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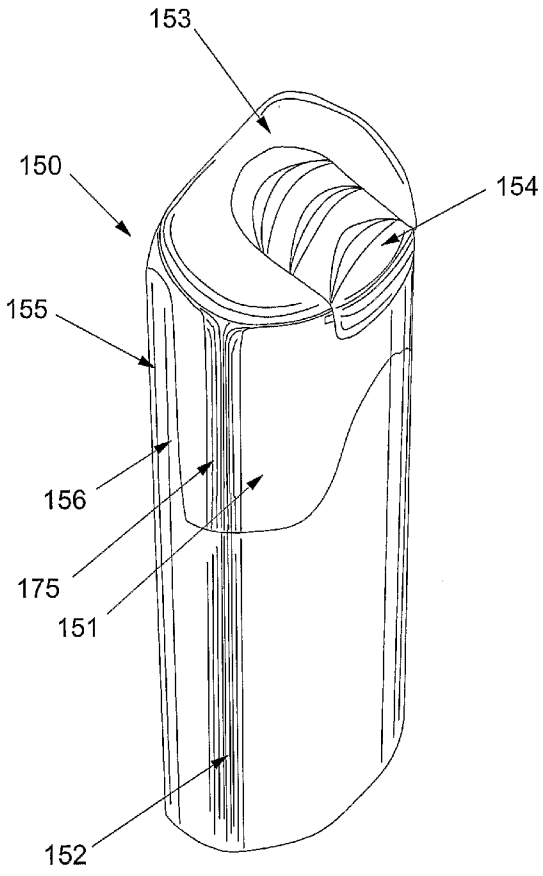
(54) Title: MULTI-DAY OR ERGONOMIC DISPENSERS FOR SMALL OBJECTS



(57) Abstract: The invention is a container, being closeable by way of a closure, for small items, said container having a floor and sidewalls, said sidewalls defining a top opening opposite said floor, the improvement comprising a closure having slidable means for urging said closure into an open position when said door or cap is in a closed position relative to said top opening.

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Title: MULTI-DAY OR ERGONOMIC DISPENSERS FOR SMALL OBJECTS

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TECHNICAL FIELD

The present invention relates to small object dispensers, especially for pills and capsules used for medication.

BACKGROUND ART

Medications in the form of pills and capsules are commonly delivered to the user in a small, inexpensive bottle, often with a child proof cap. Such a container is often inconvenient or a barrier to use. Many older persons can only infrequently open or need to have someone else open their child resistant caps for them to dispense their pills or capsules. Text on the bottle labels is typically printed in rather small type size, with multiple additional labels applied to the bottle by the pharmacist for tracking purposes. In effect, the medication bottle is a serious impediment to older and/or disabled persons from taking medication in the proper dose at the right time.

The multiplication of medicines to treat our many illnesses can cause a user to possess several bottles pills or capsules. Every additional bottle of medicine possessed by a user multiplies the potential for missing, doubling up or taking dangerously interacting doses of prescribed drugs. Yet, we need these medicines to save our lives.

Well designed pill dispensers are needed to address this growing problem of being properly treated with prescription and non-prescription medications. An additional design consideration for pill dispensers is the need to reduce the number of bottles that must be available for the user to take medications at an appropriate time. It is inconvenient to carry even a single bottle of medications, which usually hold a month's worth of medication.

Pill dispensers are known to have been designed with multiple compartments, where each compartment holds a single set of medications scheduled to be taken at a day or hour of the day. At a predetermined time, a user opens a single compartment and removes the pills and capsules in the compartment for ingestion. Yet, prior art pill dispensers often have a fault common to pill bottles.

All pill dispensers must have a way to seal individual compartments so that pills and capsules can't spill out of them before the user needs the medication. Prior art pill dispensers typically have a hinged door with a latch. Releasing and closing the latch in the prior art devices is sometimes as challenging as opening and closing the child resistant caps of the pill bottles. Such prior art latches are so complex or difficult to release that a person with reduced strength or impaired eyesight will often just leave the individual compartments open and risk losing medication rather than fight a latch at each medication time. In addition, such prior art devices can be and are often made from inexpensive polymer for ease of cleaning and low cost. Latches formed in inexpensive polymer break down after repeated use, forcing the user to either immediately buy another one or leave the broken latched doors open and thereby hope that no medication is lost thereby.

Pill dispensers made of polymer resin can be molded in several pieces and assembled thereafter. The hinge component of a compartment door can be formed as a living hinge so that the door is continuously integral with the body of the compartment. However, taking advantage of this savings in molds and assembly time results in a severe limit on the latch structure. Where the compartment door and compartment body are formed in separate mold cavities, the latch design can be made to be more easily and repeatedly opened by a user without breakage. This advantage eliminates the cost advantage of forming the door and the compartment body in a single molding step.

A current design for a pill dispenser comprises seven side by side and rectangular compartments are arranged in an elongated rectangle. Doors cover upward facing openings of the seven compartments. These doors are attached by hinge to a rear edge. The doors are held closed by releasable latches at a front edge of the compartment opening. Integral projections from the door must be provided so that each door can be opened from a latched and closed position. This

is a disadvantage in that a child may easily lift upward on these projections and gain access to medication within the compartments. Senior citizens often have somewhat reduced dexterity and are thereby prone to fumble ineffectually with prior art pill containers.

Another current and well known design for pill containers comprises a cylindrical bottle with a removable cap, which is sometimes "child resistant". Such a container requires two hands to open, which for disabled or arthritic persons is a substantial deterrent to keeping current with such medications.

There is a need for a small object dispenser, such as a pill dispenser, that may be easily opened and closed many times by a user and incorporates child safety features and is user friendly.

DISCLOSURE OF THE INVENTION

A multi-day embodiment of the present invention is a small object or pill dispenser with upwardly open compartments arranged side by side. Each opening is closable with a rectangular top door attached by living hinge to a rear edge of the opening. A top surface of the door has a sliding piece movable in a forward and/or rearward direction. The sliding piece is rectangular and is adapted to slide in a direction normal to the axis of the door's living hinge, i.e., so that a portion of the sliding piece will remain engaged with the door top while another portion will project horizontally over a forward edge of the door or over the rear edge of the door (the hinged edge).

In a safe or closed position, the sliding piece, in a preferred form, is moved to a position substantially within the door's form factor. Each door has a latch part that engages a forward edge of the compartment opening when in the closed position. In the prior art, front and side door edges typically have outward projections so a user can lift them upward to open the door. In a preferred form of the invention, a closed and latched door is not capable of being opened without a user's interaction with a sliding piece, as described below.

Consider a case where a sliding piece is moved from its inaccessible position substantially within the form factor of a door to a position partly projecting over a front edge of the door. A user then has a lever which can be lifted upward by finger

pressure to release the latch and open the door. The door can be closed and re-latched by pressing down on the projected part of the sliding piece.

Consider a case where a sliding piece is moved from its inaccessible position substantially within the form factor of a door to a position partly projecting over a rear (hinged) edge of the door. A user then has a lever which can be pressed downward by finger pressure to release the latch and open the door. The door can be closed and re-latched by lifting the projected part of the sliding piece.

An ergonomic embodiment of the invention is a single compartment for small object such as pills or other medication where the single compartment is, in cross section, substantially cylindrical, oval or some other flattened cylinder shape. Where a typical pill container in the prior art has a removable cap, the invention design attaches a cap by hinge to a rear edge of the compartment and uses a unique latch so that the cap can be opened using a single hand.

In a closed position, the cap extends downward around half or more of the circumference of the outside of the compartment (forward from the hinge). Latching means comprise a pair of slots and mating flanges on substantially opposite sides of a top part of the compartment. The slot and flange combination are parallel with a length of the compartment. In a preferred form, the compartment has two long, downward slots near the opening and open to the outside surface. Each slot is about equidistant from one of the two ends of the hinge so that the outward-opening slots are generally opposite one another on the compartment circumference. The cap sleeve comprises two flanges that are urged into their intended slots by spring pressure of the sleeve upon the outside of the compartment. The sleeve part of the cap cannot extend around more than about 70 to 80 percent of the compartment circumference or the cap cannot be opened or closed.

Consider the closing operation of the cap from an open position. The sleeve part of the cap is directed substantially upward and parallel to an axis of the compartment. In this position, the rear edge of the cap is attached by a hinge to a rear edge of the compartment. The sleeve does not extend circumferentially to the rear part of the cap which connects by hinge to the compartment. In top view in this open position, the general circumference of the inside and outside of the compartment and the cap are seen to be of similar shape, with the cap internal

circumference having about the same dimensions and shape as the outside circumference of the compartment. Long flanges on inside surface of the cap and slots on the outside surface of the compartment are seen in end view in this top view of the open position. In the open position, medication is in the compartment is easily dispensed. In this top view, it is easily seen that the sleeve of the cap terminates its circumferential reach at parallel and opposite terminating edges, thereby forming a wide slot. In one form, the flanges are formed on the inside of the sleeve so that they comprise those terminating edges.

In moving from the open to the closed position, the sleeve terminating edges sweep down about the hinge axis to engage outside surfaces of the compartment. In continuing to a closed position, the flanges and terminating edges continue their downward sweep to literally "embrace" the sides of the compartment by spring force of the sleeve around the compartment and the flanges are finally urged into their mating slots to latch closed. A front edge of the sleeve may be provided with a projected tab or other means for lifting the cap to an open position from the latched closed position.

In a more preferred embodiment, a sliding piece is incorporated into a top surface of the cap and may be moved to a position substantially within the cap's form factor. Consider a case where a sliding piece is moved from its inaccessible position substantially within the form factor of a cap to a position partly projecting over a front edge of the top surface of the cap. A user then has a lever which can be lifted upward by finger pressure to release the latch and open the cap. The cap can be closed and re-latched by pressing down on the projected part of the sliding piece.

The ergonomic embodiment may be opened and closed with a single hand where a user grasps the compartment in their palm and opens and closes the cap with thumb or fingers. A user can move the sliding piece out of the top surface of the door very easily with their thumb. In a preferred embodiment, the top surface of the cap is slanted downward and frontward so that the sliding piece is moved to a projected position more easily. When the sliding piece is projected from the top of the cap, it is easily pushed upward and open with the thumb of the compartment-grasping hand.

The ergonomic embodiment creates latch means that are exceptionally easy to understand and operate. These latch means will not fail even after long or hard usage by a user.

The invention embodiments define slidable means adapted to be moved by sliding motion from an inaccessible to an accessible position, thereby providing the user with a way to open the closure-sealed container. It is within the scope of the invention to adapt these means to the closures of other containers than those used for pills and small objects. For example, the slidable means may be adapted to sealing closures for food containers or other such larger sealing containers that require some substantial effort by a user to remove the closure from the container.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a top perspective view of a preferred form of the multi-day embodiment of the invention.

FIGS. 2, 3, 4, 5, and 6 are respectively rear, front, side, top and bottom views of the embodiment of FIG. 1.

FIGS. 7, 8, 9, and 10 are respectively bottom, top, side and mid section cutaway views of a sliding piece shown in FIG. 1.

FIG. 11 is a side cutaway view of a door of the embodiment of FIG. 1 in a closed position with a sliding piece substantially within the form factor of the door.

FIG. 12 is a side cutaway view of a door of the embodiment of FIG. 11 in a closed position with a sliding piece substantially projected and extended frontward over a front edge of the door.

FIG. 13 is a top perspective view of a preferred form of the ergonomic embodiment of the invention.

FIG. 14 is a view of the embodiment of FIG. 13 with a cap in an open position.

FIG. 15 is a view of the embodiment of FIG. 13 with a sliding piece removed from the cap.

FIG. 16 is a view of the embodiment of FIG. 13 with a sliding piece partly projected from a front edge of the cap.

FIGS. 17, 18, 19, 20 and 21 are respectively top, bottom, rear, front and side views of the embodiment of FIG. 13.

FIGS. 22, 23 and 24 are respectively cap closed position, sliding piece extended position, and cap open position views of a side view of the embodiment of FIG. 21.

FIG. 25 is a side cutaway view of the embodiment of FIG. 22 with the sliding piece removed.

FIG. 26 is a side cutaway view of the embodiment of FIG. 23 with the sliding piece extended.

FIG. 27 is a top view of embodiment of FIG.s 14 and 24.

FIG. 28 is a cross section of the cap engaged with a top part of the compartment of the embodiment of FIG. 13.

FIG. 29 is the cross section of FIG. 28 with the latch means disengaged.

FIG. 30 is a top perspective view of a two compartment form of the embodiment of FIG. 13.

FIG. 31 is a top perspective view of non-sliding piece form of the embodiment of FIG. 13.

FIGS. 32 and 33 are bottom perspective views of an alternate embodiment of the device of FIG. 13.

FIGS. 34 and 35 are broken away and top perspective views of an alternate embodiment of a cap of device of FIG. 13 where said cap is formed separate from the vial or container portion.

FIG. 36 is a broken away and side view of the device of FIGS. 34 and 35.

FIG. 37 is a top view of a compartment portion of the device of FIGS. 34 and 35.

FIG. 38 is a side and cutaway view of a separated cap and compartment of the device of FIGS. 34 and 35.

FIG. 39 is a side and cutaway view of a cap fixed to the compartment of the device of FIGS. 34 and 35.

FIG. 40 is a side and cutaway view of a cap fixed to the compartment of the device of FIGS. 34 and 35 with the cap in the open position.

FIG. 41 shows a second door in top, front end and side views respectively in the right, left and bottom figures.

FIG. 42 is a side and cutaway view of the door of FIG. 41.

FIG. 43 shows a second sliding piece in top, front end and side views respectively in the left, right and bottom figures.

FIG. 44 is a top view of a third sliding piece.

FIG. 45 is section 13 of FIG. 44.

FIG. 46 is a top view of the second door engaged with the third sliding piece in a closed, non-extended position.

FIG. 47 is a side and cutaway view of the device of FIG. 46.

FIG. 48 is a top view of the second door engaged with the third sliding piece in a closed, extended position.

FIG. 49 is a side and cutaway view of the device of FIG. 46.

FIG. 50 shows a top view of a third door.

FIG. 51 shows top, side and front views (respectively in top, bottom and right positions) of a fourth sliding piece.

FIG. 52 shows cross section 14 of FIG. 51.

FIG. 53 shows a top view of the third door engaged with the fourth door in a closed, non-extended position.

FIG.s 54, 55 and 56 show side and cutaway views of the device of FIG. 53 in, respectively, locked and non-extended, unlocked and non-extended, and unlocked and extended positions.

FIG. 57 shows bottom, top and front end views (respectively in top, bottom and left positions) of a fourth door.

FIG. 58 shows the door of FIG. 57 in a side and cutaway view in a closed position relative to a compartment.

FIG. 59 shows top and bottom views of a fifth sliding piece (respectively in top and bottom locations).

FIG. 60 shows a side and cutaway view of the device of FIG. 59.

FIG. 61 shows a side view of the device of FIG. 58 with the door in the open position.

FIG.s 62, 63, 64 and 65 are side and cutaway views of device of FIG. 61. FIG. 62 shows the door in the closed position. FIG. 63 shows the door just being disengaged from a latch. FIG. 64 shows a further disengagement from the latch. FIG. 65 shows the door fully released from the latch.

FIGS. 66 and 67 are respectively top and side views of a single rectangular compartment with an open top, said open top adapted to be closed by an invention V-top latch door.

FIGS. 68, 69, 70, and 71 are respectively top, front, bottom and side views of the invention V-top latch door in an extended position.

FIG. 72 is a side and cutaway view of the door of FIG. 71.

FIGS. 73, 74 and 75 are respectively first, second and third insertion steps for the door of FIG. 72.

FIGS. 76 and 77 are outer surface views respectively of the top and side of the door of FIG. 75.

FIG. 78 is a side and cutaway view of the compartment of FIG. 67 with the view of the door of FIG. 75 in a latched and engaged position in said compartment.

FIG. 79 is the assembly of FIG. 78 after a user has depressed a finger surface of the V-top latch door, thereby causing the latch connection between the door and compartment to disengage.

FIG. 80 is the assembly of FIG. 79 showing the door and compartment separated so that a user can have access to the compartment.

FIGS. 81 and 82 are respectively top and bottom views of a round top embodiment of the V-top latch door of FIGS. 68 through 80.

FIG. 83 is a side and cutaway view of the round door of FIG. 82 shown latched and engaged with a round compartment.

FIGS. 84 and 85 are respectively top and side cutaway views of a single rectangular spring-return door body.

FIGS. 86 and 87 are respectively top and side cutaway views of a sliding piece for the spring-return door body.

FIGS. 88 and 89 are respectively top and side cutaway views of the spring-return door body with its sliding piece engaged in a closed position.

FIGS. 90 and 91 are respectively top and side cutaway views of the spring-return door body with its sliding piece engaged in an open position.

MODES FOR CARRYING OUT THE INVENTION

The invention is now discussed with reference to the figures.

The general construction of the invention small object dispenser comprises a bottom section with the compartments and top section with sealing doors.

FIG. 1 shows a top perspective view of multi-day embodiment device 100 comprising open compartments 101 arranged side by side. The arrangement of compartments 101 results in an elongated structure designed for multi-day dose storage for medications or other such small pieces. Each opening of compartments 101 is closable by a rectangular top door 102 attached by living hinge (not shown) to a rear edge of the compartment 101 opening. A top surface 127 of each door engages a sliding piece 107 movable in a forward (and/or rearward, not shown) direction 128. Each sliding piece 107 is preferably rectangular and is adapted to slide in the direction 128 normal to the axis of the door's living hinge, i.e., so that a portion of the sliding piece 107 will remain engaged with the door top while an extended portion 111 will project horizontally over a forward edge of the door (or over the rear edge of the door, i.e., the hinged edge, not shown).

In a safe or closed position, the sliding piece 107, in a preferred form, is moved to a position substantially within the door's form factor, as shown in the case of the two left most sliding pieces 107 in FIG. 1. Each door has a latch part 110 that engages a forward inside edge of the opening for each compartment 101 when in the closed position (not shown). It is apparent from inspection of said two leftmost sliding pieces 107 lie within the form factor of their doors and are inaccessible to a user. Such leftmost doors are not capable of being opened without projection of a sliding piece, as shown by the extended portion 111 of the middle door and compartment of device 100. Stop 103 extends up from top surface 127 to engage a slot on the underside of sliding piece 107, which prevents extension of sliding piece 107 unless a user moves it forward with substantial force.

Device 100 comprises a slanted front wall 104 which rises to a front edge which is essentially flush with front ends of the doors 101 and their non-extended sliding pieces 107. Front wall 104 is essentially a flat plate. A user has no access to a projection what would allow them to open a door from a closed position (as in the two leftmost doors) to an open position (as in the three rightmost doors). A child without an understanding of the invention sliding pieces would be unable to open

device 100 when all the doors 101 are in the closed position and sliding pieces 107 lie essentially within the form factor of their engaged doors.

When extended portion 111 is available to a user, they may use portion 111 as a lever which may be lifted upward by finger pressure to release the door latch and open a door 101. The door 102 can be closed and re-latched by pressing down on the extended portion 111 of the sliding piece 107 or on the top of door 102.

In a preferred form, day initials 105 are formed on the top surface 127 to indicate to a user that for a particular day of the week the user's medication dosages will be found in the compartment 102 closed by the indicated door 102. Other indications of days of the week may be in Braille thereon or on other portions of the door. Partitions 108 are formed to separate each of compartments 102 from each other.

FIG. 2 shows living hinges 112 of doors 101 and rear wall 113. Doors 102 are joined at living hinges 112 to the top edge of rear wall 113. FIG.s 3, 4, 5 and 6 respectively show front, end, top and bottom views of the multi-day embodiment. FIG. 6 shows floor 117 comprising the floor sections of the compartments.

FIG. 6 shows that the underside of front wall 104 comprises a defined space 104d, bounded by front sidewalls of essentially vertical front sidewalls 104a of compartments 101 and portions of endwalls 115, and thereby open in a downward direction. It is preferable that ribs 104b supportively connect the inside surface of front wall 104 and front sidewalls 104a. This construction solves an important problem in multi-compartment devices such as this one. If a user grasps the ends of device 100 and twists in opposite directions, latches typical of this device can be made to spring open unintentionally. The present construction shown in FIG. 6 substantially resists this tendency.

FIG.s 7, 8, 9 and 10 show an exemplary sliding piece 118 which is similar to the sliding pieces described above. FIG. 7 shows the bottom surface 120 with slot 119 forming a cavity for receipt of a stop on a top surface of a door. Undercut cutaway 121 comprises a curved indentation in a rear end of sliding piece 118 adapted to receive a user's fingertip so that a user may push and/or pull sliding piece 118 to an extended position outside of the form factor of its engaged door. FIG.s 8 and 9 shows a stepped up top surface 123 and slot flanges 122. FIG. 10 shows a side view of a longitudinal mid-section cutaway of sliding piece 118.

FIG. 11 is a side view of the sliding piece 118 of FIG. 10 engaged in the form factor of door 101 in slot 119 so that forward motion of piece 118 is resisted by rounded resistance extension 103 in top surface 127. As shown in FIG. 12, when a sliding piece 118 is engaged with a door 101, slot flanges 122 are engaged in mating horizontal slots 124 in top surface 127 and are adapted to provide a secure sliding track for moving sliding piece 118 forward and back. Referring again to FIG. 11, front end 126 of sliding piece 118 closely and smoothly transitions to the top, front edge of front wall 104 so that a user cannot lift upward on a projecting edge of door 101 or sliding piece 107 in the closed position. In a closed position, lug 129 projecting forward from door 101 engages notch 130 to form a latch to retain door 101 in a closed position.

In FIG. 12, front end 126 of sliding piece 118 has been pushed forward by a user past extension 103 as compared with the inaccessible position in FIG. 11. A user cannot push piece 118 forward beyond that position permitted by stop 103a, which abuts the rearmost part of piece 118. A user pushes upward on the extended part of front end 126 with sufficient force to cause lug 129 to disengage from notch 130 so that a user can move door 101 to an open position.

An ergonomic embodiment of the invention is shown as device 150 in FIG. 13. Device 150 comprises a single compartment 152 for small object such as pills or other items where the single compartment 152 is, in cross section, substantially cylindrical, oval or some other flattened cylinder shape. Device 150 attaches a cap 151 by hinge to a rear edge of the compartment 152 and uses a unique latch so that the cap 151 can be opened using a single hand. Cap 151 preferably comprises a forward and downward angled top surface 153 engaging a sliding piece 154 similar in function to the sliding pieces of the multi-day embodiment. A rear edge of top surface 153 forms part of the hinged attachment to a top rear edge of an upper part 155 of compartment 152. Extending down from top surface 153 is sleeve 175, which is comprised of side portions 169 (which end in terminal edges 156) and a front portion joining side portions 169. Sleeve 175 matingly engages its inside surface to upper part 155 of compartment 152, although not all of upper part 155 is engaged by sleeve 175.

FIG.s 14, 24 and 27 show cap 151 in an open position relative to compartment 152. FIG. 14 shows that sleeve 175 comprises an inside surface from which extends two long flanges 160 generally parallel to the downward walls of sleeve 175. Flanges 160 are located in side portion 169 of sleeve 175 in an opposing relationship. Cap 151 further comprises a recess bottom edge 159 which is continuous with terminal edges 156. Edges 159 and 156 generally lie adjacent to inset ledge 158 when cap 151 is in the closed position. Inset surface 157 is the portion of upper part 155 which is engaged by the inside surface of sleeve 175 when cap 151 is in the closed position. The inside of cap 151 is shown to have substantial internal capacity and is continuous with the inside of compartment 152. User's may take advantage of this capacity of cap 151 in the open position. A user can tilt compartment 152 so that pills or other small items slide into the inside of cap 151 for selection or sorting. A user need not contaminate such pills or small items by spilling them into a user's hand or countertop.

Recess bottom edge 159 makes an upward cutaway from the level of edges 156 when the cap is in the closed position. It has been found that this recess is important to the user's ability to open the cap. When the sliding piece is moved into its extended position, an upward movement on the extended part causes the cap to

open. However, the front edge of the cap swings outward and can interfere with the user's contact with the sliding piece if the cap is extended down too far. The recess shown in the cap allows unimpeded use of the extended part of the sliding piece when opening the cap.

FIG.s 15 and 16 show sliding piece 154 respectively disengaged and partly engaged with top surface 153. Undercut 164, shown in broken lines in top surface 153, is adapted to slidingly receive sliding flanges 166 of sliding piece 154 so that sliding piece 154 is capable of being moved back and forth along direction 170 (as in FIG. 15). An opening 165 provides user access to ridged top surface 167 of sliding piece 154. FIG. 16 shows that extended part 168 is available for a user to push upward on its underside, thereby causing cap 151 to disengage from a latched and closed position with respect to compartment 152. FIG.s 17 through 21 provide other views of the device 150 of FIG. 13.

FIG.s 22, 23 and 24 in succession show the steps of a moving cap 151 from a closed position to an open position. FIG. 22 shows that a user has no access to any projection from cap 151 that would allow the user to open closed cap 151. The entire outside surface of device 150 is essentially smooth and uniform, which makes device 150 pleasing to view and will easily store with other articles in a user's pocket or purse without becoming tangled or caught upon those other articles. FIG. 23 shows that a user has moved sliding piece 151 in a downward and frontward motion so that projection 168 is available to push upward. The ergonomic embodiment may be opened and closed with a single hand where a user grasps the compartment 152 in their palm and pushes the underside of extension 168 with their thumb tip to disengage latch means that hold cap 151 in the closed position. FIG. 24 shows cap 151 in an open position whereby pills or items in compartment 152 can be dispensed. FIG. 24 shows one of flange slots 161 which is engaged by flanges in cap 151 to form the latch means. Flange slots 161 are in the form of semi-cylinders with an open top and solid bottom. Slits 161a are preferably made in the walls of slots 161 from at topmost edge and down most of their vertical length to provide ease in manufacturing and use.

The relationship of sliding piece 154 to top surface 153 is shown in FIG.s 25 and 26, mid-section cutaway views of the ergonomic embodiment in side view. In FIG.

25, undercut 164 of top surface 153 is shown to extend to an opening in a front edge of top surface 153. In FIG. 26, sliding piece 154 is shown with extended portion 168 (as in FIG. 23.

FIG. 28 is a horizontal cross section of upper part 155 and sleeve 175 in a fully latched and closed position. Flanges 160 are urged into flange slots 161 by the opposing spring force of sleeve 175 to form the latch means. FIG. 29 is the cross section of FIG. 28 with sleeve 175 slightly forward of the latched position in direction 176 so that flanges 160 have been moved out of flange slots 161 and instead are urged against right and left sides of inset surface 157.

FIG. 30 is an alternate form of the ergonomic embodiment with a body divided into two joined compartments 152a and 152b separated by an internal partition (not shown) and having closures at their respective open ends caps 151a and 151b. This form is the equivalent of fusing two floors of two devices 150 to provide a two compartment device.

FIG. 31 is an alternate form of the ergonomic embodiment with a cap 151c lacking a sliding piece to open said cap. Instead, a raised portion 172 of a front edge of the sleeve of cap 151c can be lifted up by a user's fingertip or thumb.

FIGS. 32 and 33 show an alternate embodiment of the device of FIG. 13 where a bottom surface 177 is adapted to provide a user with means for carrying the device suspended from a string, keychain, lanyard, clip or other such devices. These carrying means comprise an arched loop 178 with opening 181 for passage of the string or lanyard. Loop 178 is adapted to be folded along its living hinge 182 connection with a rear edge of bottom surface 177 so that it can be stored flush with bottom 177 in arched slot 179. Upward extension 180 fills opening 181 when loop 178 is in the stored position.

It is an alternate embodiment of the invention of FIG. 13 to form the cap apart from the compartment with means to connect the two parts. This embodiment is shown in FIGS. 34 through 40.

FIGS. 34, 35 and 36 are views of the alternate embodiment where a cap 151d is shown fitted to the top portion of compartment 152d with a part of the attachment means extended outside of compartment 152d. The latch means of this embodiment are similar to the of the device of FIG. 13 and are not repeated again. FIG. 34 shows

that cap 151d comprises a rear portion 184 from which extends from living hinge 185 an angled section 186/187. From section 186/187 extends connector plate 188 bearing lug 189. Connector plate 188 is rectangular and is adapted to be inserted and fixed to an interior pair of slots inside the rear wall 183 of compartment 152d. FIGS. 34 and 35 display a notch 190 at a top edge of rear wall 183 into which fits angled section 186/187 when cap 151d is fixed to compartment 152d.

FIG. 37 is a top view of compartment 152d showing two U-shaped slots 192 formed between L-shaped extensions 193 and the inside of rear wall 183. Zone 191 is where the connector plate of the cap will be fixed when said cap is fixed to compartment 152d. As described above for the device of FIG. 13, flange slots 161 are formed in the walls of compartment 152d.

FIG. 38 shows cap 151d oriented above compartment 152d ready for fixing thereto by insertion in direction 195 where a lowest edge of connector plate 188 is directed into the open top end 196 of slots 192. Plate fixing notch 194 is formed in rear wall 183 to receive lug 189 and thereby fix plate 188 to the inside surface of the rear wall 183.

FIG. 39 shows cap 151d fixed to compartment 152d. Connector plate 188 is shown urged against the inside of rear wall 183 by L-shaped extensions 193 so that lug 189 is secured in notch 194. FIG. 40 shows cap 151d opened with respect to compartment 152d, having been rotated upward on living hinge 185.

Additional Forms of Sliders for the Multi-Day Embodiment

FIG.s 41 through 64 contain four additional sliding pieces adapted to slide back and forth across the door top surfaces. The previously disclosed sliding pieces were described above with reference to FIG.s 1 through 12.

A second door and sliding piece are now disclosed. Turning to FIG. 41, a door 200 is shown in top, front end and side views respectively in the right, left and bottom figures. Door 200 is similar to the first door described previously, comprising a top plate 201 covering an internal slot 202, further bounded by sidewalls and floor 203. FIG. 42 shows door 200 in side cross section.

Turning to FIG. 43, a second sliding piece 204 is shown in top, front end and side views respectively in the left, right and bottom figures. Sliding piece 204 is similar to the first sliding piece described previously, comprising a center plate 205 with side flanges 206 for engaging grooves the internal slot of the door. Finger impression 107 is adapted to be pressed by a user's thumb or finger to move piece 204 forward.

FIG. 44 shows a third sliding piece 208 comprising a central plate in which two slots 209 define a tab 210 which can be pressed downward at a rear end. This action causes said tab 210 to deflect downward from the adjacent central plate. On a portion of tab 210 is stop 211, which is raised slightly above the surface plane of the central plate. FIG. 45 shows these features in side cross section 13 of FIG. 44.

FIG. 46 shows piece 208 engaged within the internal slot of door 200, which is shown in a closed position. FIG. 47 shows a side cross section view of the device of FIG. 46 where stop 211 abuts a rearmost edge of top plate 201 so that piece 200 can't be pushed in a forward direction. However, FIG. 48 shows that piece 208 can be pushed in a forward direction to provide an overhang which a user may use to open door 200. FIG. 49 shows that a user may depress the rearmost part of tab 210 so that it downwardly deflects stop 211 below the level of the inside surface of top surface 201. When stop is so deflected, a user may press forward on a rear end of tab 210 and move piece 208 in a forward direction.

FIG. 50 shows a third door for incorporation into the device of the multi-day embodiment. Door 212 comprises a top surface 213 with lock piece opening 215. A slot 214 is formed in this third door similar to that of the second door. FIG. 51 shows top, side and front views (respectively in top, bottom and right positions) of a fourth

sliding piece 216. Piece 216 comprises a central plate 217 with lengthwise flanges and a rear impression 220. Plate 217 comprises a defining slot which defines deflectable tab 218, which has a raised locking extension 219. FIG. 52 shows a side cross section of piece 216 of FIG. 50 showing that extension 219 is urged upward by the spring action of tab 218 relative to plate 217.

FIG. 53 shows piece 216 engaged in an internal slot of door 212. FIG. 54 is a side cutaway view of the device of FIG. 53, where extension 219 is urged upward in a locking position into opening 215. When extension 219 is maintained in that position, piece 216 cannot be moved forward to allow opening of door 212. FIG. 55 shows the position of extension 219 when a user has depressed it below the level of top surface 213, whereafter (as shown in FIG. 56) a user may press impression 220 to move the piece into the extended position for opening the door.

A fourth door 221 is shown in bottom, top and front end views in FIG. 57 (respectively top, bottom and left positions) comprising a top surface 222 and a bottom surface 223 joined by sidewalls to form an internal slot 224. A downward extension from a front edge of bottom surface 223 is formed for further extension of latch plate 226. Latch plate 226 comprises a latch edge 225. FIG. 58 shows door 221 in side cross section in a closed position with respect to front sidewall 234. Slot 224 is shown to have front and rear openings. Latching edge 225 is shown engaged in latch notch 233, which prevents opening of door 221. Rounded top edge 232 is provided at the top edge of sidewall 234. As shown in FIG. 58, a user cannot easily open door 221.

FIG. 59 shows top and bottom views of a fifth sliding piece 227 (respectively in top and bottom locations) comprising a plate 228 with an impression 229 in a rear edge and an door opening ramp 231. Bottom surface 230 has a substantially reduce elevation relative to ramp 231. FIG. 60 shows that ramp 231 is inclined downward in a rearward direction relative to a front edge of piece 227. Piece 227 is adapted to, when pushed forward relative to its engaging door, pop open said door by causing a release of any latching means holding the door closed. In addition, when the door is pressed into a closed position, piece 227 is forced back into its "loaded" position, ready once again to open said door. FIG. 61 shows door 221 with piece 227 moved into its forward most position, with door 221 fully opened on hinge 238. Hinge 238

connects door 221 to compartment 236. Compartment 236 comprises front sidewall 234 and other sidewalls 237. Front sidewall 234 comprises the latch notch 233, which prevents opening of door 221 by engaging edge 225. Rounded top edge 232 is provided at the top edge of sidewall 234.

FIG.s 62 through 65 show the steps of opening door 221 relative to compartment 236. Closing door 221 relative to compartment 236 is accomplished with these steps in reverse.

FIG. 62 is a side and cutaway view of door 221 in a closed position, with edge 225 fixed in notch 233. Piece 227 is slidably fixed in slot 224 in door 221 so that a user can move piece 227 forward by pressing on impression 229. Ramp 231 contacts top edge 232. Piece 227 can only be moved in a forward direction for distance 239, until a forward edge of impression 229 abuts a rearmost edge of top surface 222.

FIG. 63 shows the device of FIG. 62 just after piece 227 has been slightly forward. Ramp 231 is forced over edge 232, raising all of the front of door 221 so that edge 225 slightly flexes out of notch 233. FIG. 64 shows an continuation of that process, where edge 225 springs free of notch 233 to permit door 221 to open as shown in FIG. 65. The limit of forward motion of piece 227 relative to door 221 (distance 239 of FIG. 62) prevents a bottom edge of ramp 231 from moving too far forward. In the forwardmost position, the lower edge of ramp 231 will miss top edge 232 and impact ramp 231 instead. Closing door 221 thereby returns piece 227 to the position shown in FIG. 63.

A V-top latch embodiment is now described with reference to FIGS. 66 through 83. In general, the V-top latch refers to the side view shape of an actuating addition to the sliding piece shown opening a door in FIGS. 62 through 65. That sliding piece is changed in this embodiment so that multiple hinges form an upside down V-shape in a rear part of the sliding piece. When a user presses down and forward on the top surface of the rearmost part of the upside down V-shape, a ramp at the front of the sliding piece presses against an inside top edge of the compartment. Increasing force to the ramp causes the entire front of the door to lift up and unlatch from its connection with the compartment. It is clear from the description of the embodiment shown in FIGS. 62 through 65 that the door and sliding piece must be separately

molded and comprise separate pieces. The present V-top latch door can be formed and molded from an appropriate polymer as a single, unitary piece, i.e., in a single "shot" or molding step.

FIGS. 69 through 71 show the V-top latch door device 240 generally comprising a sliding piece 241 and body of the door 242 connected by living hinge 248, which allows sliding piece 241 to be securely rotatable about the axis of living hinge 248. Sliding piece 241 also comprises ramp section 243 connected by living hinge 246 to center section 244. Center section 244 is in turn connected to pressing section 245 by living hinge 247. Pressing section 245 is in turn connected with door 242 by living hinge 248. Living hinges 246, 247 and 248 are parallel with each other and permit a range of rotation to obtain the objects of the invention. FIG. 71 shows that hinges 246 and 247 comprise substantial clearance so that the subsequent insertion steps can be accomplished.

FIGS. 69 through 71 further illustrate a structure of door 242 as comprising a rectangular door adapted to be secured as a sealing lid for a compartment. Specifically, extensions 256 are adapted to fit into notches on a compartment as a latching means.

FIGS. 66 and 67 are representative of a rectangular compartment 270 having sidewalls 271, front wall 272 and rear wall 274 extending up from a floor to form an open top container similar to the individual compartments in the multi-day embodiment. Compartment 270 may be a single compartment or may be joined side by side with other such compartments as described in the multi-day embodiment. Horizontal notches 273 are adapted to receive extensions 256 of door 241, as shown in FIG. 71. FIG. 71 further indicates that section 243 comprises a ramp 249 and a bottom surface 250. Ramp 249 acts and accomplishes results similar to the ramp 231 (as shown in FIGS. 59 and 60).

FIGS. 69 through 72 further illustrate the structure of door 242 as comprising surface 253 extending down and forward from living hinge 248. Extending down from the forward edge of surface 253 is wall 260, whose lower end extends horizontally forward as bottom plate 262. Fixed above a forwardmost part of plate 262 is top plate 251. Top plate 251, bottom plate 262 and supporting sidewalls define a passage 262 having a top opening 254 and a forward opening 259. A pair

of raised walls 252 are arranged extending up from sides of surface 253 to protect the upside down V-shape sliding piece when sliding piece 241 is in its actuating position. FIGS. 69 through 72 show the sliding piece 241 in an extended position. Such an extended position is a preferred position in which the device 240 appears during its molding.

Consider FIGS. 73 to 75, which show the steps of folding and inserting sliding piece 241 into door 242 to an inserted position. A first step is shown in FIG. 73, where sliding piece 241 is folded in a forward direction so that section 245 rotates at hinge 248 relative to door 242 and section 244 rotates at hinge 247 relative to section 245. In a second step shown in FIG. 74, sliding piece 241 is further folded in a forward direction so that (i) section 245 rotates at hinge 248 relative to door 242, (ii) section 244 rotates at hinge 247 relative to section 245, and (iii) section 243 rotates at hinge 246 relative to section 244. This action brings section 243 into an insertion position relative to opening 254. The ramp end of section 243 is inserted into opening 254 and moved along path 278 to the inserted position shown in FIG. 75, where ramp 249 is oriented at opening 259 in a manner similar to that of ramp 231 shown in FIG. 32. Referring again to the V-top latch door device, it is seen in FIG. 75 that sections 245 and 246 form an upside down V-shape, where section 246 comprises an upward and rearward facing surface. It is this surface that a user will press down and forward to actuate the sliding piece 241 into unlatching device 240 from its engaged compartment. FIGS. 76 and 77 show that raised walls 252 protect sections 245 and 246 from inadvertent actuation when in the positions shown therein. FIG. 77 shows that a finger indent may be formed on section 245 so that a user may more easily press upon it. A user may also press down upon the upward facing surfaces of hinge 247 and section 244.

FIGS. 78, 79 and 80 respectively show first, second and third steps in disengaging device 240 from compartment 270. Engaging device 240 to compartment 270 simply occurs in reverse so that sliding piece 241 automatically and necessarily returns to its actuating position shown in FIG. 78. The V-top latch door device is inherently child resistant because it no time, in the closed position, presents any peripheral edge that may be pried upward to open the door. FIG. 80 shows sliding piece 241 in its actuated position, i.e., where its fowardmost part has a

ramp that caused device 240 to be lifted from its front edge out of latching engagement with compartment 270.

FIG. 78 shows ramp 249 impressed on top inside edge 275 of front wall 272. Extensions 256 are engaged in notches 273 in a latched position. The upward surface of section 245 is oriented to receive finger or thumb pressure in direction 268 to move sliding piece 241 from an actuating to an actuated position.

FIG. 79 shows that a user has depressed section 245 in direction 268 so that sections 244 and 245 collapse down to surface 253, thereby pushing section 243 forward in passage 261. Ramp 249 is also pressed forward so that it impresses on top inside edge 275 to lift the entire device 240 upward at its forward edge. The forward part of extension 256 is disengaged from notch 273 in front wall 272 so that device 204 is freed from its latched position.

FIG. 80 shows that device 240 is entirely disengaged from compartment 270. A user returns device 240 to its latched and actuating positions by simply reversing the steps shown in FIGS. 78 to 80. In so reversing those steps, a user causes ramp 249 to press upon top inside edge 275 so that sliding piece 241 returns to its upside down V-shaped position shown in FIG. 78. The device 240 cannot be re-engaged without this action occurring.

It is a further form of the V-top latch door to modify section 244. Releaseable stop means are provided so that a user may not proceed from the step shown in FIG. 78 to that in FIG. 79 without taking an intervening action. Referring to FIG. 78, stop means are added to section 244 so that its upward surface comprises an upward extension. A specific example of such an extension is shown as the extension 211 on tab 210 of in FIGS. 44, 45 and 47 to 49. In the present form of the invention, said extension abuts a rear edge of top surface 251 as shown in FIG. 78 and such a tab is formed in section 244 so that a user must press down on said tab to permit a forward sliding motion of section 243 to the position shown in FIG. 79.

FIGS. 81 to 83 show device 240a to be device 240 of FIGS. 68 to 80 adapted to seal a round compartment 270a (as shown only in FIG. 83). That adaptation does not affect the functions of device 240a to engage and disengage it from compartment 270a. Ramp 249a is adapted to have a radius appropriate to engage a top inside edge 275a of cylindrical sidewalls 257a of compartment 270a. Sliding

piece 241a is adapted to be inserted into passage 261 as previously described for sliding piece 241 in FIGS. 73 to 75 so that its ramp 249a engages top inside edge 275a. The form of device 240a is adapted to a round container to achieve an air tight seal for compartment 270a. The seal is shown in FIG. 83 as formed by causing a circumferential extension 256a from the round sidewalls 257a to sealingly engage an appropriately dimensioned circumferential notch 273a on the inside surface of sidewalls 272a.

Consider a spring return door embodiment as shown in FIGS. 84 through 91. FIGS. 84 and 85 are respectively top and side cutaway views of a single rectangular spring-return door body 300. Door body 300 comprises a sliding cavity between a lower part 302 and a removable cover 301. A post 303 arises from a floor of the lower part 302.

FIGS. 86 and 87 are respectively top and side cutaway views of a sliding piece 304. Sliding piece 304 which is adapted to be engaged with the spring-return door body to provide a means for opening the spring-return door when it engaged to a compartment (such as that shown in FIGS. 66 and 67). A long slot 310 is formed in a lengthwise axis of sliding piece 304 to engage the post of the door body. A tab 306 extends from sliding piece 304 rearward into to an opening forward from slot 310. Tab 306 urges downward latch 307 below a bottom surface of sliding piece 304. A rear edge of sliding piece 304 comprises a finger indent 305 for pushing sliding piece 304 in a forward direction.

FIGS. 88 and 89 are respectively top and side cutaway views of the spring-return door body 300 with its sliding piece 304 engaged in a closed position. Removable cover 301 is removed in FIGS. 88 through 91 to expose the operation of this embodiment. Spring 308 is secured in slot 310. One end of end of spring 308 is urged against a rear facing surface of post 303 while its other end is urged against a rearmost end of slot 310. Spring 308 resists a user pushing the sliding piece forward at indent 305. If user attempts to push said sliding piece forward, it will return to the closed position shown in FIGS. 88 and 89. FIG. 89 shows that the latch at the end of tab 306 is pressed upward by the floor of the sliding cavity in door body 300 when the sliding piece is engaged in said sliding cavity.

FIGS. 90 and 91 are respectively top and side cutaway views of the spring-return door body 300 with its sliding piece 304 engaged in an open position. These figures show the location of sliding piece 304 after a user has pushed it so far forward against the spring resistance of spring 308 that latch 307 clears front edge 309 of door body 300 and snaps downward to engage edge 309, thereby maintaining sliding piece 304 in the position shown in FIGS. 90 and 91. The extension of sliding piece 304 beyond edge 309 provides a lever a user may use to lift upward to disengage door body 300 from engagement with a compartment. A user may cause sliding piece 304 to automatically retract into door body 300 by disengaging latch 307 from edge 309.

The above design options will sometimes present the skilled designer with considerable and wide ranges from which to choose appropriate apparatus and method modifications for the above examples. However, the objects of the present invention will still be obtained by that skilled designer applying such design options in an appropriate manner.

Claims

I claim:

1. A container, being closeable by way of a closure, for small items, said container having a floor and sidewalls, said sidewalls defining a top opening opposite said floor, the improvement comprising a closure having slidable means for urging said closure into an open position when said door or cap is in a closed position relative to said top opening.

2. The container and closure of claim 1 wherein said closure comprises a top surface and which extends to engage the sidewalls near the top opening when the closure is in the closed position.

3. The container and closure of claim 2 wherein the slidable means comprise a sliding member slidably engaged in a sliding slot open at least partly to a user at the top surface of the closure and the sliding member does not substantially extend laterally beyond said top surface of the hinged door when the sliding member is in an inaccessible position.

4. The container and closure of claim 3 wherein the sliding member is capable of being moved by sliding from the inaccessible position to an accessible position so that a portion of the sliding member extends partly beyond a peripheral edge of the closure and thereby also extends beyond a peripheral edge of the top opening.

5. The container and closure of claim 4 wherein the sidewalls of the container are generally parallel and define a first axis, whereby the sliding slot and sliding member are aligned so that their sliding direction is substantially greater or less than normal to the first axis to provide an ergonomic access to an accessible extension of the sliding member when it is in the accessible position.

6. The container and closure of claim 5 wherein a radial cross section of the sidewalls of the container is generally oval or flattened from circular so that the container may be ergonomically held in a user's hand.

7. The container and closure of claim 6 wherein, when the closure is in an closed position, an edge of the closure is connected by hinge to a back edge of the container and the sliding member in the accessible position extends beyond a front edge of the closure and forms an acute angle with an outside, front surface of the container.

8. The container and closure of claim 3 wherein the sliding member, in a closed position, is capable of being moved by sliding from the inaccessible position to an accessible position so that a front portion of the sliding member is capable of impinging on an edge of the top opening or on an inside surface of the sidewalls near the top opening, thereby urging a portion of the closure near said impinging action into an open position.

9. The container and closure of claim 8 wherein the sliding member comprises a connector plate having a rear edge connected by first hinge to a back edge of the closure, a mid-plate having a rear edge connected by a second hinge to a front edge of the connector plate, and an opener plate having a rear edge connected by a third hinge to a front edge of the mid-plate, whereby the opener plate comprises an opening wedge at a front edge opposite the rear edge of the opener plate and where the sliding slot is open to the top surface of the closure for receiving the opening wedge.

10. The container and closure of claim 8 wherein, when the closure is in a closed position, at least a portion of the opener plate is engaged in the sliding slot and a portion of the opener wedge is in an alignment whereby a surface of the opener wedge forms an acute angle with respect to an inside surface of the container near the top opening.

11. The container and closure of claim 8 wherein, when the closure is in a closed position, the connector plate and mid-plate are exposed to access by a user, whereby depression of the connector plate by a user urges the closure to an open position.

12. The container and closure of claim 3 wherein the sliding member comprises releaseable latching means adapted to resist sliding motion of the sliding member when it is in an inaccessible position.

13. Two or more containers for small items, each being closeable by way of a closure and each having a floor and sidewalls, said sidewalls defining a top opening opposite said floor, where the containers are joined side by side for sequential use by a user, the improvement comprising each of said closures having slidable means for urging said closure into an open position when said door or cap is in a closed position relative to said top opening.

14. The containers and closures of claim 13 wherein each said closure comprises a top surface and which extends to engage the sidewalls near the top opening when the closure is in the closed position and the slidable means comprise a sliding member slidably engaged in a sliding slot open at least partly to a user at the top surface of the closure and the sliding member does not substantially extend laterally beyond said top surface of the hinged door when the sliding member is in an inaccessible position.

15. The containers and closures of claim 13 wherein each said top surface of each of said closures comprises a text or graphic device differentiating each of said closures from each other.

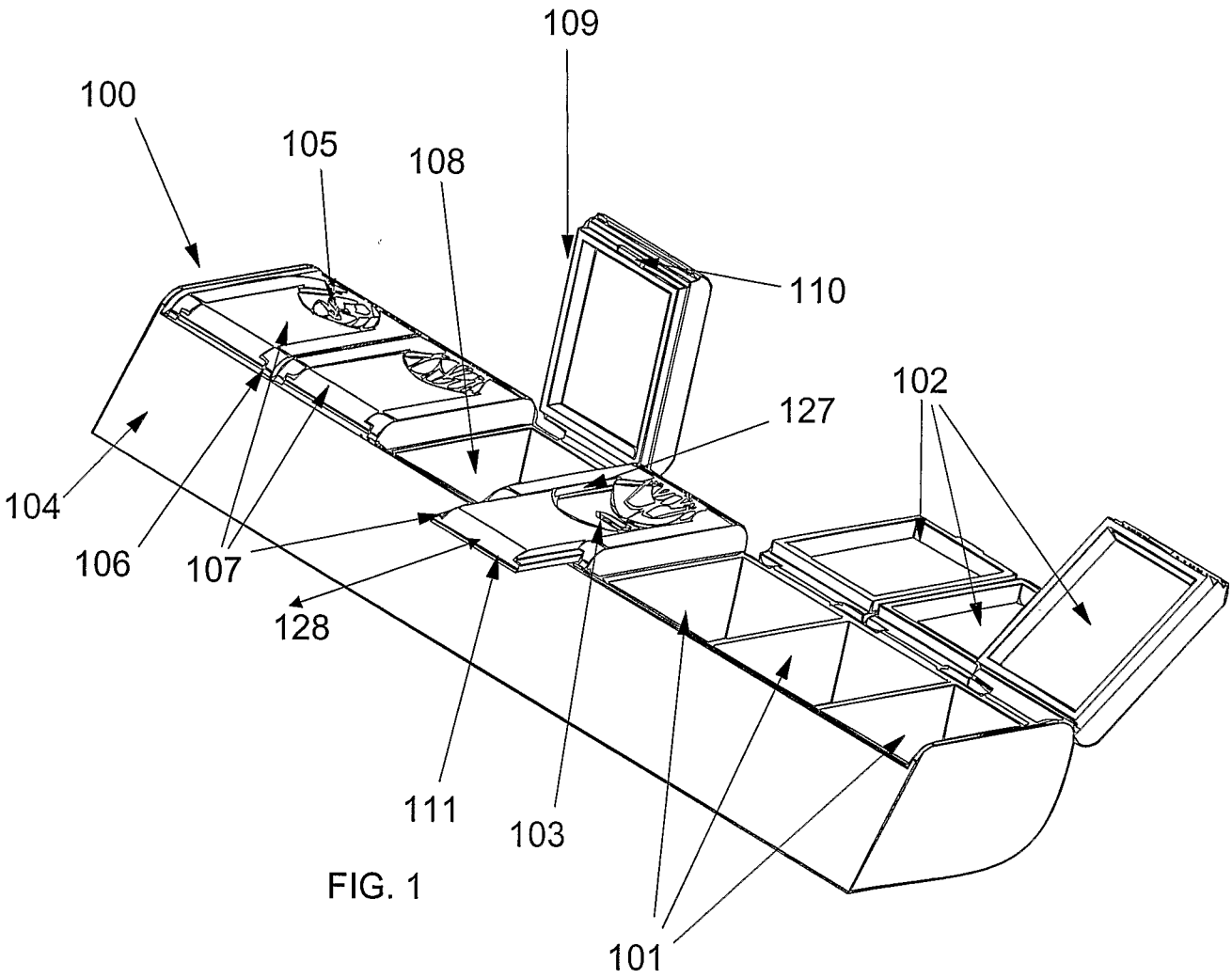


FIG. 1

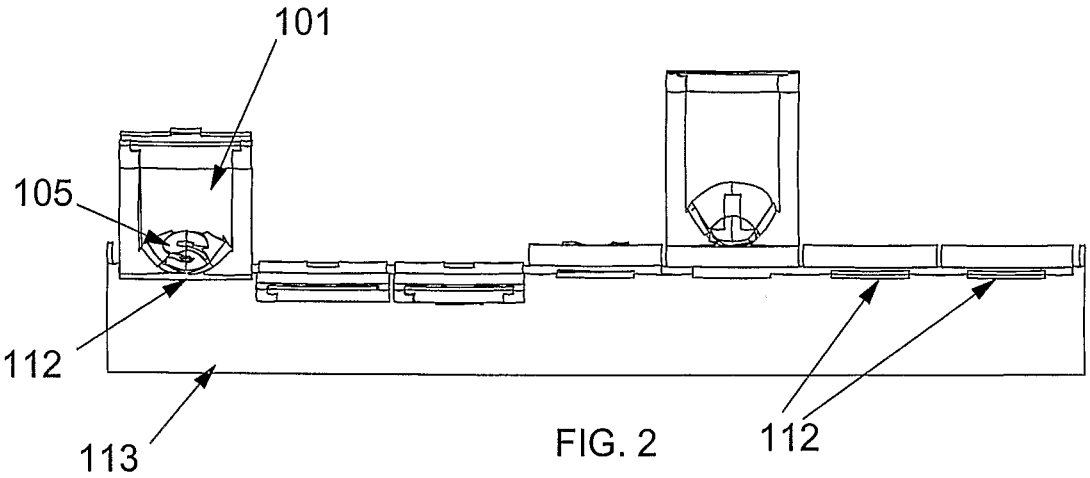


FIG. 2

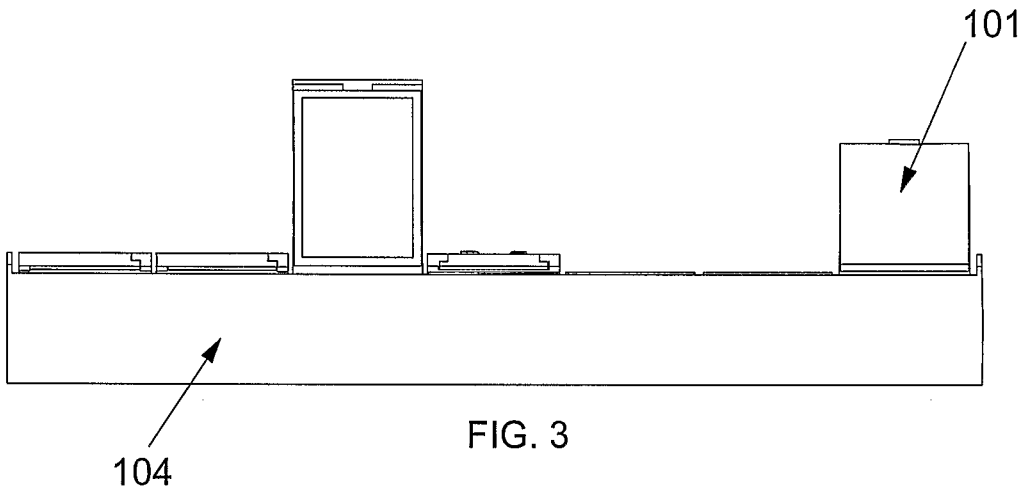


FIG. 3

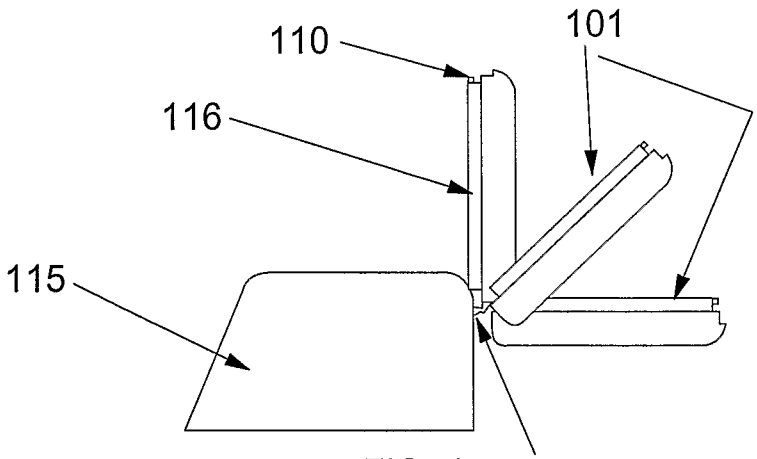


FIG. 4

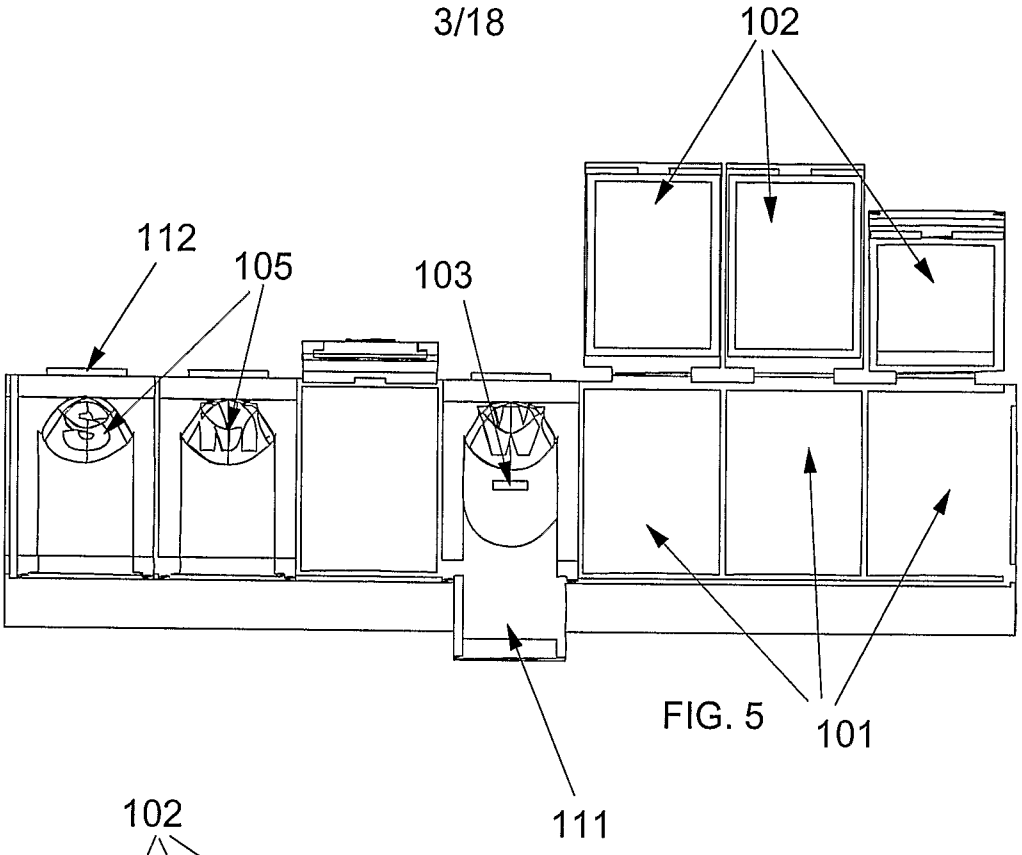


FIG. 5

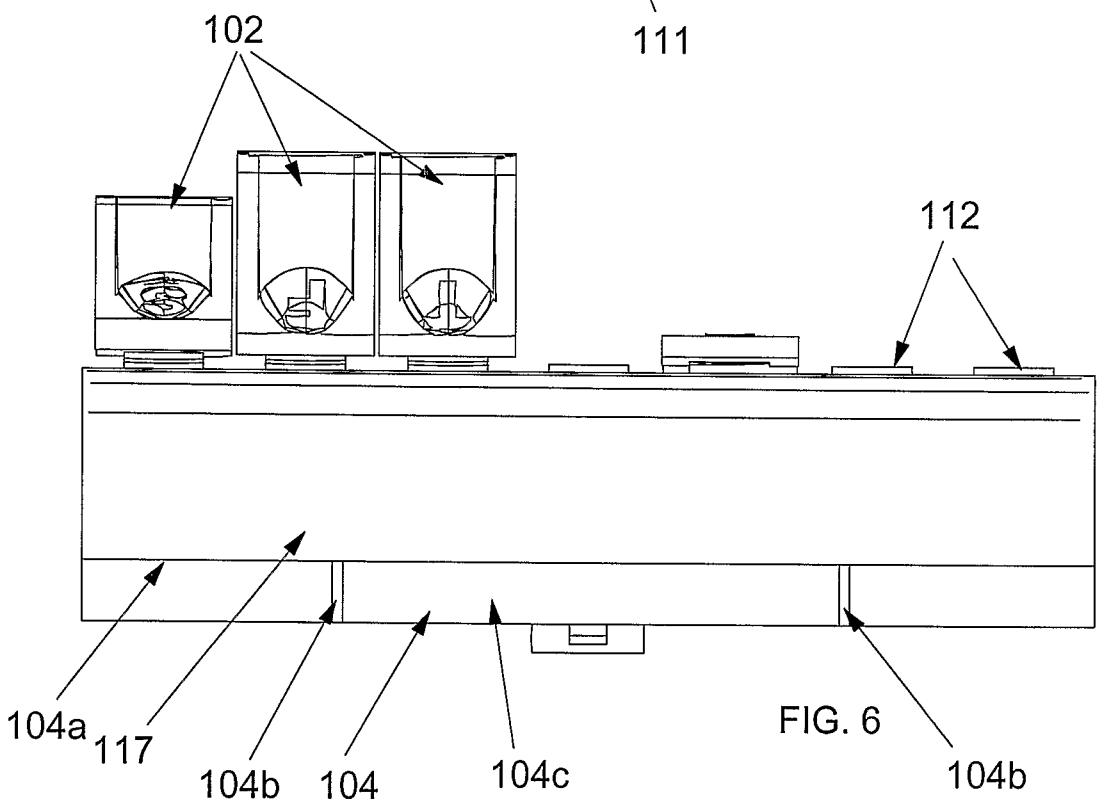


FIG. 6

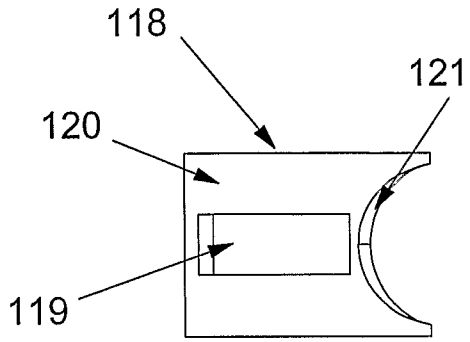


FIG. 7

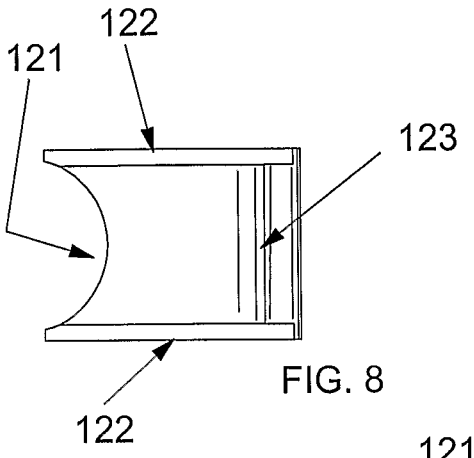


FIG. 8

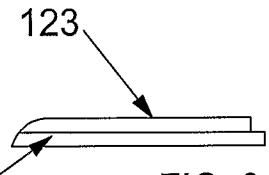


FIG. 9

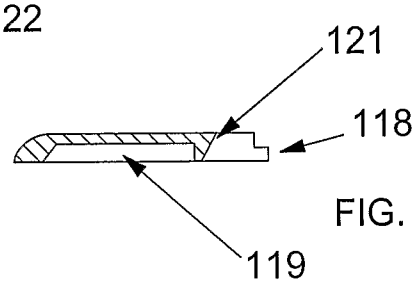
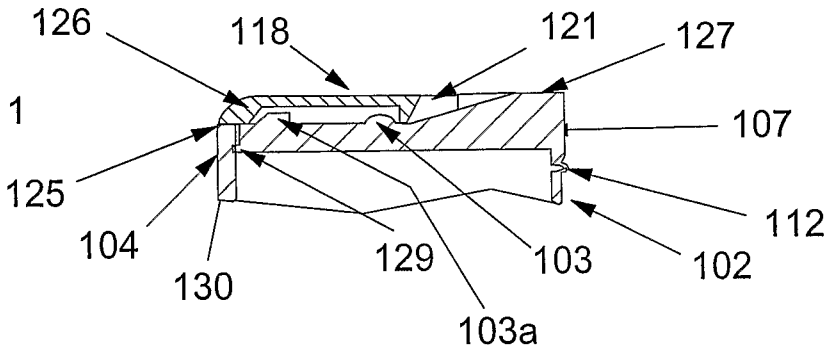


FIG. 10

FIG. 11



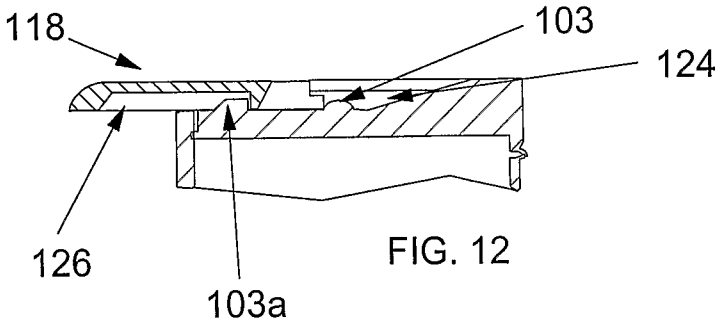


FIG. 12

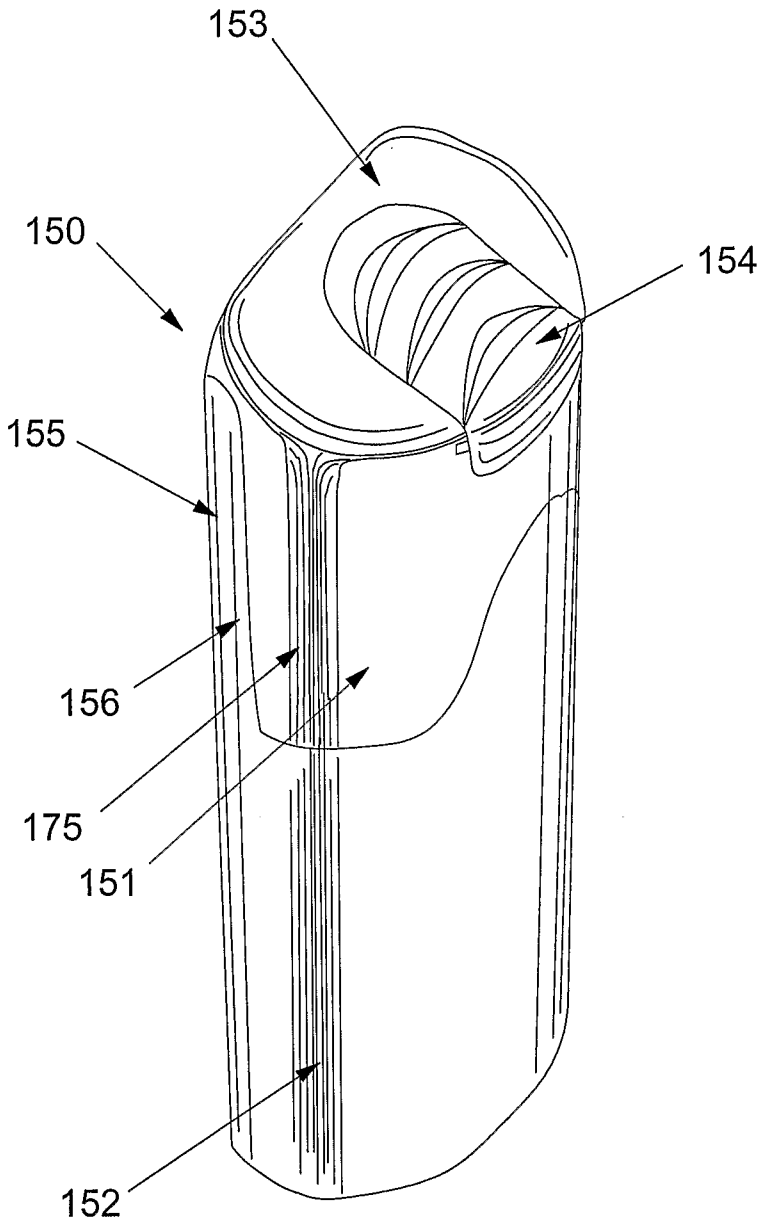


FIG. 13

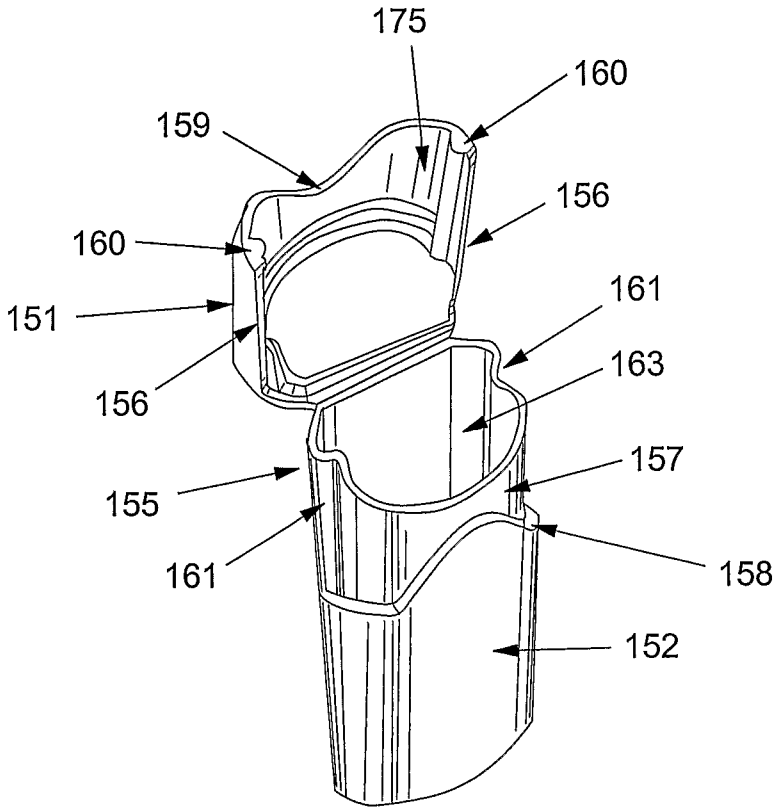


FIG. 14

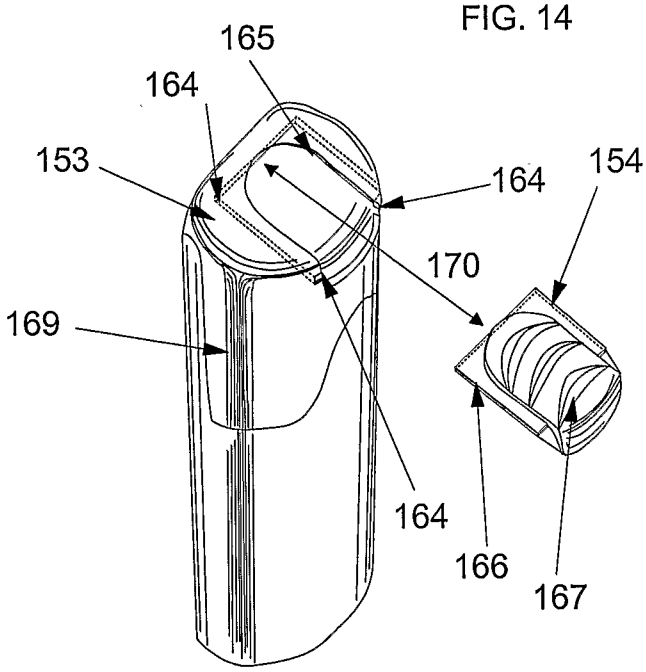


FIG. 15

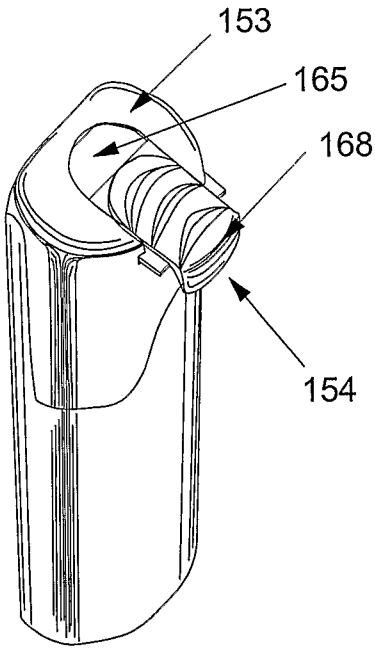


FIG. 16

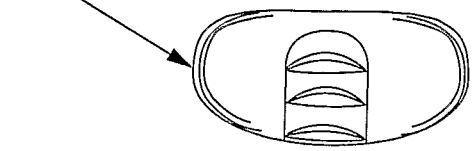


FIG. 17

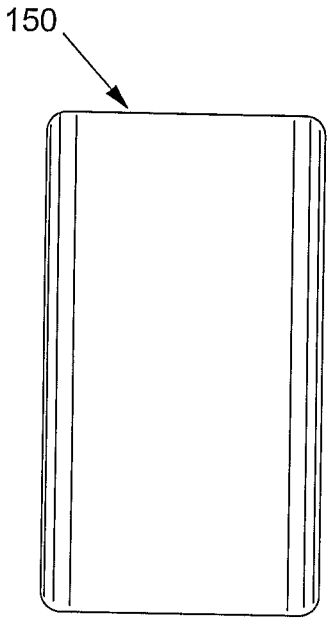


FIG. 19

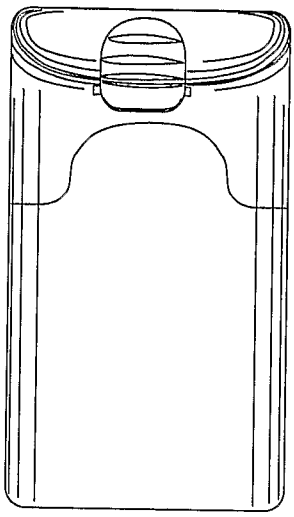


FIG. 20

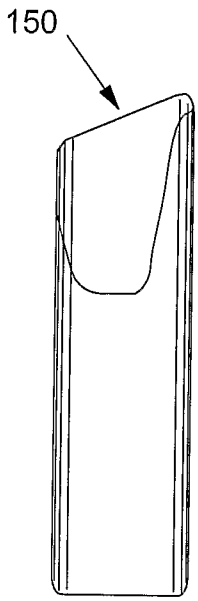


FIG. 21

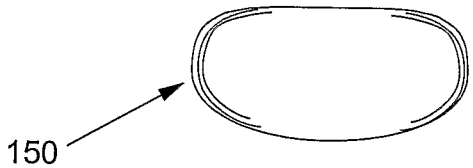


FIG. 18

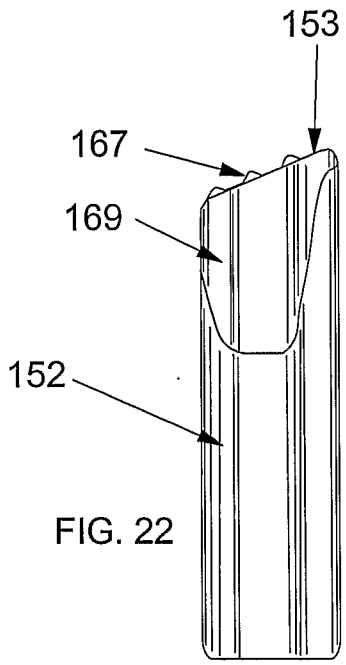


FIG. 22

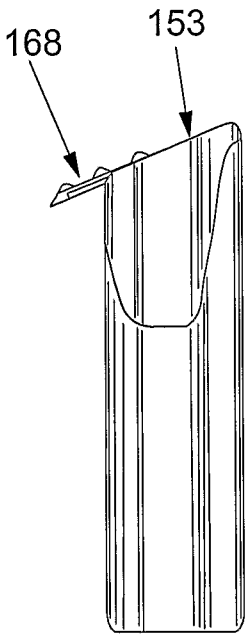
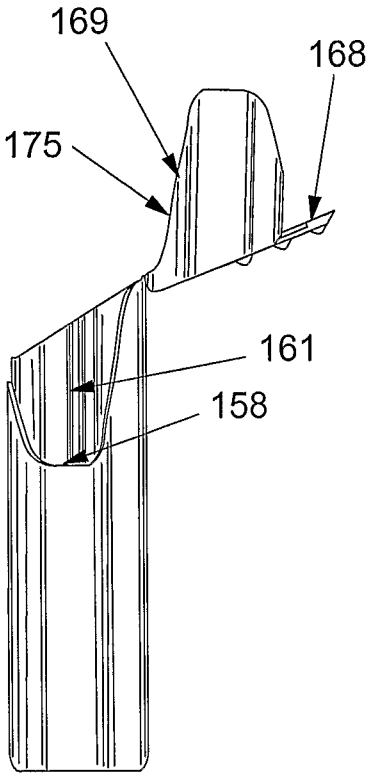


FIG. 23



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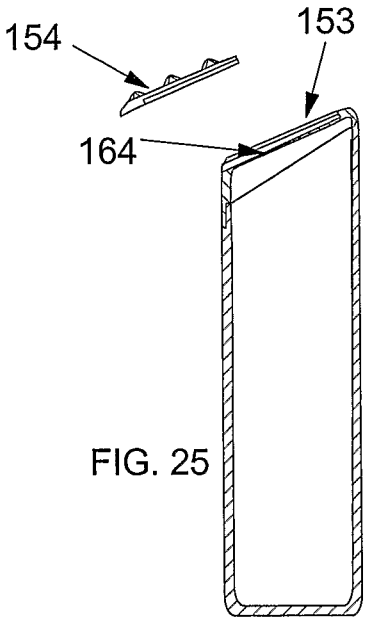


FIG. 25

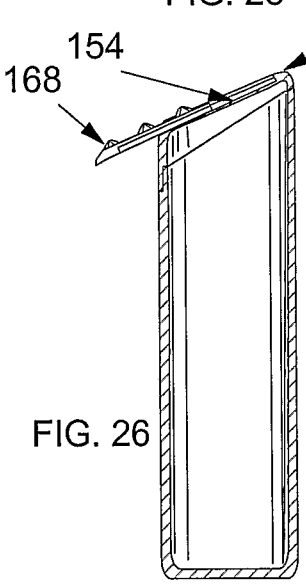
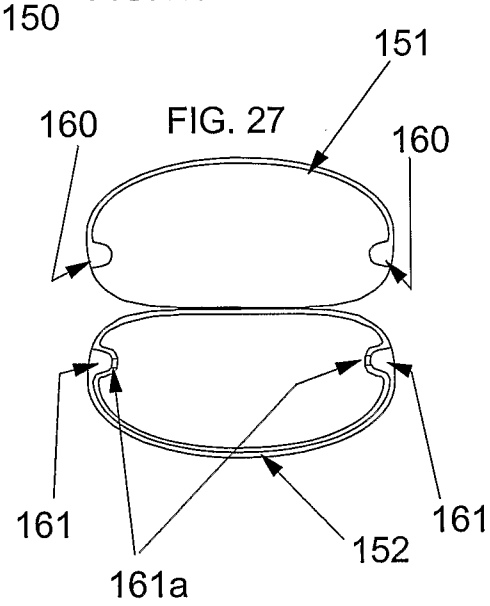


FIG. 26

FIG. 27



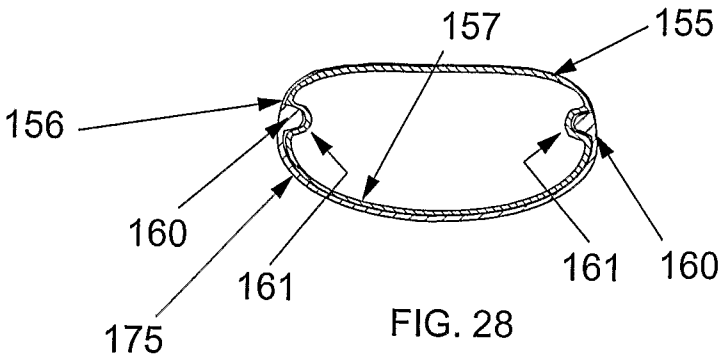


FIG. 28

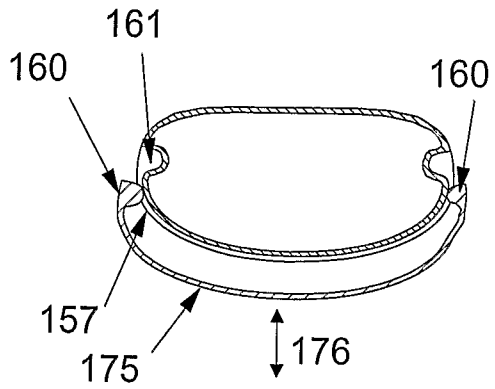


FIG. 29

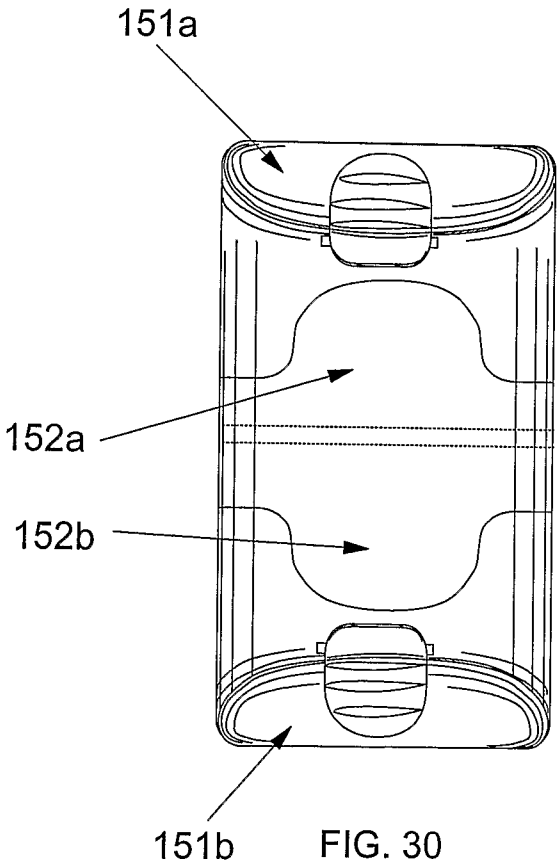


FIG. 30

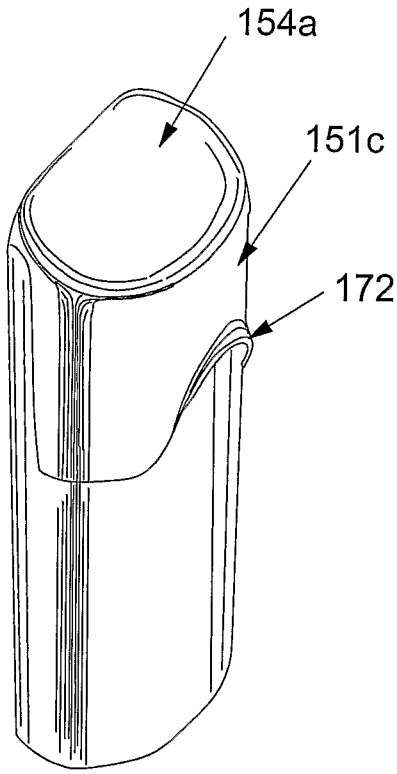


FIG. 31

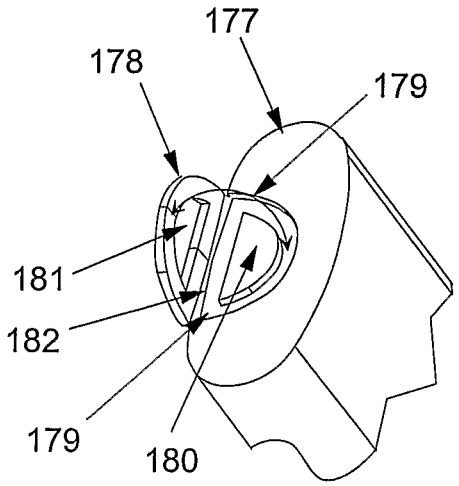


FIG. 32

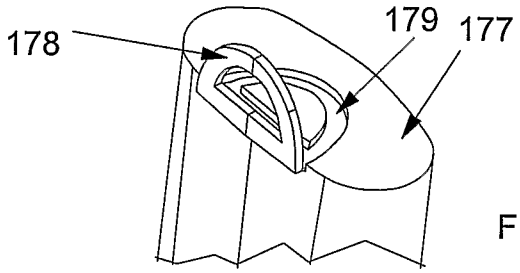


FIG. 33

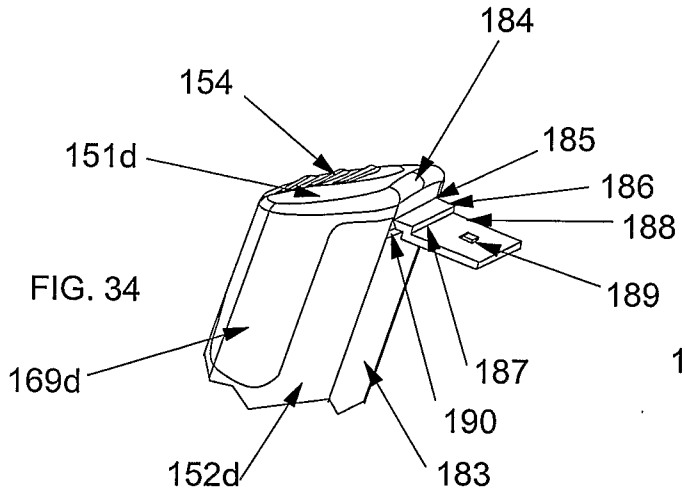


FIG. 34

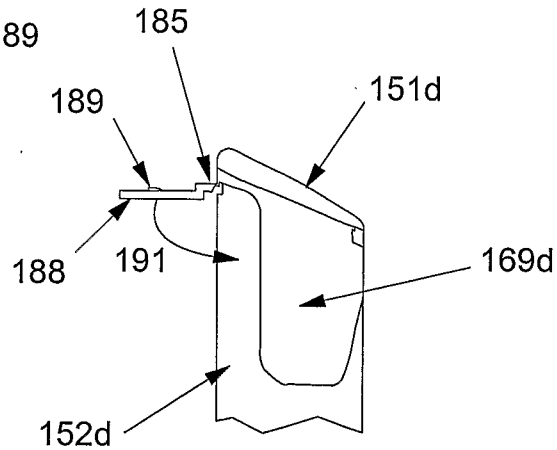


FIG. 36

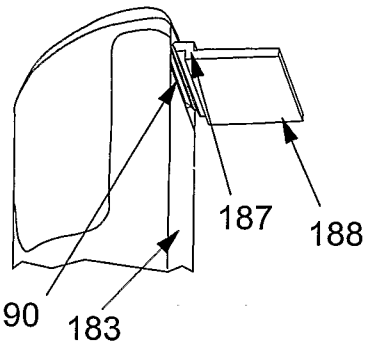


FIG. 35

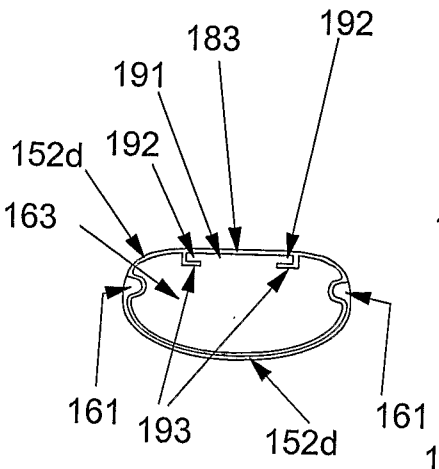


FIG. 37

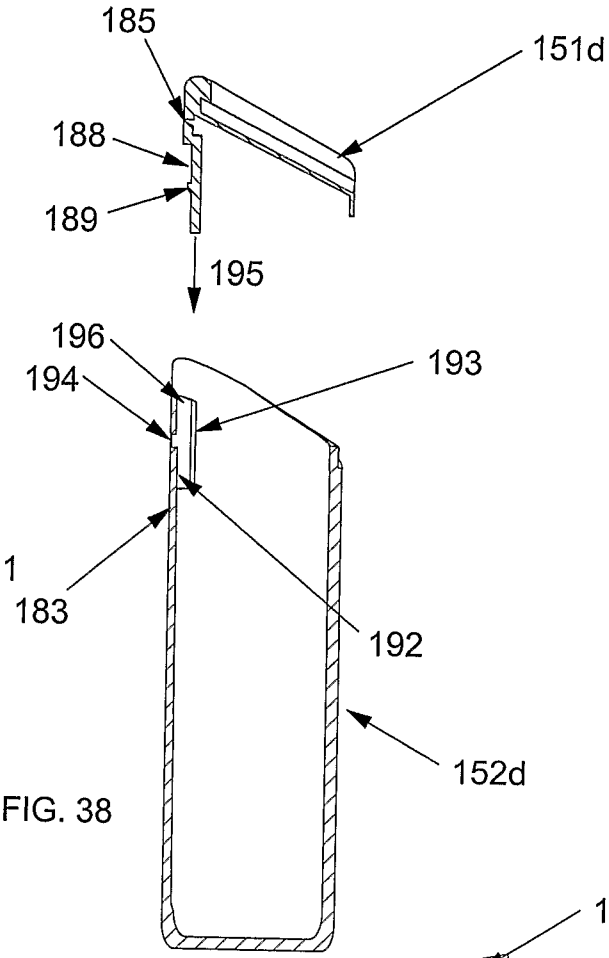


FIG. 38

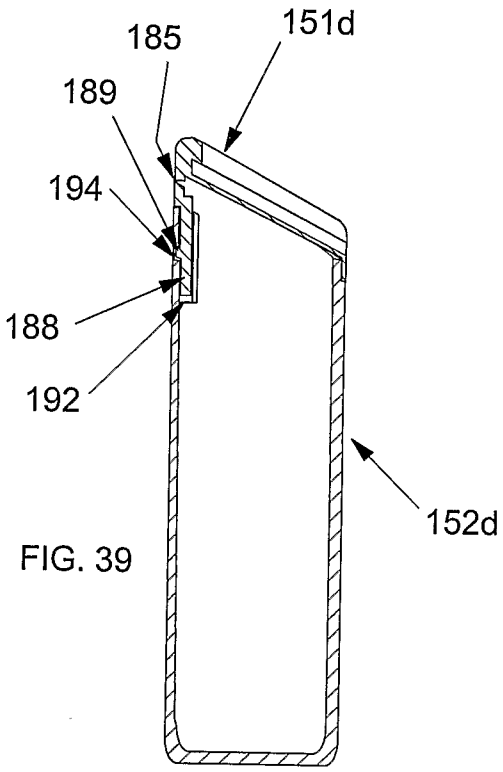


FIG. 39

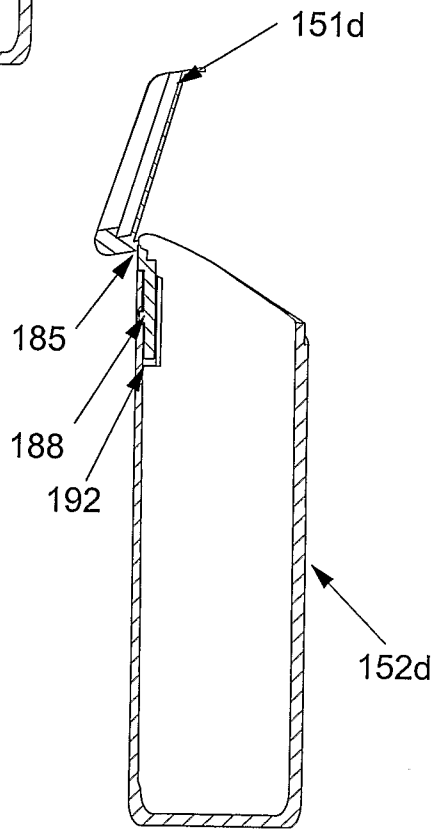


FIG. 40

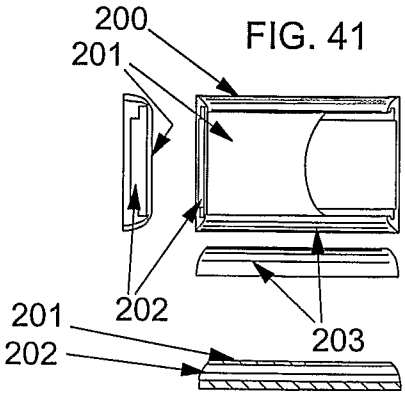


FIG. 41

FIG. 42

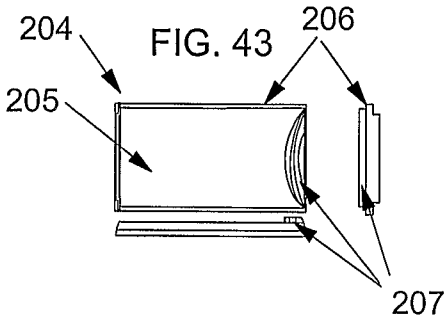
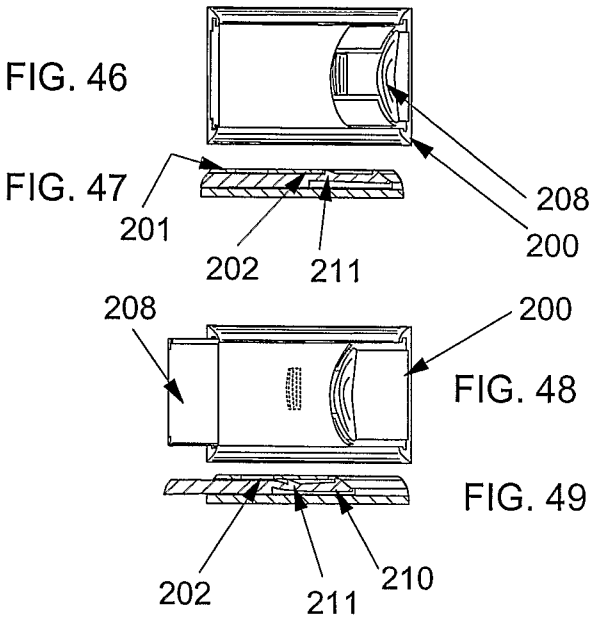


FIG. 43



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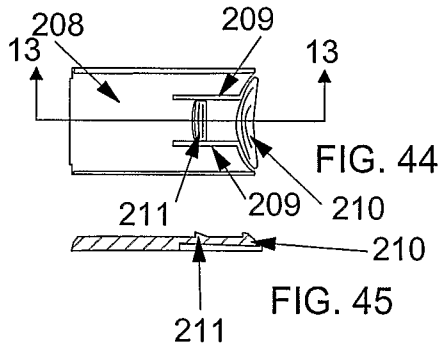

FIG. 44

FIG. 45

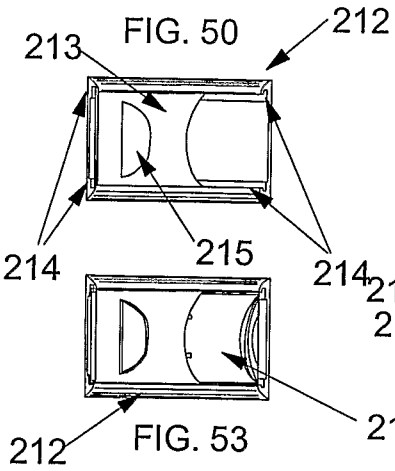

FIG. 50

FIG. 53

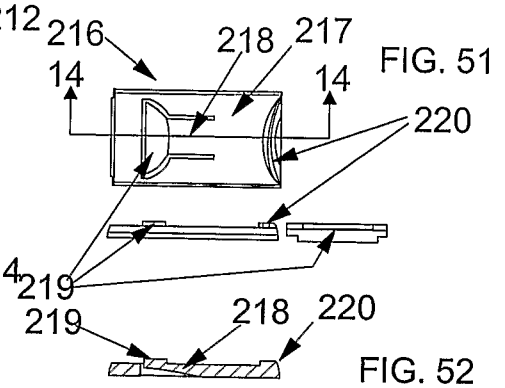

FIG. 51

FIG. 52

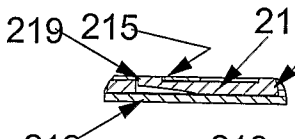

FIG. 54

FIG. 55

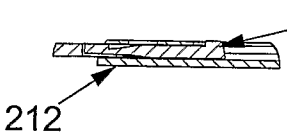

FIG. 56

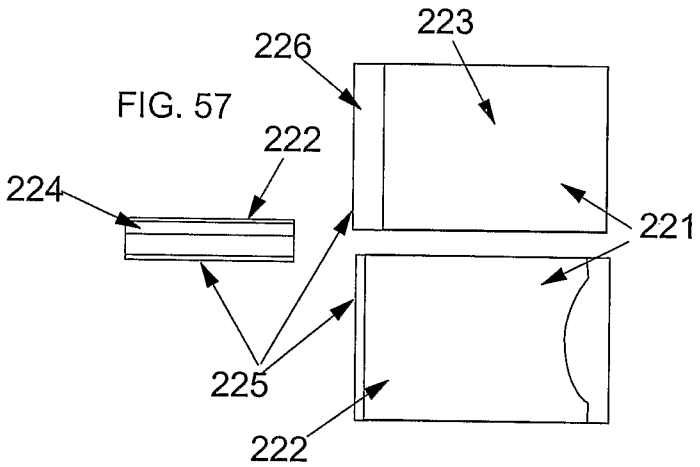

FIG. 57

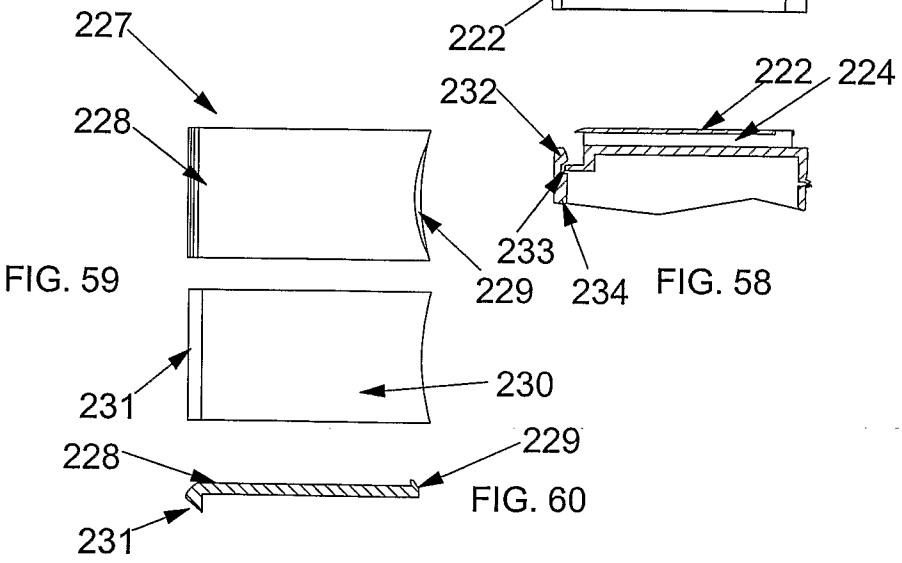

FIG. 59

FIG. 58

FIG. 60

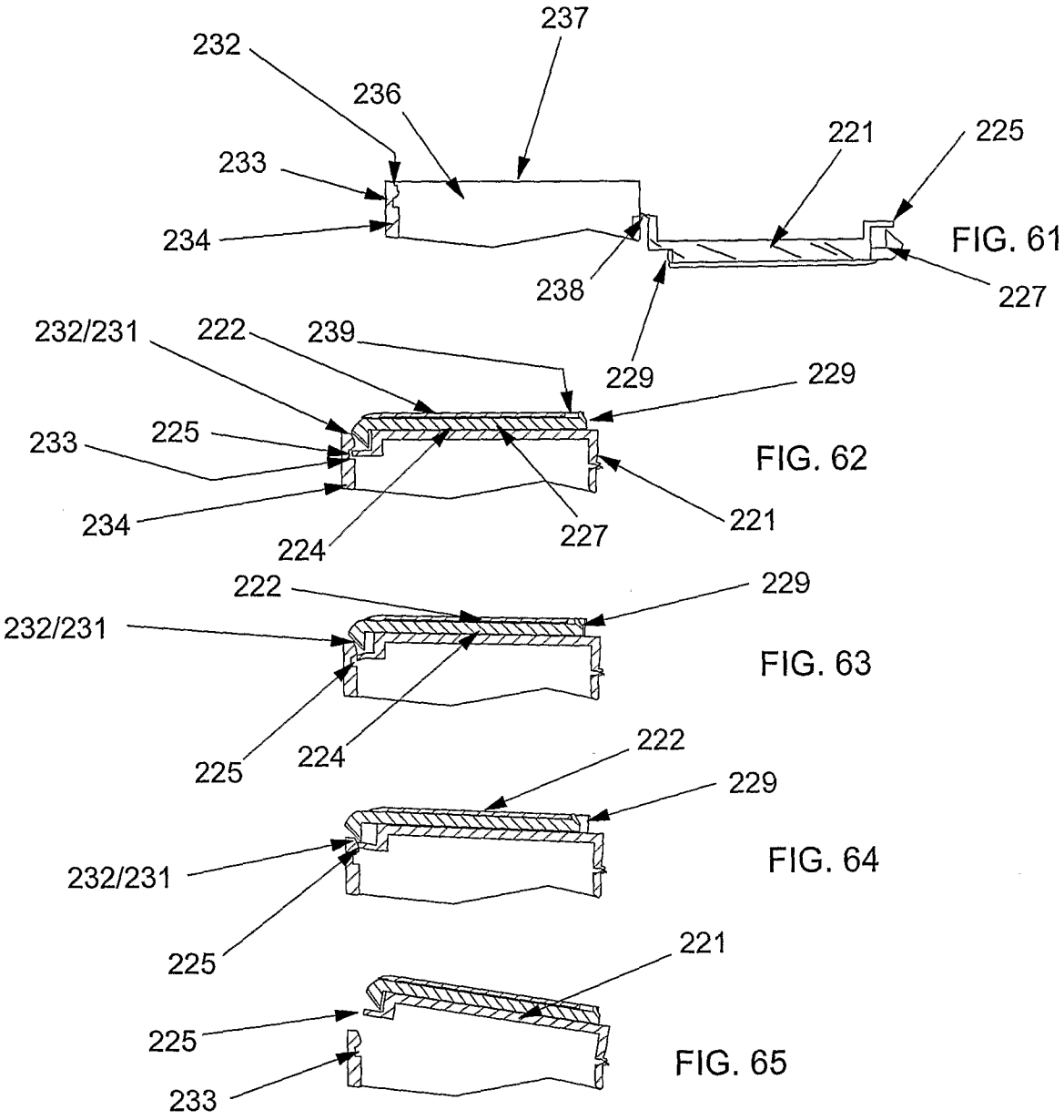
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FIG. 65

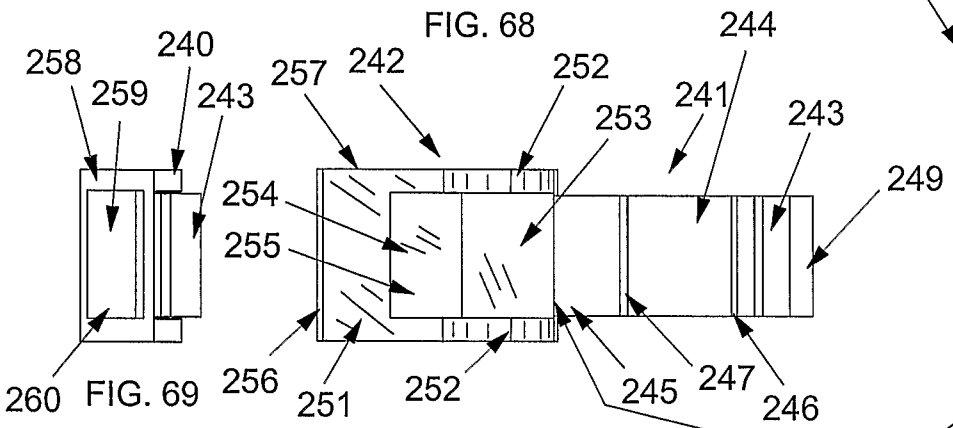

FIG. 68

FIG. 69

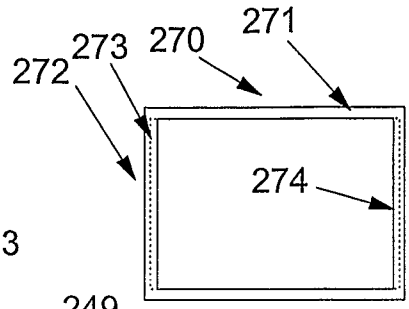

FIG. 66

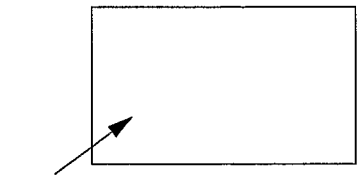

FIG. 67

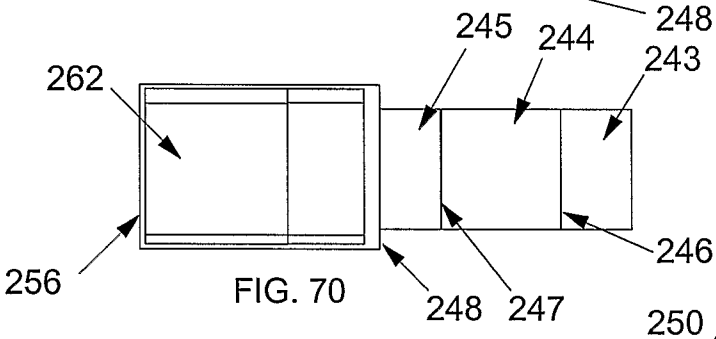

FIG. 70

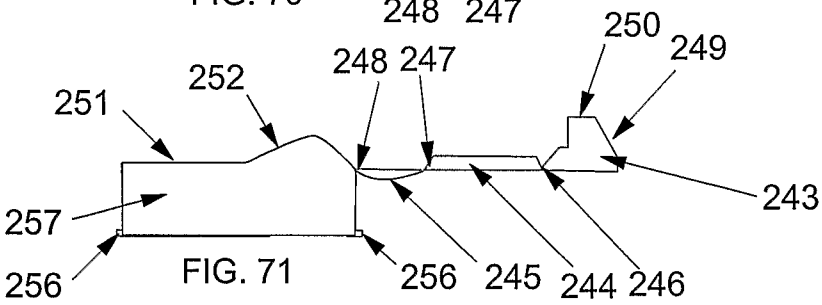

FIG. 71

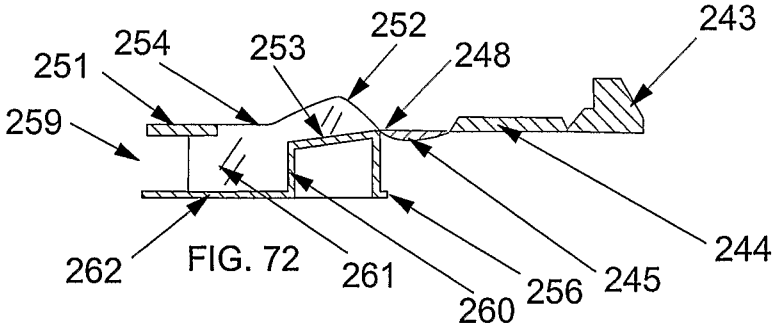

FIG. 72

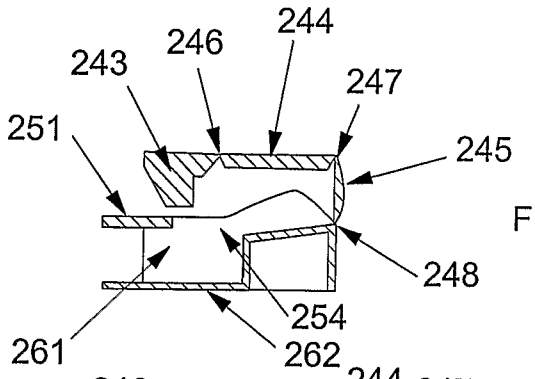

FIG. 73

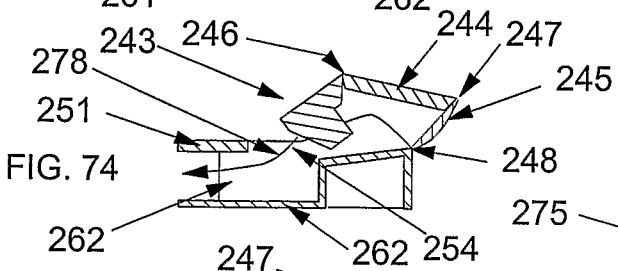

FIG. 74

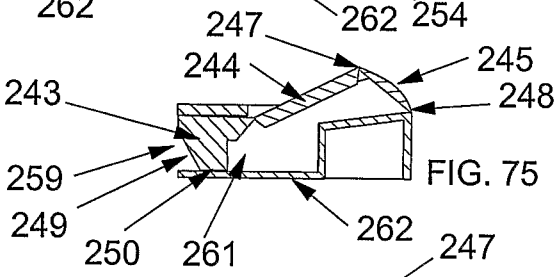

FIG. 75

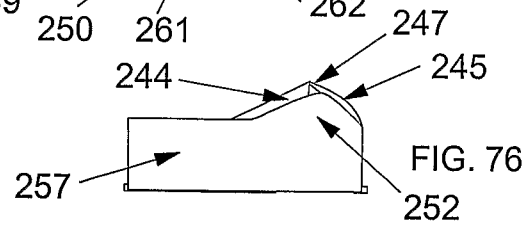

FIG. 76

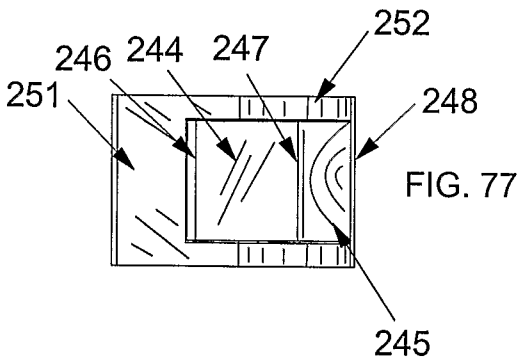

FIG. 77

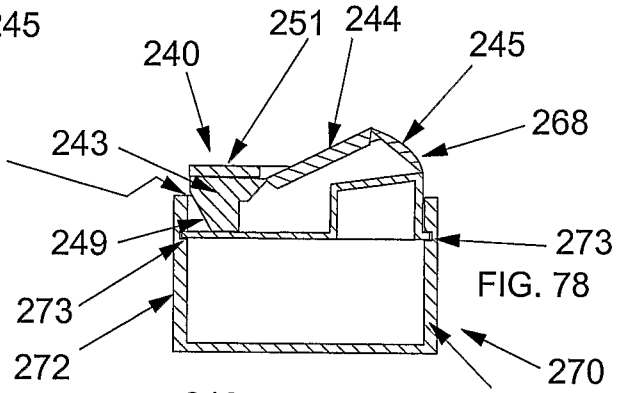

FIG. 78

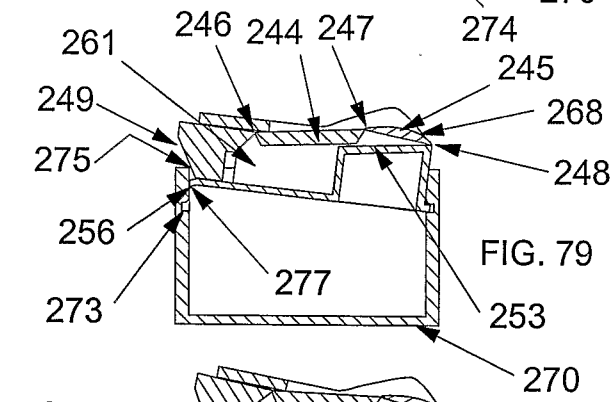

FIG. 79

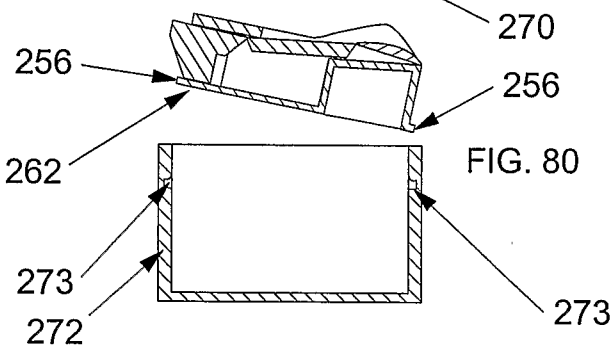

FIG. 80

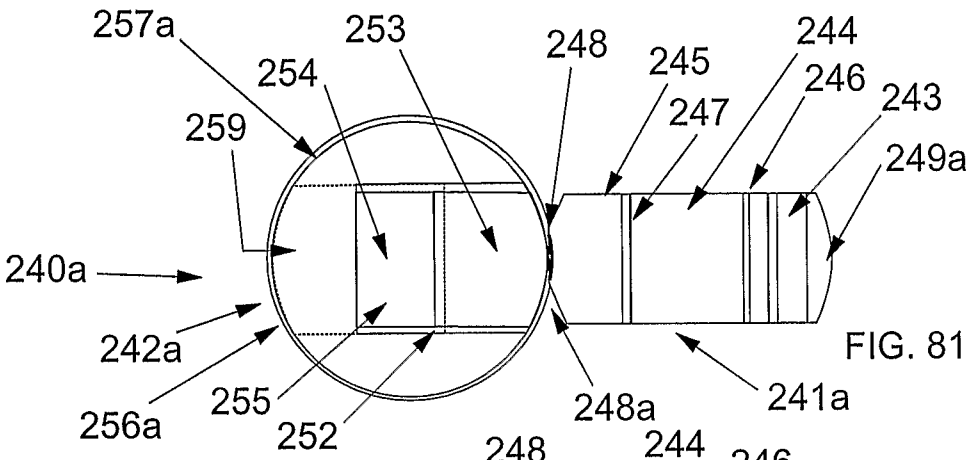

FIG. 81

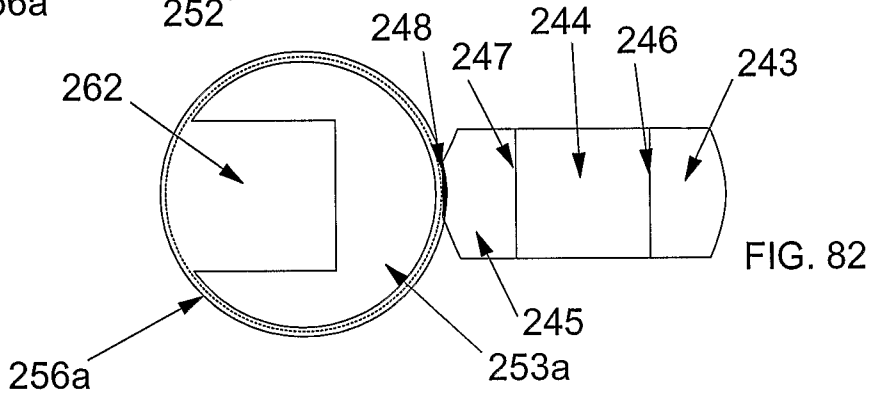

FIG. 82

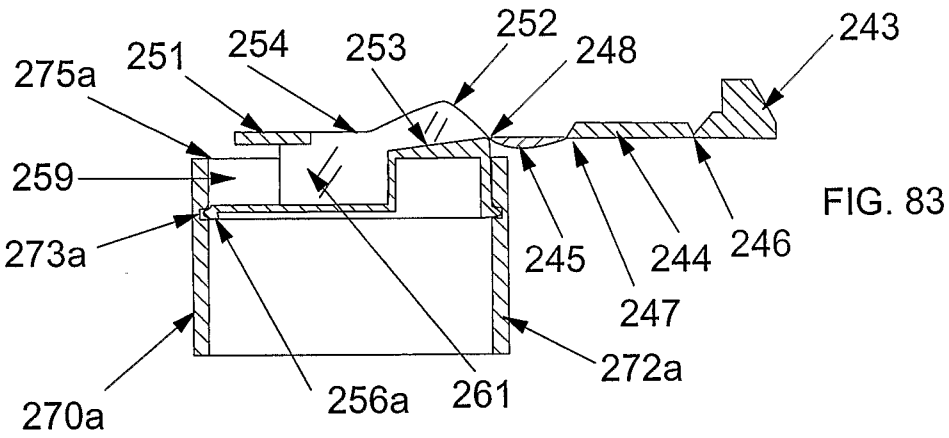

FIG. 83

FIG. 84

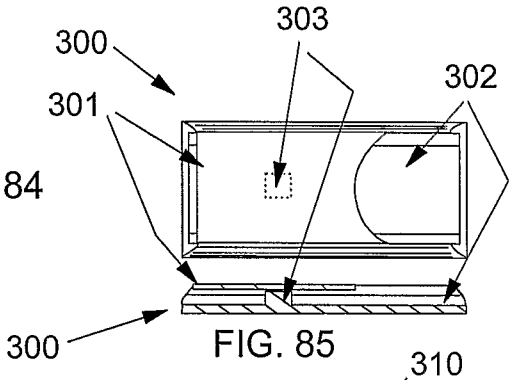

FIG. 85

FIG. 86

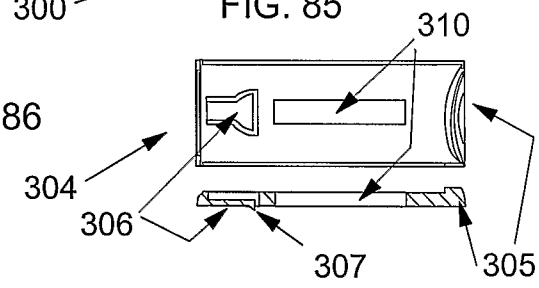

FIG. 87

FIG. 88

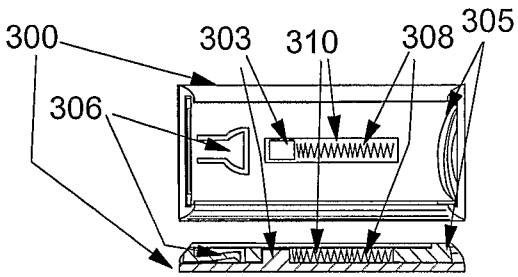

FIG. 89

FIG. 90

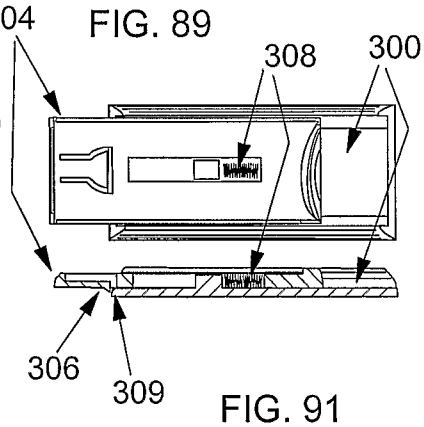

FIG. 91