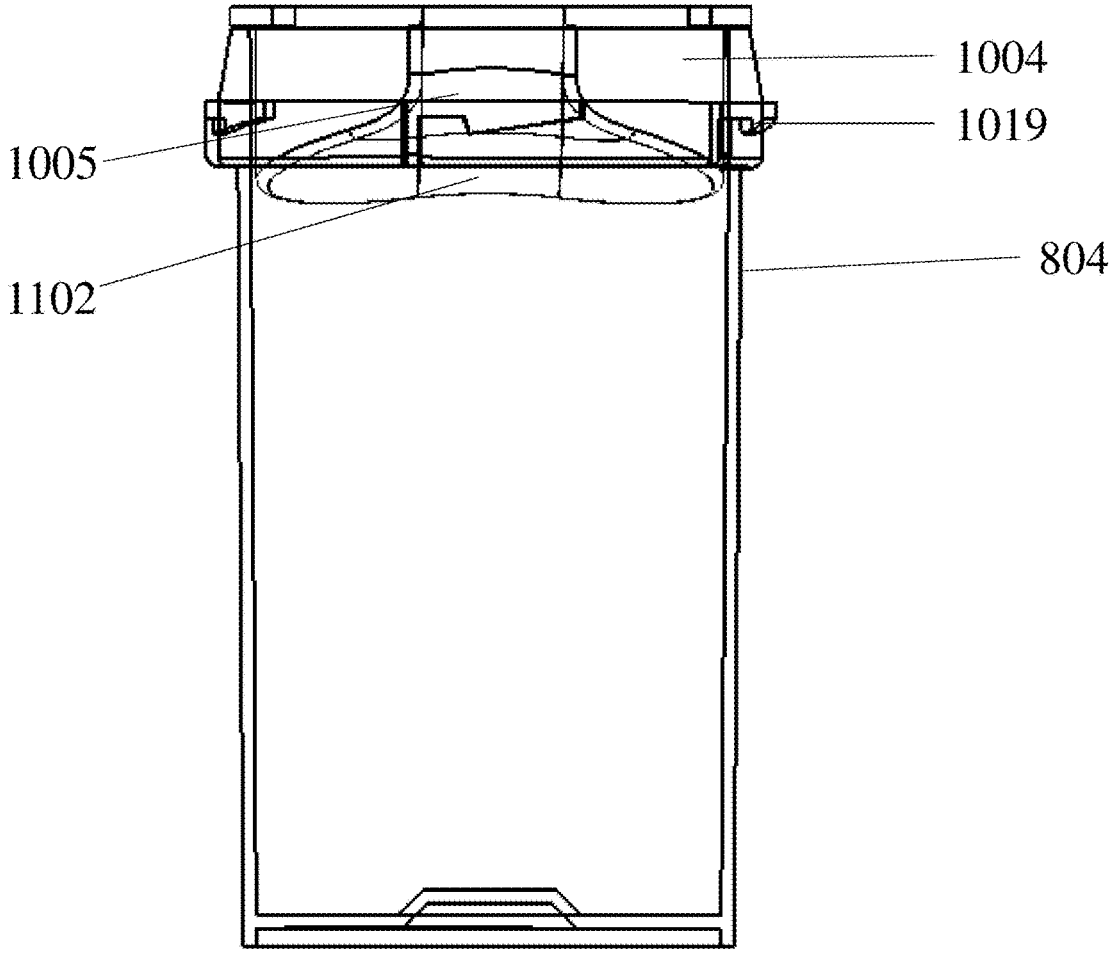


Fig. 17

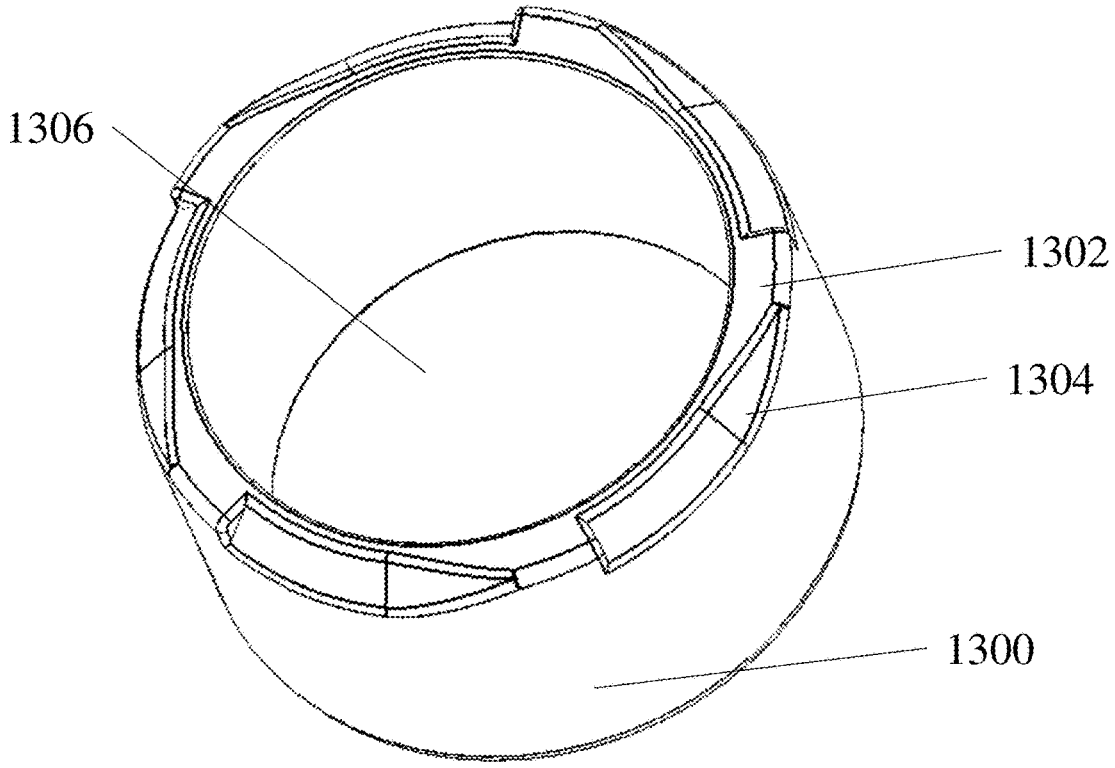
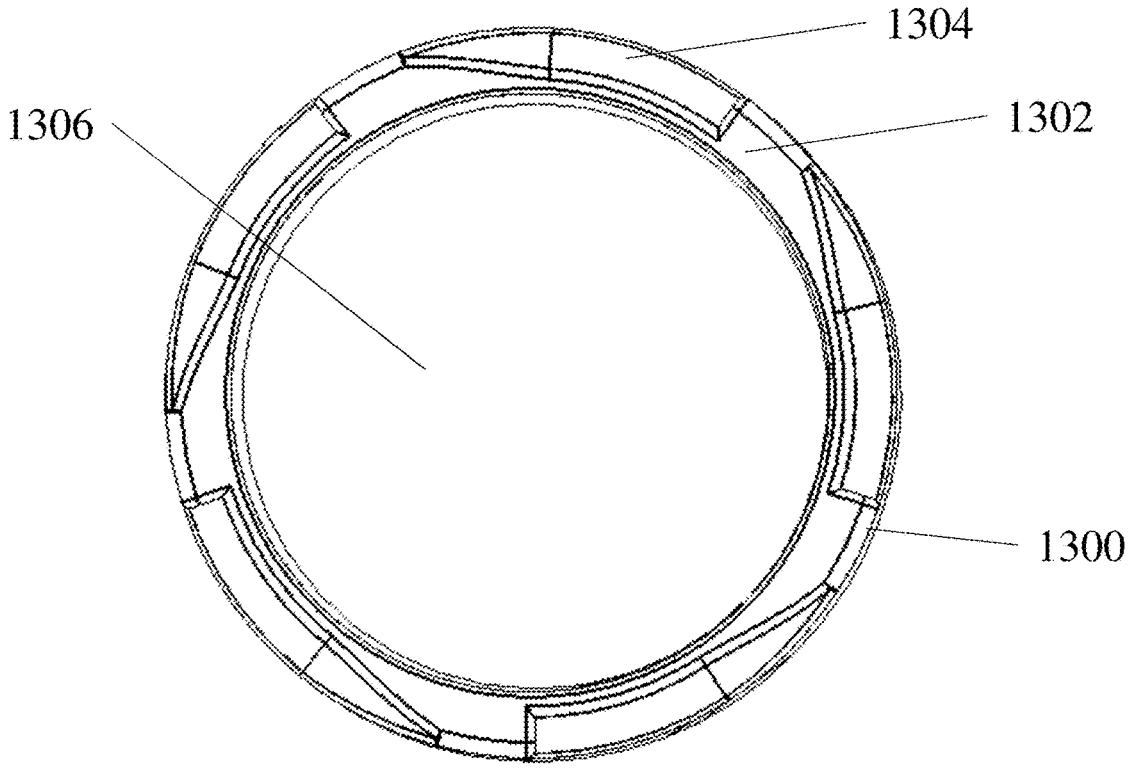


Fig. 18



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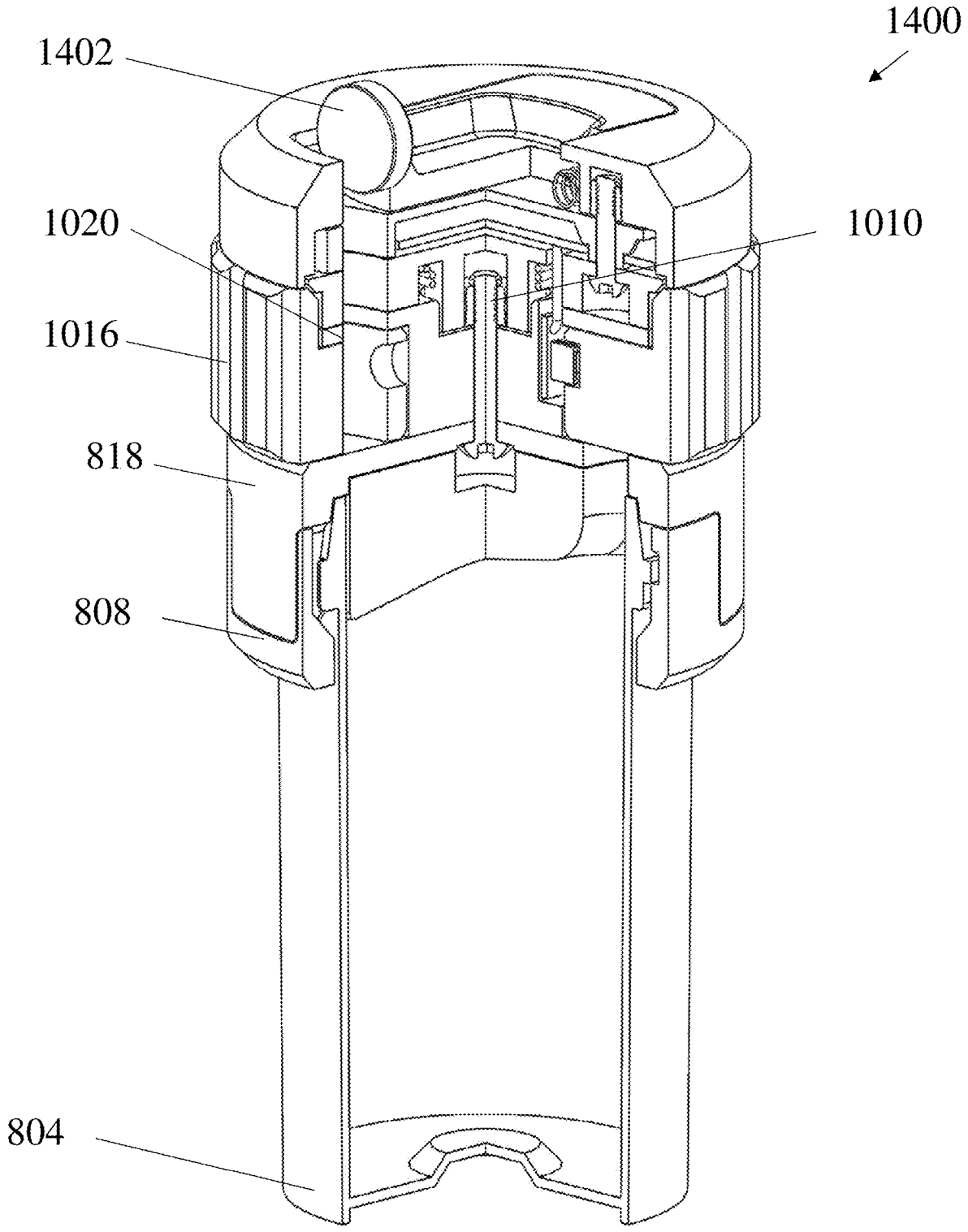


Fig. 20

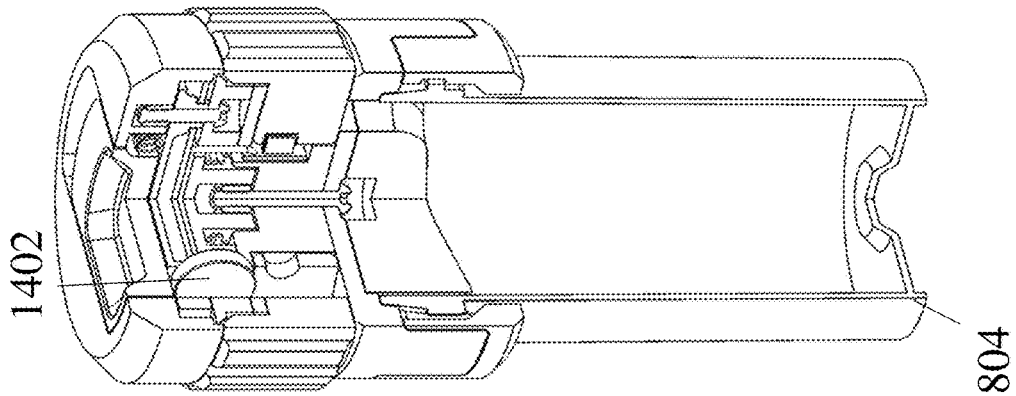
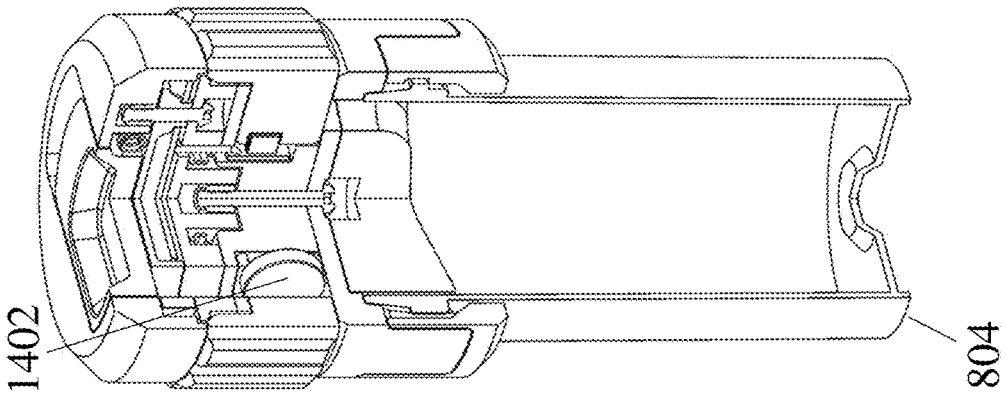


Fig. 24



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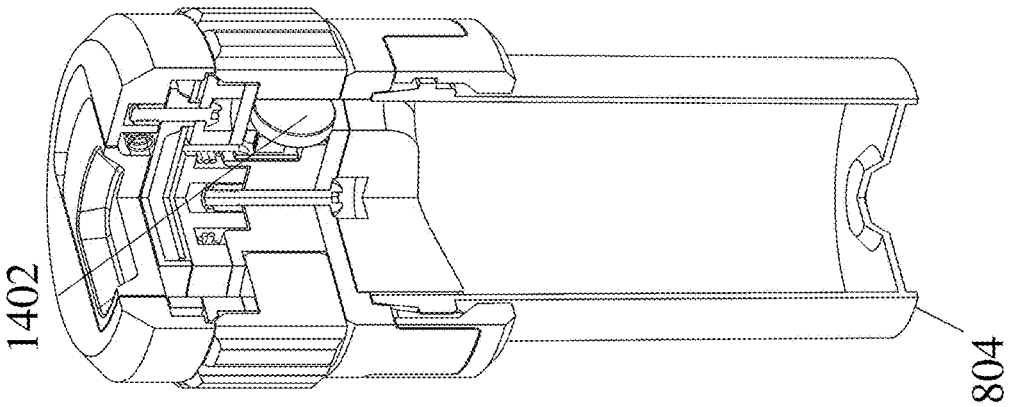

Fig. 22

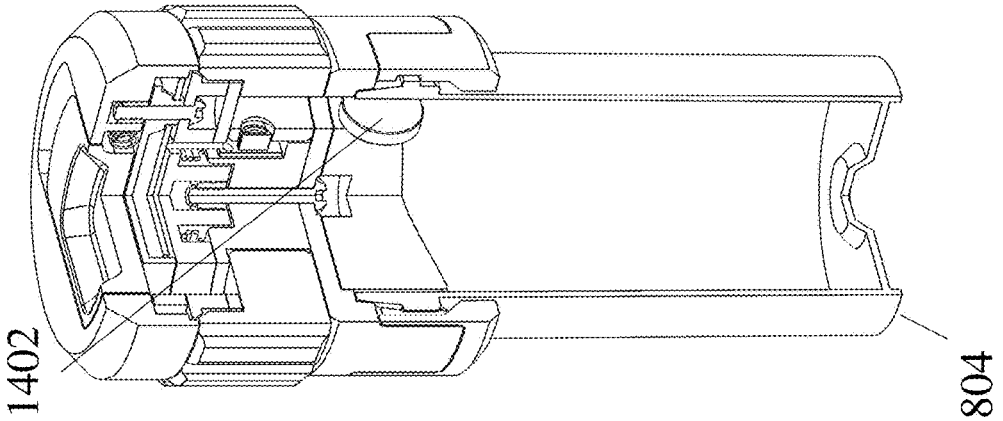

Fig. 21

PILL DISPENSER

FIELD

[0001] Disclosed embodiments relate to pill dispensers with dispensing tracking, medication scheduling, remote reporting, and other functionalities.

DISCUSSION OF THE RELATED ART

[0002] There are a variety of pill dispensers, pill bottles, and pill organizers currently on the market; none more ubiquitous than the snap on or twist-on, transparent, pill bottles dispensed by most major pharmacies. These containers provide a consistent and recognizable way of transporting and containing set amounts of medication, but provide little functionality beyond being child resistant.

SUMMARY

[0003] According to one embodiment, a pill dispenser includes a pill storage compartment to store a plurality of pills and a cap including an indicator. The cap further includes a rotatable carousel and a dispensing chamber with said rotatable carousel. The dispensing chamber is adapted to receive pills from the storage compartment, wherein the dispensing chamber includes a sensor that detects the presence of a pill in the dispensing chamber. The indicator is activated when the first sensor detects the presence of the pill in the dispensing chamber.

[0004] According to another embodiment, a pill dispenser includes a pill storage compartment to store a plurality of pills, a cap, and a control system that is adapted to wirelessly communicate information. The cap includes a dispensing chamber that prevents access to the pill storage compartment and dispenses pills via the dispensing chamber. The cap is rotated to a receiving position to introduce pills from the pill storage compartment into the dispensing chamber. The control system recognizes pill dispensing and triggers an alert indicator at key points during the process.

[0005] According to another embodiment, a pill dispenser includes a pill storage component that stores a plurality of pills, an at least partially rotatable cap, a control system, and a remote communication transmitter. The at least partially rotatable cap includes a dispensing chamber that is rotatable between a receiving position and a dispensing position, and is adapted to receive a limited number of pills from the storage compartment while in the receiving position. The control system recognizes and tracks dispensation of the pills. When the controller detects dispensation beyond a pre-set number of pills, the event is reported to a remote receiver using the remote communication transmitter.

[0006] In some embodiments, the pill dispenser is used as follows. The pill dispenser includes a storage compartment and a rotatable cap that includes a dispensing chamber. A user orients the pill dispenser such that a pill contained within the storage component of the pill dispenser enters the dispensing chamber. The user then rotates the cap to move the dispensing chamber to a dispensing position, where the dispensing chamber is no longer in communication with the storage component and instead aligns with a dispensing spout. Finally, the user removes a cover obstructing the dispensing spout such that the pill can exit the dispensing chamber and the pill dispenser.

[0007] According to another embodiment, a cap for a pill bottle has a collar, the cap comprising: a first snap-fit finger extending downwardly from the cap, the first snap-fit finger having a hook configured to hook onto a collar of a pill bottle; a second snap-fit finger extending downwardly from the cap, the second snap-fit finger being spaced from the first snap-fit finger and forming a first perimeter gap between the first and second snap-fit fingers, the second snap-fit finger having a second hook configured to hook onto the collar of a pill bottle. The cap further includes a complementary lock ring configured to obstruct access to undersides of the first and second snap-fit fingers, the lock ring including a first blocking finger extending upwardly into the first perimeter gap to either leave no gap or a gap of less than 2 mm between a lateral edge of the first blocking finger and a lateral edge of the first snap-fit finger. The first snap-fit finger includes a first distal end, and the second snap-fit finger includes a second distal end. When the cap is snap fit onto a bottle, and the first blocking finger of the lock ring is fully inserted between the first and second snap-fit fingers, the lock ring leaves either no gap or a gap of less than 2 mm between the lock ring and the first distal end, and the lock ring leaves either no gap or a gap of less than 2 mm between the lock ring and the second distal end.

[0008] According to another embodiment, a cap for a pill bottle has a collar. The cap comprises: a first snap-fit finger extending downwardly from the cap, the first snap-fit finger having a hook configured to hook onto a collar of a pill bottle; and a second snap-fit finger extending downwardly from the cap, the second snap-fit finger being spaced from the first snap-fit finger and forming a first perimeter gap between the first and second snap-fit fingers, the second snap-fit finger having a second hook configured to hook onto the collar of a pill bottle. The cap further includes a complementary lock ring configured to obstruct access to undersides of the first and second snap-fit fingers, the lock ring including a first blocking finger extending upwardly into the first perimeter gap to either leave no gap or a gap of less than 2 mm between a lateral edge of the first blocking finger and a lateral edge of the first snap-fit finger; wherein the first blocking finger either leaves no gap or a gap of less than 2 mm between the lateral edge of the first blocking finger and a lateral edge of the second snap-fit finger.

[0009] According to another embodiment, a cap for a pill bottle comprises: a coupler configured to attach the cap to a pill bottle; a rotating chamber having first and second rotation states, wherein the rotating chamber is configured to receive a pill from the pill bottle through a bottom of the cap when the cap is attached to the pill bottle and the rotating chamber is in the first rotation state, and the pill is removable from the rotating chamber through a top of the cap when the rotating chamber is in the second rotation state; and a lock ring configured to engage with a pill bottle collar and/or the pill cap in a locking position. The cap cannot be removed with the lock ring in the locking position, and removal of the lock ring from the locking position requires damaging the lock ring.

[0010] According to another embodiment, a cap for a pill bottle comprises: a rotating chamber having first and second rotation states, wherein the rotating chamber is configured to receive a pill from the pill bottle through a bottom of the cap when the cap is attached to the pill bottle and the rotating chamber is in the first rotation state, and the pill is removable from the rotating chamber through a top of the cap when the

rotating chamber is in the second rotation state; and a biasing element which biases the rotating chamber toward the second rotation state.

[0011] According to another embodiment, a cap for a pill bottle comprises: a rotating chamber having first and second rotation states, wherein the rotating chamber is configured to receive a pill from the pill bottle, through a bottom of the cap, when the cap is attached to the pill bottle, and the rotating chamber is in the first rotation state, and the pill is removable from the rotating chamber through a top of the cap when the rotating chamber is in the second rotation state; a first removably attachable guide surface configured to be attached to the cap to guide a pill toward the rotating chamber from the pill bottle, wherein the first guide surface has a first opening through which a pill travels from the guide surface into the rotating chamber; and a second removably attachable guide surface configured to be attached to the cap to guide a pill toward the rotating chamber from the pill bottle, wherein the second guide surface has a second opening through which a pill travels from the guide surface into the rotating chamber. The first opening has a different size and/or shape as the second opening.

[0012] In some embodiments, the pill dispenser is used as follows. A user proceeds by: inverting a pill bottle containing a plurality of pills and having an attached cap; rotating a dispensing chamber in the cap to move the dispensing chamber into a first rotation position in which the dispensing chamber receives one or more pills from the pill bottle; allowing the dispensing chamber to rotate to a second rotation position via force from a biasing element; moving a lid on the cap to open access to the dispensing chamber; retrieving the one or more pills from the dispensing chamber.

[0013] In some embodiments, a method of accessing a storage compartment in a pill bottle is provided. The pill bottle has an attached cap that is snap-fit to a collar of the pill bottle, and a lock ring attached to the pill bottle. The method includes permanently deforming the lock ring to permit removal of the lock ring from the pill bottle, removing the lock ring from the pill bottle, sliding ramps under each of a plurality of snap-fit fingers of the cap to disengage hooks from a collar of the pill bottle, and removing the cap from the pill bottle.

[0014] It should be appreciated that the foregoing concepts, and additional concepts discussed below, may be arranged in any suitable combination, as the present disclosure is not limited in this respect. Further, other advantages and novel features of the present disclosure will become apparent from the following detailed description of various non-limiting embodiments when considered in conjunction with the accompanying figures.

BRIEF DESCRIPTION OF DRAWINGS

[0015] The accompanying drawings are not intended to be drawn to scale. In the drawings, each identical or nearly identical component that is illustrated in various figures may be represented by a like numeral. For purposes of clarity, not every component may be labeled in every drawing. In the drawings:

[0016] FIG. **1** is a front perspective view of a pill dispenser according to one embodiment;

[0017] FIG. **2** is a front view of the pill dispenser of FIG. **1**;

[0018] FIG. **3** is a top view of the pill dispenser of FIG. **1**;

[0019] FIG. **4** is an exploded, front, top, perspective view of the pill dispenser of FIG. **1**;

[0020] FIG. **5** is an exploded, front, bottom, perspective view of the pill dispenser of FIG. **1**;

[0021] FIG. **6** is a cross-sectional view of the pill dispenser accepting a pill from the pill storage component;

[0022] FIG. **7** is a cross-sectional view of the pill dispenser with a pill in the dispensing chamber, while in the receiving position;

[0023] FIG. **8** is a cross-sectional view of the pill dispenser with a pill in the dispensing chamber, while in the dispensing position;

[0024] FIG. **9** is a cross-sectional view of the pill dispenser in the process of dispensing a pill;

[0025] FIG. **10** shows a flow chart showing the origination and flow of data throughout the sensing/control system of the pill dispenser according to some embodiments;

[0026] FIG. **11** is a front perspective view of a pill dispenser according to one embodiment;

[0027] FIG. **12** is a top view of the pill dispenser according to the embodiment of FIG. **8**;

[0028] FIG. **13** is a top view of the pill dispenser of FIG. **11** with the moveable lid removed;

[0029] FIG. **14** is an exploded, rear, top, left perspective view of the pill dispenser of FIG. **11**;

[0030] FIG. **15** is an exploded, rear, bottom, right perspective view of the pill dispenser of FIG. **11**;

[0031] FIG. **16** is a top view of a guiding surface of the pill dispenser of FIG. **11**;

[0032] FIG. **17** is a front view of the guiding surface and storage compartment of the pill dispenser of FIG. **11**;

[0033] FIG. **18** is a front, top, right, perspective view of a removal tool according to one embodiment;

[0034] FIG. **19** is a top view of the removal tool of FIG. **18**;

[0035] FIG. **20** is a cut-away front perspective view of the pill dispenser of FIG. **11**;

[0036] FIG. **21** is a cut-away front perspective view of the pill dispenser of FIG. **11** receiving a pill from the pill storage component;

[0037] FIG. **22** is a cut-away front perspective view of the pill dispenser of FIG. **11** in the receiving position;

[0038] FIG. **23** is a cut-away front perspective view of the pill dispenser of FIG. **11** in the dispensing position; and

[0039] FIG. **24** is a cut-away front perspective view of the pill dispenser of FIG. **11** in the process of dispensing the pill.

DETAILED DESCRIPTION

[0040] Prescription medications that include controlled substances are often regulated to prevent misuse and resale. For example, the total number of doses which a patient is permitted to be prescribed and/or receive in a single pharmacy visit is often limited. Such a regulatory arrangement forces the patient to repeatedly make visits to the doctor and/or the pharmacy, which is inconvenient and often difficult for people with health or transportation issues.

[0041] Patients are commonly prescribed set amounts of medication along with schedules for how frequently to take a certain dosages. For many patients who are not in situations involving continuous medical supervision, the patient bears the responsibility of following the prescribed schedules and dosages. Doctors, pharmacies, and/or the patient

can have difficulty keeping track of whether medication was taken at the correct time or in the correct dose.

[0042] Some medications, for example antibiotics, are prescribed as a full regime where the patient is supposed to take each dose regardless of when symptoms subside. Other medications, for example many opiates, are prescribed for patients to take as needed, but the amount dispensed per consultation is strictly regulated. In each of these cases, it may be beneficial for prescribing doctors and other healthcare providers to be able to monitor medication consumption and compliance.

[0043] Applicant has recognized that using a pill container which restricts and/or tracks the removal of pills from the container may be beneficial to the patient not only with respect to dosage compliance, but also by obviating the need for limited prescription quantities.

[0044] According to one embodiment, a pill container permits only a certain number of pills to be removed from the container in a given amount of time. For example, the cap may include a lock that prevents opening of the container unless a prescribed amount of time has passed since the previous pill withdrawal event. Or, the pill container may not contain any type of lock, but could instead track and report the timing of pill removal. In some embodiments, the pill container is arranged to dispense one pill at a time, or some other specific number of pills at a time, so that the number of pills dispensed may be tracked.

[0045] The dispensation of pills may be monitored via use of one or more sensors and a memory unit to keep track of how many pills have been dispensed and when the pills were dispensed.

[0046] Many pharmacies provide prescribed medication in well-known cylindrical pill containers that have snap on/off caps or twist on/off caps, often with child-resistant features. Applicant has recognized that employing compliance monitoring and pill dispensing technologies on pill bottles that look similar and operate similarly to existing pill bottles provides various advantages. For example, by using pill bottles which look similar to conventional pill bottles, patients can easily recognize the pill bottle. In some embodiments disclosed herein, caps are provided which may be used with existing pill bottle designs. Familiarity with the operation (e.g., twist the cap to access the pills) may improve accessibility and compliance. Additionally, compatibility of components may be improved. For example, some pharmacy warehouses have specialized shelving and storage designed specifically for conventional pill bottles.

[0047] One effective manner of monitoring the dispensing of pills includes limiting the number of pills that can be dispensed at once. In some embodiments of the pill dispenser, the pill dispenser includes a pill storage component for storing pills, and a cap assembly. The cap assembly includes a rotatable carousel with a chamber that accepts individual pills or groups of pills. A user inverts the pill dispenser to cause one or more pills within the storage component to enter the chamber through a bottom of the cap when the chamber is in a receiving position. The carousel is then rotated from the receiving position to a dispensing position about a longitudinal axis of the cylindrical pill dispenser such that the chamber aligns with a pill spout in the top cover on the top of the cap assembly. With the carousel in this dispensing position, the user opens a flexible cover or other removable cover to allow the pill or pills to fall from the chamber through the top of the cap, completing the dispensation. The user then rotates the carousel back to its original position in preparation for the next dispensing event. With such an arrangement, though the storage component may contain numerous pills, a user may dispense only as many pills as the chamber is sized to allow in one rotation.

[0048] Instead of a flexible cover closing the chamber, in some embodiments, the cap has a moveable lid that selectively covers or uncovers the dispensing chamber when the chamber is in the dispensing position. The moveable lid may be a sliding hatch that is spring biased toward a closed position covering the dispensing chamber. The sliding hatch may include a depression on its outwardly-facing surface, and the sliding hatch may include friction grips to facilitate the use of a thumb or other finger to slide the hatch from a closed to an open position. Other covers such as, but not limited to, inwardly-swinging doors or flip tops, may be used in some embodiments.

[0049] In some embodiments of the pill dispenser, the carousel includes a biasing element such as a spring, arranged such that rotating the carousel away from the receiving position tensions the spring. When the user releases the carousel after dispensing the pill, the carousel automatically rotates back to its home position due to the spring tension. In some embodiments, the biasing spring may comprise a torsion spring. However, other springs or biasing elements may be used. In some embodiments, other carousel return mechanisms may be used, such as powered actuators.

[0050] To restrict user access to the pills without dispensing the pills through the carousel arrangement, some embodiments of the pill dispenser include a cap assembly that is permanently attached to the storage component such that the cap assembly and/or storage container must be broken to access the pills all at once. Or, in some embodiments, the cap assembly may include a removal arrangement wherein a piece of the cap assembly is permanently deformed or removed in order to allow removal of the cap. In this manner, the dispensation of too many pills will be apparent either from a deformed or broken piece, or by reviewing a memory unit that shows the number of pills dispensed.

[0051] In some embodiments, the cap assembly requires a special tool to separate the cap assembly from the storage component.

[0052] In some embodiments of the pill dispenser, the pill dispenser includes a cap assembly that additionally includes a locking ring that prevents the user from using the special tool to separate the cap assembly from the storage compartment. In these embodiments, the locking ring has to be separately removed or damaged before the cap assembly can be removed by the special tool. It is contemplated that the locking ring would not be re-attachable to the pill dispenser after damage or removal. As a result of having the locking ring, even if a user has the removal tool, the locking ring must still be removed for the user to gain access to the contents of the storage compartment in some embodiments. Thus, if a user chooses to breach the storage compartment in some way, it becomes apparent to a healthcare provider or pharmacist that the pill dispenser was breached based on the apparent damage to the locking ring or the lack of a locking ring.

[0053] In some embodiments, the locking ring is removable by tearing the locking ring along a pre-perforated or

pre-weakened section. However, other mechanisms may be provided which allow a user to remove the locking ring, including, but not limited to, requiring the locking ring to be cut off with a sharp object, or having a brittle locking ring that can be destroyed with sufficient blunt force. In some embodiments, the locking ring tightens around the cap using ratchet system that can be only unlocked with a key. Embodiments may be used where removing or damaging the locking ring allows the user to remove the cap assembly without the need of a special tool.

[0054] In some embodiments with locking features, the cap assembly includes a coupler at the storage compartment-facing side of the cap. The coupler includes a plurality of snap-fit fingers extending downwardly away from the cap, allowing the coupler to grasp the collar of the pill bottle. The snap-fit fingers may be resiliently, reversibly deformable and include hooks at their distal ends such that as the cap assembly is slid onto the storage compartment, the snap-fit fingers deform circumferentially outwardly around a collar of the storage compartment, returning toward their undeformed shape/position when the hooks have moved past the collar. The snap-fit fingers hook onto the collar and snap-fit the cap assembly to the storage compartment.

[0055] While a coupler with a plurality of snap-fit fingers having perimeter gaps between the fingers is described, other arrangements are contemplated including a fully circumferential lower extension that snap-fits over the collar of the storage compartment. The circumferential lower extension may include one or more relief seams to facilitate expansion of the circular lower extension during snap-fitting.

[0056] The removal tool according to some embodiments has an annular body with a plurality of raised protrusions extending from a leading edge of the tool. The protrusions may include ramped protrusions or ramps in some embodiments. The tool has a center aperture with a diameter sized to be slightly larger than the diameter of the storage compartment such that the tool can be run along the body of the storage compartment with the storage compartment placed within the central aperture of the tool. In practice, the user can slide the tool upwardly from the bottom of the storage compartment toward the cap. When the ramps reach the snap-fit fingers of the cap, the ramps slide under the hooks of the snap-fit fingers, bending the fingers circumferentially outwards. In this deformed state, the snap-fit fingers are functionally unhooked from the collar of the storage compartment. Continued upward movement of the tool pushes the cap upwardly, completing the removal of the cap from the storage compartment.

[0057] While an annular tool with discrete ramped protrusions is described, it should be understood that any structure of any shape or size capable of simultaneously or sequentially prying each snap-fit finger from the collar of the storage compartment is contemplated. For example, an annular tool with a single, fully circumferential ramped edge instead of discrete protrusions may be used.

[0058] The locking ring according to some embodiments is an annular device shaped and sized to have a central aperture with a diameter slightly larger than the diameter of the storage compartment such that the storage compartment fits through the central aperture of the locking ring. The locking ring includes a plurality of blocking fingers that extend upwardly from the circumference of the body of the locking ring. The locking ring is complementary to the cap in that when the locking ring is in a locking position, the blocking fingers extend between the snap-fit fingers of the cap and prevent a removal tool from sliding beneath the snap-fit fingers to remove the cap. In some embodiments, a first blocking finger extends into a first perimeter gap between a first and second snap-fit finger such that there is no gap between the first blocking finger and the first and second snap-fit fingers. Similarly, a second blocking finger may extend into a second perimeter gap between a second and third snap-fit fingers, and so forth around the circumference of the cap. The snap-fit fingers and blocking fingers may be of any suitable length, size, and shape.

[0059] In practice, after the cap is snapped onto the storage compartment, the locking ring may be slid from the bottom of the storage compartment toward the cap such that the blocking fingers interlock with the snap-fit fingers. In some embodiments, the blocking fingers may include snap-fit features such as hooks that grasp the collar of the storage compartment in a similar manner to how the snap-fit fingers grasp the collar. In some embodiments, friction alone is enough to keep the locking ring on the storage compartment. However, alternative embodiments of the locking ring may be used where the circumference of the locking ring is manually reduced after the ring has been placed over the collar or container. Adhesives may be used in some embodiments.

[0060] The locking ring may be slid upwardly until no gap exists between distal ends of the snap-fit fingers and the locking ring. For example, there may be no space between a first distal end of the first snap-fit finger and the locking ring, no space between a second distal end of the second snap-fit finger and the locking ring, and so forth. In other embodiments, gaps of less than 2 mm may exist between the locking ring and the first distal end, or between the locking ring and the second distal end, and so forth. The gaps between the locking ring and the distal ends may be of any suitable length to prevent the use of a foreign object to pry open the snap-fit fingers or blocking fingers. For example, the gaps between the locking ring and the distal ends may have a length of less than or equal to 5 mm, less than or equal to 4 mm, less than or equal to 3 mm, less than or equal to 2 mm, less than or equal to 1 mm, or equal to 0 mm. In some embodiments, the gaps have a length of greater than or equal to 0 mm, greater than or equal to 1 mm, greater than or equal to 2 mm, greater than or equal to 3 mm, greater than or equal to 4 mm, or greater than or equal to 5 mm. Combinations of the above-referenced ranges are also possible (e.g., greater than or equal to 1 mm and less than or equal to 2 mm). Other ranges are also possible.

[0061] While a locking ring with blocking fingers that interlock with snap-fit fingers of the coupler such that no lateral space remains between the blocking and snap-fit fingers is described, arrangements with gaps between the snap-fit fingers and the blocking fingers are contemplated. For example, a gap of less than 2 mm may be left between a lateral edge of the first blocking finger and a lateral edge of the first snap-fit finger. Gaps of the same size or of different sizes may also exist between a second lateral edge of the first snap-fit finger and a lateral edge of the second blocking finger. Gaps of the same size or of different sizes also may exist between lateral edges of the second blocking finger and the corresponding snap-fit fingers and so forth. The gap between the lateral edges of the snap-fit fingers and the lateral edge of the blocking fingers may be of any

suitable length to prevent access of foreign tools being used to pry open the snap-fit or blocking fingers. For example, the gap between the locking ring and the distal ends may have a length of less than or equal to 5 mm, less than or equal to 4 mm, less than or equal to 3 mm, less than or equal to 2 mm, less than or equal to 1 mm, or equal to 0 mm. In some embodiments, the gaps have a length of greater than or equal to 0 mm, greater than or equal to 1 mm, greater than or equal to 2 mm, greater than or equal to 3 mm, greater than or equal to 4 mm, or greater than or equal to 5 mm. Combinations of the above-referenced ranges are also possible (e.g., greater than or equal to 1 mm and less than or equal to 3 mm). Other ranges are also possible.

[0062] Embodiments are also contemplated where the locking ring is integral with the coupler. In these embodiments, the user can grasp and rotate the cap with a certain amount of force to break the frangible locking ring and remove the cap. The locking rings in these embodiments act like tamper-evident bands or security rings.

[0063] In other embodiments of the cap assembly, the cap assembly may have a ratchet band at the bottom of the cap along with a detachable winch system allowing a pharmacist or healthcare provider to tighten the cap around the storage compartment. The winch interface can be designed to require a specifically shaped winch tool to tighten the cap.

[0064] In some embodiments, when a user inverts the pill dispenser, the pills within the pill dispenser may not necessarily enter the chamber unless the pills are aligned with the hole to the chamber. Multiple pills attempting to enter the chamber at once could also obstruct the hole. In view of this, some embodiments of the pill dispenser may include attachable guide surfaces configured to be attached to the cap or to a mouth of the storage compartment to guide pills toward the entrance to the rotating chamber. The guide surfaces may include a ramped surface with a lowest point at an opening that leads to the opening in the bottom of the cap leading to the dispensing chamber. When the pill dispenser is inverted, pills contact the ramped surface and slide toward the opening. The opening is sized and shaped to allow a single pill to enter the chamber to prevent blockage. In some embodiments, the opening may be sized and/or shaped to allow a set number of pills (greater than one) to enter the chamber.

[0065] To account for different possible pill shapes and configurations, a first guide surface attached to the cap or storage compartment can be removed and replaced with a second attachable guide surface configured to be attached to the cap to guide a pill toward the chamber from the storage compartment. The second guide surface includes a second opening that has a different size and/or shape than the first opening and/or a different surface shape than the first guide surface to accommodate pills of different shapes and/or sizes so that some caps can be configured for use with different pills depending on the guide surface used.

[0066] According to some embodiments, the pill container detects and records when pills enter the chamber. Because the chamber dispenses a consistent number of pills with each dispensation event (which may be a single pill in some embodiments), the total number of pills dispensed may be tracked by recording the number of times that one or more pills are detected in the chamber. In some embodiments, the cap assembly further includes a controller that receives input from one or more sensors that monitor the occupation status of the chamber. The sensors report to the controller when a pill (or pills) is detected in the chamber, and report again when the chamber is emptied due to dispensation, altogether indicating one round of pill dispensation.

[0067] To ensure that the change in status was not from the pill re-entering the storage component, some embodiments of the pill dispenser use at least two sensors located on different sides of the carousel. A first sensor or set of sensors detects occupation of the chamber while the carousel is oriented such that the chamber can receive a pill from the storage component, and a second sensor is oriented to detect the occupation state of the chamber when the carousel is in the dispensing position. If the controller receives information that the chamber is full from the first sensor, and then receives information that the chamber is empty from the second sensor, it can determine that a pill was dispensed. If the first sensor indicates occupation, and then non-occupation before the second sensor detects the presence of the chamber at all, then the pill fell back into the storage component. If the first sensor indicates occupation and then the user opts against dispensing a pill and resets the carousel by continuing to rotate back to the receiving position, the second sensor will indicate occupation of the chamber followed immediately by the first sensor detecting an occupied chamber without the second sensor detecting a loss of occupation. This would alert the controller that dispensation event was cancelled.

[0068] Some embodiments of the pill dispenser include one or more sensors that rotate with the carousel and additional sensors that remain static relative to the chamber. In this embodiment, the cap assembly further includes a rotary encoder or other sensor that can detect and interpret rotation state that reports the rotational state of the carousel to the controller. In these embodiments, the controller interprets the sequence of pill detection events from the chamber and the carousel's rotation to determine when a pill is dispensed. For instance, if the chamber indicates that a pill is present, the rotary encoder reports rotation to the dispensing position, and subsequently the chamber reports that it is no longer holding a pill, then the controller records an instance of dispensation.

[0069] It should be understood that although specific combinations of sensor systems and pill dispensation detecting methods have been described above, the current disclosure is not limited to the described systems. The pill dispenser may include more or fewer sensors of different types and functions that work alone or in tandem to indicate when pills have been dispensed. In addition, not all of the disclosed features are necessarily required to be present, and various features may be used in various combinations. After detecting dispensation information, the controller notes the time and date of each dispensation and transmits the information via a signal transmitter to a remote server or mobile device, according to some embodiments. In these embodiments, the pill dispenser may include a wireless communication system such as a Bluetooth transmitter/receiver, a Wi-Fi transmitter/receiver, and/or any other suitable communication system. The pill dispenser is further associated with a mobile app or computer program that accepts each recorded instance broadcast by the pill dispenser. The program or app takes each recorded instance and creates a history of dispensation, which can be representative of a user's compliance schedule with the medication in question.

[0070] In some embodiments of the pill dispenser, the cap assembly includes a local digital storage medium that saves the dispensation events recorded by the controller, and a

local battery or other power source to power the system. These embodiments may further include input/output media ports such as USB ports, that may be used to transfer data between the local digital storage medium and another device. In these embodiments, the pill dispenser may also attempt to broadcast the event to a remote server or mobile device regardless of whether the event is saved locally or not. As the user dispenses doses over the course of the prescribed regime, each recorded instance is gathered by the controller to form a recorded history of when the user took each pill.

[0071] Using this history, a caregiver can determine if the patient was compliant with each scheduled dose. Additionally, a caregiver can also determine if a user is erring in consumption frequency, or if a user is dispensing too frequently and potentially abusing the medication. A caregiver or pharmacist can also see if the number of dispensation events does not match the remaining dosage. For instance, if a user were to attempt to abuse or sell a narcotic and return to a pharmacy or doctor's office to request a refill, it would be apparent to the caregiver or pharmacist that the number of attempted dispensations was too frequent. Alternatively, if the user found another way to remove the pills, the pharmacist would see that the number of dispensations did not match the number of remaining pills.

[0072] The pill dispenser may provide additional functionality. In some embodiments, the cap assembly further includes one or more indicator systems. For convenience, the disclosure describes LED lights as indicators, but it should be understood that the indicators may be any suitable feature that gets a user's attention, including but not limited to a vibration generator, a sound source, a heat generator, a non-LED light source, or a combination of the above. The LED lights may be connected to the controller such that when the pill first enters a chamber, one indicator, such as a red light, turns on to indicate that the chamber is occupied. When the user has fully rotated the carousel such that the chamber is now in the dispensing position, a second indicator, such as a green light, is activated indicating to the user that they can extract the pill. When the pill is detected to have left the chamber, the lights turn off.

[0073] Other systems of notification and feedback may be used. For instance, only one indicator may flash when the pill first enters the chamber, and the indicator may flash again when the chamber has been rotated to the dispensing position. Alternatively, for medication schedules that require multiple doses, one of the indicators may remain activated until the appropriate number of pills have been dispensed. It should be understood that the current disclosure is not limited to any particular notification or feedback system.

[0074] In some embodiments, the indicators alert users at predetermined times that they should take their medication. For example, in embodiments with local memory storage, when the prescription is being filled, a pharmacist may program a prescribed schedule for taking medication. After prescription fulfillment, at the specified times, the controller activates at least one of the indicators, alerting the user that it is time to take the medication.

[0075] For embodiments that include a mobile device or remote server that communicates with the pill dispenser, the prescribed schedule may be saved on the mobile device or saved on the remote server. The mobile device and remote server may send a signal to the pill dispenser at the specified times. The controller receives these signals, and triggers the indicator.

[0076] In embodiments with both local memory storage and connection functionality with a mobile device, instead of activating an indicator at predetermined times according to the pre-programmed schedule, the controller instead may broadcast a signal to the mobile device. An alert may then appear on, or be generated by, the mobile device to alert the user to take the medication. The schedule may be stored only on the mobile device such that the mobile device alerts the user without involving the pill dispenser at all.

[0077] Turning to the figures, specific non-limiting embodiments are described in further detail. It should be understood that the various systems, components, features, and methods described relative to these embodiments may be used either individually and/or in any desired combination as the disclosure is not limited to only the specific embodiments described herein.

[0078] FIGS. **1-3** show one embodiment of a pill dispenser **100**. A cap assembly **102** is attached on the top of a storage component **104** and obstructs direct access to the contents of storage component **104**. A top cover **402** of cap assembly includes a flexible cover **106** that is pivotably attached to a top surface of cap assembly **102** at one end, and removably covers the pill spout at the other end. Indicators **108** are provided. In the illustrated embodiment, indicators **108** include a pair of LED lights. However, as mentioned above, indicators **108** may be any suitable system capable of getting a user's attention. In this embodiment, cap assembly **102** is both a twist-on cap and a snap-on cap as will be described further below. However, cap assembly **102** may be only a snap-on cap or only a twist-on cap, or may be permanently attached to storage component **104**.

[0079] FIGS. **4** and **5** show a top perspective exploded view and a bottom perspective exploded view of pill dispenser **100**. Track features **419** on storage component **104** interface with corresponding features on the inside of a snap-on cap **414** such that the cap snaps over the track features **419**, and can be rotated clockwise to lock the snap-on cap in place. Snap-on cap **414** includes a through-hole **413**, which allows pills from within storage component **104** to pass through. Also positioned on snap-on cap **414** are attachment channels **416** which accept attachment feature **409** as described below, and grooves **418**.

[0080] A carousel **410** sits on top of and rotates freely on snap-on cap **414**. The outside edges of carousel **410** include surface features that assist gripping of the carousel for rotation. The pill chamber is housed within carousel **410**, and chamber **412** within carousel **410** accepts pills from storage component **104** through through-hole **413**. Chamber **412** may be sized as suitable for a prescribed dosage. For example, if a prescribed regimen required a single pill, chamber **412** may be just large enough for that pill. Similarly, if a regiment requires multiple pills, chamber **412** and through-hole **413** may be sized to contain multiple pills for a single dispensation event. In some embodiments, through-hole **413** may be gated with protruding features to guide individual pills into the through-hole, or prevent multiple pills from becoming jammed in the entrance.

[0081] A dispensing lid **406** is positioned atop carousel **410**, and an attachment feature such as a two-pronged post **409** extends through a carousel channel **411** to interface with attachment channels **416**. Dispensing lid **406** has a rim **407**

around its perimeter. Within rim **407** sits a circuit board **404**, which may include a controller, a power source such as a battery, and a transmitter and/or a receiver. As seen in FIGS. **6-9**, a chamber sensor **604** and a dispensing sensor **606** extend from the bottom of circuit board **404** and sit within carousel access port **408** on dispensing lid **406**.

[0082] Top cover **402** has lips **403** on its bottom surface which interface with rim **407** to attach the top cover to the dispensing lid such that flexible cover **106** aligns with pill spout **405** on the dispensing lid. FIGS. **6-9** show a sequence of cross-sectional views of the pill dispenser during the process of dispensing a pill. FIG. **6** shows the pill dispenser in the receiving position, as a pill **602** is entering the chamber **412** via through-hole **413**. As seen in FIG. **7**, once the pill **602** is within the chamber, chamber sensor **604** detects the presence of the pill and in some embodiments triggers an indicator **108** via the controller to alert the user that a pill has entered the chamber. The user then grips and rotates the carousel until the carousel arrives at the dispensing position shown in FIG. **8**. In the dispensing position, dispensing sensor **606** detects that the chamber containing the pill is in the dispensing position. Upon receiving this information, the controller triggers a second indicator **108** in some embodiments to alert the user to open flexible cover **106** to receive pill **602**. Dispensing sensor **606** detects that pill **602** has left the chamber, and the dispensing event may be recorded and/or may be communicated to a mobile device or remote server. In some embodiments, the user rotates the carousel back to its original position, or, in other embodiments, a torsion spring causes the carousel to return. If the pill **602** did not leave the chamber as determined by dispensing sensor **606**, the event is not recorded. In this situation, once the carousel returns to its original position, the pill **602** falls back through through-hole **413** and into storage component **104**. Chamber sensor **604** and dispensing sensor **606** may be a proximity sensor, weight sensor, IR sensor, or any other suitable sensor to sense the physical presence of a pill.

[0083] FIG. **10** shows a flow chart describing the flow of information and data recorded by the sensing/control system throughout operation of the pill dispenser **100** in some embodiments. When a pill **602** enters the chamber **412** and is dispensed, the chamber sensor **604** and dispensing sensor **606** detect each event, respectively. In some embodiments, each respective event is reported by an indicator **108** on top cover **402**. When a pill is dispensed, the controller notes the event and sends information to the transmitter. The transmitter then sends the information to a mobile device or a remote server. The transmitter may use Bluetooth technology or any other suitable type of transmitter, and ultimately communicate with the mobile device or remote server via the Internet. The remote server or mobile device may each include software that accepts and records the information to create a pill dispensation history that can be reviewed by the prescriber or a caregiver.

[0084] The cap assembly may be equipped with a lock, for example, the cap assembly may include a push-pull solenoid that extends a latch into a receiving recess on the storage component, preventing the cap assembly from rotating relative to the storage component, limiting access to the pills contained within. The current disclosure is not limited to any specific locking mechanism, and a lock need not be present in various embodiments.

[0085] In some embodiments, the mobile device may be used to send locking and unlocking commands to the controller, which in turn actuates the lock. The cap assembly may remain actively locked for most of a given time period, and be unlocked for dispensation via a mobile device during a specified time window around a prescribed dispensation time. Similarly, a caregiver or a user may remotely send a lock command to the pill dispenser to prevent access if the dispenser is stolen or expired.

[0086] In some embodiments utilizing a mobile device, the pill dispenser may be unlocked for dispensation by entering a password and/or through biometric authentication. An application loaded on the mobile device may be configured to accept a fingerprint, take a facial scan, apply voice recognition, or otherwise ensure that an authorized user is the person attempting to access the pill dispenser. When the user is authenticated, the mobile device sends an unlock command to the controller, which then actuates the lock, allowing dispensation to occur.

[0087] In some embodiments of the pill dispenser, a caregiver or prescriber may desire a higher level of security, and an application (e.g., on a mobile device) may be used to record video of the pill being dispensed and/or consumed. In some embodiments, the caregiver may be able to select an option that requests or requires a user to start recording a video in order for the pill container to unlock. For example, the user's mobile device application may receive an indication that videos are required, and when it is time to access the pill container, a reminder may be displayed on the mobile device. Once a video recording is started, the mobile device may send an instruction to the pill container to permit opening. Regardless of whether the pill container has a lock, the application that is used to record dispensation history on the mobile device may be configured provide a time and date stamp for each recorded video, and may be configured to associate each video with each dispensation event, for example with a unique code. In these embodiments, when a caregiver reviews the dispensation history, he or she can additionally view the videos the ensure that the user was compliant with the medication schedule. In other embodiments, the software or application may send the videos and the dispensation history to a remote server for storage and management.

[0088] The cap assembly may be shaped and sized to fit on a typical pill bottles used by pharmacies. This design may allow a caregiver or pharmacist to maintain their current supply channels and opt to use a pill dispenser of the present disclosure when instructed by the prescriber, or if the prescribed medication is particularly dependent on compliance or is often abused. In addition, the familiar form factor and appearance of the pill container may be easier for a user to recognize when looking for the container.

[0089] While the cap assembly may be adapted to work with typical cylindrical, plastic pill bottles, the cap assembly may be used with containers made of different materials and/or containers with different shapes. For instance, some embodiments of the pill dispenser include a storage component made of stainless steel or another material that is difficult to penetrate. These embodiments make it particularly difficult to access the pills within the storage component except via the cap assembly, providing another level of prevention against potential medication abuse.

[0090] Another embodiment of the pill dispenser utilizes a storage component shaped like a common pill bottle, but the

walls of the bottle are lined with electrically conducting filaments such that the filaments are contained entirely within the walls of the storage component. In these embodiments, each filament creates a complete circuit, and current within the circuit is detected by the controller via an ammeter. If the storage component is compromised, the filaments are easily broken, breaking the electric circuit. In such a situation, the controller may register this event to a local digital memory storage component, or report to a remote server depending on the embodiment. With such an arrangement, a caregiver or pharmacist is made aware of the compromised container and can take further action if appropriate.

[0091] FIG. **11** shows an embodiment of a pill dispenser **800** which includes a cap assembly that can be attached to a conventional pill bottle and used to dispense a single pill at a time or a certain number of pills at a time. A cap assembly **802** is attached to the top of a storage component **804**. A moveable lid **806** on the top surface of cap assembly **802** covers an opening **812**. The opening allows one or more pills to be dispensed from a spout **904** that receives pills from the chamber when the carousel **1016** is in the dispensing position. A user may use a thumb grip **814** to slide the moveable lid from a closed to an open position. A coupler **818** extends from the bottom of cap assembly **802**. Snap-fit fingers **816** extending from coupler **818** interlock with blocking fingers **809**, which extend upwardly from a locking ring **808**.

[0092] In the illustrated embodiment, the carousel **1016** of cap assembly **802** is prevented from rotation when tab **810** is in a lowered latched position. When a user slides tab **810** upwardly, a latch on the bottom of tab **810** leaves a recess in the cap, allowing the carousel to rotate.

[0093] FIG. **12** is a top view of the pill dispenser **800**, and FIG. **13** is a top of pill dispenser **800** with moveable lid **806** removed. As can be seen in FIG. **13**, springs **902***a* and **902***b* bias the moveable lid toward the closed position. Dispensing spout **904** allows pills to leave the chamber when the carousel is in the dispensing position and the moveable lid is in the open position.

[0094] FIG. **14** is a top exploded view of the pill dispenser **800**, while FIG. **15** is a bottom exploded view. A central aperture **1000** of locking ring **808** fits around storage compartment **804**. The depicted embodiment has a locking ring with snap-fit hooks **1002** at the distal end **1003** of the locking ring on blocking fingers **809**. The snap-fit hooks attach to collar **1019**. Guiding surface **1004** in this embodiment is attached to the mouth of the storage compartment via guide stands **1006** which rest on the walls of the mouth of the storage compartment and is secured by coupler **816** resting over the mouth. The funnel surface **1102** guides pills to the opening of the guiding surface. The opening of the guiding surface acts as pill funnel **1005**, which leads through through-hole **1014** to chamber **1020** in carousel **1016**. Carousel **1017** rotates about rotation base **1010** which rests in stand base **1008** as best seen in FIG. **16**. Grip features **1017** are grippable by a user to rotate carousel **1017** about spring base post **1022**, which extends through carousel channel **1018**.

[0095] A torsion spring **1104** which biases the carousel toward the receiving position is mounted on spring base **1024**. Spring base channel **1026** allows lid **1028** to be attached to the spring base **1024**. A hole in the lid marks the beginning of the dispensing spout **904**. A circuit board **1034** rests on top of lid **1028**, and moveable lid base **1026** rests on top of circuit board **1034**. A chamber sensor **1038** extends from circuit board **1034** and actively monitors an occupation status of the chamber as will be described further below. A cap top **1030** rests over moveable lid base **1026**, circuit board **1034**, lid **1029** and spring base **1024**.

[0096] In the depicted embodiment, collar **1019** has gaps around the perimeter of the storage compartment. However, in some embodiments, the collar extends continuously around the perimeter of the storage compartment.

[0097] FIGS. **16** and **17** show the guiding surface **1004** attached to the storage container **804**.

[0098] FIGS. **18** and **19** are a perspective view and a top view of a removal tool **1300**.

[0099] Ramped protrusions **1304** extend from a top surface **1302** of the removal tool. A tool aperture **1036** is sized to have a diameter slightly larger than the diameter of the storage compartment **804** such that when the removal tool is sliding up the storage compartment, the ramped protrusions **1304** can slide under the snap-fit fingers **816** to pry them from collar **1019**.

[0100] FIG. **20** shows a cut-away view of one embodiment of the pill dispenser **1400**. In this figure, it can be seen that rotation base **1010** is nested in guiding surface **1004**. The remaining sections of the cap assembly are held together by rotation base **1010**.

[0101] FIGS. **21-24** show a sequence of cut-away views of the pill dispenser **1400** during the process of dispensing a pill **1402**. FIG. **21** shows the pill dispenser in the receiving position as a pill **1402** is entering the chamber **1020** through pill funnel **1005** and through-hole **1014**. As seen in FIG. **22**, when pill **1402** is in the chamber **1020**, chamber sensor **1038** detects the presence of the pill and, in some embodiments, triggers an indicator via a controller. To move the carousel **1016** to the dispensing position, the user slides tab **810** upwardly to an upper unlatched position, freeing the carousel to rotate. The user can then grip and rotate the carousel to the dispensing position shown in FIG. **23**. The user can then slide moveable lid **806** to the open position, and retrieve the pill from the chamber as seen in FIG. **24**. The chamber sensor **1308** detects that the pill has left the chamber and records the event. In some embodiments, the torsion spring **1014** returns the carousel to the receiving position, while springs **902***a* and **902***b* return the moveable lid to the closed position. When the carousel is returned to the receiving position, tab **810** is free to return to its lower latched position as well. In some embodiments, the tab **810** is spring biased to the lower latched position. In other embodiments, the tab **810** simply falls back to its latched position when the carousel is in the receiving position.

[0102] The above-described embodiments of the technology described herein can be implemented in any of numerous ways. For example, the embodiments may be implemented using hardware, software or a combination thereof. When implemented in software, the software code can be executed on any suitable processor or collection of processors, whether provided in a single computer or distributed among multiple computers. Such processors may be implemented as integrated circuits, with one or more processors in an integrated circuit component, including commercially available integrated circuit components known in the art by names such as CPU chips, GPU chips, microprocessor, microcontroller, or co-processor. Alternatively, a processor may be implemented in custom circuitry, such as an ASIC,

or semicustom circuitry resulting from configuring a programmable logic device. As yet a further alternative, a processor may be a portion of a larger circuit or semiconductor device, whether commercially available, semicustom or custom. As a specific example, some commercially available microprocessors have multiple cores such that one or a subset of those cores may constitute a processor. Though, a processor may be implemented using circuitry in any suitable format.

[0103] Also, the various methods or processes outlined herein may be coded as software that is executable on one or more processors that employ any one of a variety of operating systems or platforms. Additionally, such software may be written using any of a number of suitable programming languages and/or programming or scripting tools, and also may be compiled as executable machine language code or intermediate code that is executed on a framework or virtual machine.

[0104] As is apparent from the foregoing examples, a local digital storage medium may retain information for a sufficient time to provide computer-executable instructions in a non-transitory form. Such a local digital storage media can be transportable, such that the program or programs stored thereon can be loaded onto one or more different computers or other processors to implement various aspects of the present disclosure as discussed above. As used herein, the term "local digital storage medium" encompasses only a non-transitory computer-readable medium that can be considered to be a manufacture (i.e., article of manufacture) or a machine. Alternatively or additionally, the disclosure may be embodied as a computer readable medium other than a computer-readable storage medium, such as a propagating signal.

[0105] The terms "program" or "software" are used herein in a generic sense to refer to any type of computer code or set of computer-executable instructions that can be employed to program a computer or other processor to implement various aspects of the present disclosure as discussed above. Additionally, it should be appreciated that according to one aspect of this embodiment, one or more computer programs that when executed perform methods of the present disclosure need not reside on a single computer or processor, but may be distributed in a modular fashion amongst a number of different computers or processors to implement various aspects of the present disclosure.

[0106] For purposes herein, the term "pill" is intended to include any type of medication having a solid or semi-solid outer surface which maintains its shape during normal handling. For example, the term "pill" is intended to include tablets, capsules, caplets, lozenges, suppositories, chewing gum pieces, as well as other types of medication intended for patient ingestion.

[0107] Various aspects of the present disclosure may be used alone, in combination, or in a variety of arrangements not specifically discussed in the embodiments described in the foregoing and is therefore not limited in its application to the details and arrangement of components set forth in the foregoing description or illustrated in the drawings. For example, aspects described in one embodiment may be combined in any manner with aspects described in other embodiments.

[0108] Further, some actions are described as being performed by a user. It should be appreciated that a user need not be a single individual, and that in some embodiments, actions attributable to a user may be performed by a team of individuals and/or an individual in combination with computer-assisted tools or other mechanisms.

[0109] While the present teachings have been described in conjunction with various embodiments and examples, it is not intended that the present teachings be limited to such embodiments or examples. On the contrary, the present teachings encompass various alternatives, modifications, and equivalents, as will be appreciated by those of skill in the art. Accordingly, the foregoing description and drawings are by way of example only.

What is claimed is:

1-2. (canceled)

3. A cap for a pill bottle which has a collar, the cap comprising:

a first snap-fit finger extending downwardly from the cap, the first snap-fit finger having a hook configured to hook onto a collar of a pill bottle;

a second snap-fit finger extending downwardly from the cap, the second snap-fit finger being spaced from the first snap-fit finger and forming a first perimeter gap between the first and second snap-fit fingers, the second snap-fit finger having a second hook configured to hook onto the collar of a pill bottle; and

a complementary lock ring configured to obstruct access to undersides of the first and second snap-fit fingers, the lock ring including a first blocking finger, which, when the cap is snap fit onto a bottle, extends upwardly into the first perimeter gap to leave either no gap or a gap of less than 2 mm between a lateral edge of the first blocking finger and a lateral edge of the first snap-fit finger;

wherein the first blocking finger either leaves no gap or a gap of less than 2 mm between the lateral edge of the first blocking finger and a lateral edge of the second snap-fit finger.

4. A cap as in claim **3**, wherein:

the first snap-fit finger includes a first distal end,

the second snap-fit finger includes a second distal end;

when the cap is snap fit onto a bottle, and the first blocking finger of the lock ring is fully inserted between the first and second snap-fit fingers, the lock ring leaves either no gap or a gap of less than 2 mm between the lock ring and the first distal end, and the lock ring leaves either no gap or a gap of less than 2 mm between the lock ring and the second distal end.

5. A cap as in claim **3**, further comprising a third snap-fit finger which extends downwardly from the cap, the third snap-fit finger being spaced from the second snap-fit finger and forming a second perimeter gap between the second and third snap-fit fingers; wherein

the lock ring includes a second blocking finger extending upwardly into the second perimeter gap to leave either no gap or a gap of less than 2 mm between a lateral edge of the second blocking finger and a lateral edge of the second snap-fit finger; and

the second blocking finger leaves either no gap or a gap of less than 2 mm between the lateral edge of the second blocking finger and a lateral edge of the third snap-fit finger.

6. A cap as in claim **5**, wherein the first blocking finger comprises a snap-fit finger configured to hook onto the collar

of the pill bottle, and the second blocking finger comprises a snap-fit finger configured to hook onto the collar of the pill bottle.

7. A cap as in claim **6**, in combination with the pill bottle, wherein the lock ring is configured such that the lock ring has to be damaged in order to remove the lock ring from the collar of the pill bottle when the cap and the lock ring are attached to the pill bottle.

8. A cap and pill bottle as in claim **7**, wherein the pill bottle collar is a continuous ring encircling a perimeter of the pill bottle.

9. A cap and bottle as in claim **7**, wherein the pill bottle collar has gaps around a perimeter of the pill bottle.

10. A cap for a pill bottle, the cap comprising:

a coupler configured to attach the cap to a pill bottle;

a rotating chamber having first and second rotation states, wherein the rotating chamber is configured to receive a pill from the pill bottle through a bottom of the cap when the cap is attached to the pill bottle and the rotating chamber is in the first rotation state, and the pill is removable from the rotating chamber through a top of the cap when the rotating chamber is in the second rotation state; and

a lock ring configured to engage with a pill bottle collar and/or the pill cap in a locking position, wherein the cap cannot be removed with the lock ring in the locking position, and removal of the lock ring from the locking position requires damaging the lock ring.

11. A cap as in claim **10**, wherein the cap is configured such that removal of the cap from the bottle requires a tool.

12. A cap as in claim **10**, in combination with the pill bottle, wherein the pill bottle has a collar, and the cap coupler is configured to grasp the collar of the pill bottle.

13. A cap and pill bottle as in claim **12**, wherein the cap is configured such that removal of the cap from the bottle requires a tool to disengage the cap coupler, and the lock ring prevents access of the tool to the cap coupler.

14. The cap for the pill bottle of claim **10**, the cap further comprising:

a biasing element which biases the rotating chamber toward the second rotation state.

15. A cap as in claim **14**, wherein the biasing element comprises a spring.

16. A cap as in claim **15**, wherein the spring comprises a torsion spring.

17. A cap as in claim **14**, further comprising a movable lid, the movable lid selectively covering and uncovering the rotating chamber when the rotating chamber is in the second rotation state.

18. A cap as in claim **17**, wherein the movable lid is slidable.

19. The cap for the pill bottle of claim **14**, the cap further comprising:

a first removably attachable guide surface configured to be attached to the cap to guide a pill toward the rotating chamber from the pill bottle, wherein the first guide surface has a first opening through which a pill travels from the guide surface into the rotating chamber; and

a second removably attachable guide surface configured to be attached to the cap to guide a pill toward the rotating chamber from the pill bottle, wherein the second guide surface has a second opening through which a pill travels from the guide surface into the rotating chamber; wherein

the first opening has a different size and/or shape as the second opening.

20. (canceled)

21. A method of accessing a storage compartment in a pill bottle, the pill bottle having an attached cap that is snap-fit to a collar of the pill bottle, and a lock ring attached to the pill bottle, the method comprising:

permanently deforming the lock ring to permit removal of the lock ring from the pill bottle;

removing the lock ring from the pill bottle;

sliding ramps under each of a plurality of snap-fit fingers of the cap to disengage hooks from a collar of the pill bottle; and

removing the cap from the pill bottle.

22. The cap for a pill bottle of claim **3**, wherein:

the first snap-fit finger includes a first distal end,

the second snap-fit finger includes a second distal end; and

when the cap is snap fit onto a bottle, and the first blocking finger of the lock ring is fully inserted between the first and second snap-fit fingers, the lock ring leaves either no gap or a gap of less than 2 mm between the lock ring and the first distal end, and the lock ring leaves either no gap or a gap of less than 2 mm between the lock ring and the second distal end.

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