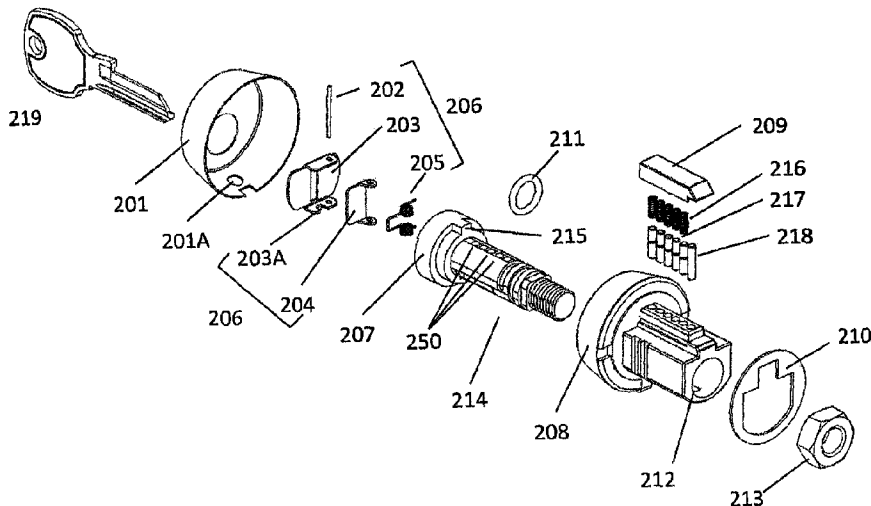




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(54) Title: WEATHER RESISTANT TUMBLER LOCK



(57) **Abrégé/Abstract:**

A weather resistant tumbler lock extends along a longitudinal axis from an outer facial surface to a distal end. The shell houses a rotatable core having a keyway. A drainway extends downwardly and outwardly to drain water ingress adjacent the facial surface via a drain adjacent the facial surface. The lock provides a channel for water to flow outwardly from a proximate end of the core head. The lock defines an arcuate chamber adjacent the proximate end of the rotatable core in water communication with the drain. The arcuate chamber is defined in a lower quadrant between an outer surface of the core head and the interior surface of the shell to drain water ingress and accommodate debris during rotation of the core. At the proximate end, an access door rotates adjacent the keyway at an elevated position, to provide a gap along the bottom edge of the access door.

**ABSTRACT**

A weather resistant tumbler lock extends along a longitudinal axis from an outer facial surface to a distal end. The shell houses a rotatable core having a keyway. A drainway extends downwardly and outwardly to drain water ingress adjacent the facial surface via a drain adjacent the facial surface. The lock provides a channel for water to flow outwardly from a proximate end of the core head. The lock defines an arcuate chamber adjacent the proximate end of the rotatable core in water communication with the drain. The arcuate chamber is defined in a lower quadrant between an outer surface of the core head and the interior surface of the shell to drain water ingress and accommodate debris during rotation of the core. At the proximate end, an access door rotates adjacent the keyway at an elevated position, to provide a gap along the bottom edge of the access door.

**TITLE: WEATHER RESISTANT TUMBLER LOCK**

**FIELD OF THE INVENTION**

The present invention relates to keyed tumbler locks including pin tumbler locks, wafer  
5 tumbler locks, disc tumbler locks and other cylinder lock designs and to a method of  
providing weather resistant features which are desirable for outdoor use.

**BACKGROUND**

As an example, known pin tumbler locks are prone to weather related failure, corrosion,  
water penetration and other weather related problems. US Patent Application No.  
10 12/004,856 filed on December 21, 2007 and published under publication number  
2008/0276666 and issued to patent under US Patent No. 9,273,487 is an example of  
one such available pin tumbler lock.

See Figs 1-3 and 7 of the present application which illustrate the features of one  
example of a prior art pin tumbler lock used in mailboxes including outdoor mailbox  
15 applications. Fig. 7 illustrates a rear view of a simplified profile 200 of a prior art pin  
tumbler lock, viewed from the distal end of the prior art pin tumbler lock assembly 100.  
When this lock design is installed in locations which are exposed to outdoor weather  
conditions, there are a number of potential weather related issues.

By way of example, when installed in outdoor locations, such locks are prone to freezing  
20 particularly during weather conditions including temperature changes from rain to  
freezing rain or snow. With regard to the prior art drawings, Figs.1-3 and particularly Fig  
1, water ingress is often a problem from:

- The front of the prior art pin lock between keyhole 125 and dust cover 119 and  
between cylinder 101 and plug cap 123 in prior art pin tumbler lock assembly  
25 100; and

- The top of the prior art pin lock at the interface between the spring retainer 117 and the surrounding edge of the prior art cylinder 101. Furthermore, the shape of the top rear of cylinder 101 allows water dripping down from the mail compartment door to be biased towards spring retainer 117. The spring retainer 117 is made from flat bar material. Spring retainer 117 is held in place by crimping the surrounding edge of the cylinder 101 to form an overlapping lip from the cast metal used to make the cylinder 101. Often, tolerances are such that water can easily pass around and under the lip and around the edges of spring retainer 117, into the pin chambers below.
- 10 The rear of the prior art pin lock may also experience water ingress between cylinder 101 and plug 103. The dust cover 119 frequently does not fully close when dust, dirt or ice is present. The upper and lower pivot points of dust cover 119 are square and do not promote easy or smooth pivoting of the door. Water may pool at the lower pivot point which in turn may freeze and hinder movement of the dust cover.
- 15 Under these circumstances, water may freeze and render the lock inoperable. By way of further example:
- Pins 113, retainer 126 and springs 115 may freeze in the pin chambers thus preventing the key from turning;
  - Ice may build up in cylinder 101 to prevent plug 103 from rotating. With regard to Fig. 2, stop 601 may prevent cylinder 101 from rotating if ice builds-up in stop chamber 602 which is positioned at the bottom of cylinder 101 where water and ice may accumulate;
  - Ice may build up in keyway 127 so that the key cannot be fully inserted; and
  - Ice may build up at the bottom of dust cover 119 and so that the dust cover will not open.

In some cases, customers may bend the dust cover 119 when ice builds up at the bottom of dust cover 119 and the cover won't open when force is applied with a key. A

customer faced with ice build-up may firmly push on key 111 with sufficient force to bend the door near the lower pivot point. Deformation of the dust cover may prevent the dust cover from subsequently operating correctly and it may become necessary to replace the prior art pin lock.

- 5 Prior art locks may also be prone to corrosion or other water/ice related damage because of water penetration and accumulation within those locks.

There is a need for a suitable lock design with weather resistant features for use in outdoor applications.

### INTRODUCTION TO THE INVENTION

- 10 The invention includes an improved, weather resistant, keyed cylindrical lock design which may be applied to pin tumbler locks, wafer tumbler locks, disc tumbler locks and other keyed lock designs. Various embodiments and aspects of the invention will be apparent to persons skilled in the art, upon reading the entirety of this specification, including the description and drawings appended hereto. The following introduction is  
15 meant to provide an overview of the invention, without limiting the invention to the specific aspects and features which are described in general terms for illustration of some examples of the invention.

- In one embodiment, a keyed cylindrical tumbler activated lock extends along a longitudinal axis from an outer face at a proximate end to a distal end. The cylindrical  
20 lock includes a shell extending between the proximate and distal ends. The shell houses a rotatable cylindrical core. The core rotates within an interior chamber defined by the shell. In some embodiments, such as a pin tumbler lock, the shell defines an elevated pinway extending along the longitudinal axis. The elevated pinway extends upwardly to a top wall from an intermediate edge defined by the shell. The elevated  
25 pinway is bounded by first and second opposed vertical side walls and a vertical end wall extending between the first and second opposed side walls. The end wall is adjacent the distal end of the pin lock. The rotatable core defines a first linear plurality of pin slots communicating with the keyway when an operating key is inserted into the

keyway. The elevated pinway defines a second linear plurality of pin slots in opposing relation to the first plurality of pin slots defined by the rotatable core. A first set of pins is held in the first linear plurality of pin slots abutting in coplanar interfacial alignment with a second set of pins in the second linear plurality of pin slots. When the key is inserted and the lock is in the first position, the core is allowed to rotate, about the axis, within the shell.

In this example, a hood is secured above the elevated pinway. The hood, which may take the form of a top cap, defines a rigid water barrier enclosing the second set of pins in the second linear array of pin slots. The hood extends downwardly from the top wall to the intermediate edge, and about the vertical side walls and the end wall. Preferably, the hood is secured to the elevated pinway along a band adjacent the intermediate edge.

In some aspects of the invention, a band defined by an interior surface of the hood projects inwardly to secure the hood to the elevated pinway. The band may be formed by crimping a lower edge of the hood for secure engagement along the intermediate edge of the elevated pinway. The hood may also be crimped to form the band at the intermediate edge of the elevated pinway.

In some embodiments, the intermediate edge is adjacent to a bottom edge of the elevated pinway, extending along a shoulder defined by a bottom portion of the shell.

Some aspects of the invention may feature an interior drainway which extends downwardly and outwardly from within the tumbler lock, for example, a pin tumbler lock. The drainway may extend below an access door to the keyway which is pivotably mounted between the outer face and the keyway. Preferably, a drainway is provided to promote the flow of water outwardly and downwardly via a sloped channel and connected drain opening. The drainway may define a pathway for water to flow outwardly from the shell, the rotatable core, the access door, and an (optional) outer face ring which covers the face of the shell (if a face cover is provided) while surrounding the keyway. The access door may be pivotably mounted on a post extending between a top recess in a frame and a bottom recess in the frame. The

bottom of the access door may define an elevated bottom edge which travels above an adjacent surface defined by the frame or a bottom edge of a recess within the face of the rotatable core. The elevated edge may define a clearance gap above the adjacent surface when the access door pivots within the frame. The post may be rotatable  
5 relative to the frame and the access door.

A detent may be featured adjacent the intermediate edge, between the interior surface of the hood and an adjacent surface of the elevated pinway to more securely fasten the hood to the elevated pinway. The hood may be crimped, press-fit, snap-fit, slide-fit or the band may be formed in another manner to provide secure engagement with the  
10 detent.

By way of further example, the detent may be an elevated ridge or a recess adjacent the intermediate edge.

In another aspect, the pin tumbler lock comprises an outer face ring at a proximate end. The pin lock includes a shell defining an elongated body extending along a longitudinal  
15 axis between the proximate end and the distal end. The shell houses a rotatable core adapted for connection to a driver, cam or other component of a lock mechanism. The shell defines an elevated pinway extending along the longitudinal axis. The elevated pinway extends upwardly to a top wall from an intermediate edge extending from a pair of opposed shoulders defined by the shell. The elevated pinway comprises: a first  
20 vertical side wall, a second vertical side wall opposite to the first vertical side wall, and a vertical end wall extending between the first and second side walls, the end wall being adjacent the distal end. The elevated pinway defines a first set of pins in a first linear plurality of pin slots through the top wall and vertically opposed to a second set of pins in a second linear plurality of pin slots defined by the rotatable core, the first and second  
25 linear plurality of pin slots being vertically aligned and communicating with a keyway in the rotatable core when an operating key is inserted into the keyway when the lock is in a first position. An interior drainway extends downwardly and outwardly from within the pin lock. The drainway comprises a channel along the bottom interior of the shell, and a dripway from the keyway in communication with the channel. The dripway extends

along an access door to the keyway and along a proximate lower edge of the shell, for water to flow outwardly via a drain opening. The access door rotates about a post pivotably mounted within a frame between the outer face and the keyway when the access door is pushed away from the keyway upon entry of the operating key into the keyway. The access door may be elevated to define a gap upon rotation above a bottom ledge of the frame. A hood defines a rigid water barrier closing the first linear array of pin slots in the top wall. Preferably, the first set of pins are biased inwardly from a top interior surface of the hood toward the rotatable core. The hood may extend downwardly from the top wall to the intermediate edge, and about the first and second vertical side walls and the end wall, and when the hood is engaged with the elevated pinway, a band defined by an interior surface of the hood projects inwardly to secure the hood to the elevated pinway.

In some aspects, the band may project between the hood and the elevated pinway to secure the hood to the pinway. The hood may be glued or otherwise affixed with adhesive, crimped, press-fit, snap-fit, slide fit or assembled in some other manner, into secure engagement between the band and the elevated pinway. The band may be formed by crimping the hood into secure engagement with a detent defined by the elevated pinway.

In some other aspects, the drainway may define a pathway for water to flow outwardly from the interior of the shell, the interior of the rotatable core, the access door, and an outer face ring surrounding the keyway. In some aspects, a water resistant seal is provided at the proximate end between the outer face ring and the shell or at the distal end to inhibit water ingress between the rotatable core and the shell. Preferably, the pin lock includes water resistant seals at the proximate end and the distal end to minimize water ingress.

In other preferred aspects of the invention, the drainway includes a drainway opening, for example, a channel within the head of the core and extending downwardly, in communication with an exterior elongated channel opening. The exterior elongated channel opening extends partially along the bottom of the shell (and optional face

covering if provided), beginning inwardly of the face and ending offset outwardly from the vertical outer face of a storage structure in which the lock is secured. In the preferred embodiment, the exterior elongated channel is configured as a slot extending toward the outer face of the storage structure but sufficiently offset from the face of the storage structure to inhibit water from dripping or running along the face of the storage structure. When the rotatable cylindrical core is in its locked position, the drainway is oriented at the bottom of the shell, in alignment so that the drainway opening aligns within the exterior elongated channel opening (for example a slot), to enhance outward and downward flow of water away from the interior of the lock via the drainway. Where the drainway includes an elongated drainage outlet opening, the lower outer edge of the outlet may define a drip edge to further enhance downward flow of water, away from the interior of the lock.

The head of the rotatable core preferably includes an arcuate recess extending within the lower right quadrant (between the 3 o'clock and 6 o'clock position, for example, in cylindrical locks unlocked by rotating clockwise 90 degrees) or the lower left quadrant (between the 6 o'clock and 9 o'clock position, for example, in cylindrical locks unlocked by rotating counterclockwise 90 degrees). The arcuate recess provides a gap between the rotatable core and the stationary shell to take up accumulated water, ice formed from undrained water, and pieces of ice or other debris when the cylindrical core is rotated in cold weather or other adverse conditions. When the core is rotated, the frozen undrained residue, ice particles or other debris may reside within the arcuate head space, to reduce the torque needed to operate the rotatable core. Preferably, the arcuate head space is configured to define a downwardly and outwardly sloped drainway segment when the cylindrical core is in the locked position.

In a preferred embodiment, the lock comprises a stainless steel MIM core rotating within a shell, typically cast from zinc or other corrosion inhibiting alloys.

The invention also comprises storage structures which have been provided with a tumbler lock having one or more of these features.

Other aspects of the invention will become apparent upon a review of the appended drawings and the following detailed description of preferred embodiments of the invention.

Preferred embodiments of the invention will be described in detail having regard to the  
5 appended drawings. However, it will be understood that these examples illustrate certain embodiments of the invention and that the illustrated examples are not to be interpreted as limiting the scope of the invention. Persons skilled in the art will understand that the invention may be implemented for use in other forms, systems, and methods and that many other variations, modifications and embodiments fall within the  
10 scope of the invention.

## THE DRAWINGS

**Figure 1** is a drawing of an exploded view, in perspective, of the components in a prior art pin lock;

**Figure 2** is a drawing in perspective, showing a core and a shell of the prior art pin lock  
15 shown in **Figure 1**;

**Figure 3** is a drawing of a perspective view of an enlarged retainer clip 505 provided with the prior art pin lock shown in **Figure 1**;

**Figure 4** is a drawing of an exploded view, in perspective, of the components of an embodiment of the present invention, namely, a pin lock;

20 **Figure 5A** is a side view of the rotatable core of the embodiment of the invention shown in **Figure 4**;

**Figure 5B** is a frontal view of the rotatable core of the embodiment of the invention shown in **Figure 4**;

25 **Figure 5C** is a side view in perspective from the distal end of the rotatable core of the embodiment of the invention shown in **Figure 4**;

**Figure 6A** is a frontal view, in perspective, of the proximate end of the shell housing of the embodiment of the invention shown in **Figure 4** configured for clockwise (CW) rotation of the rotatable core;

5 **Figure 6B** is a frontal view of the shell housing of the embodiment of the invention shown in **Figure 4** configured for clockwise (CW) rotation of the rotatable core;

**Figure 6C** is a perspective view, from the distal end, of the shell housing of the embodiment of the invention shown in **Figure 4**;

10 **Figure 6D** is a frontal view, in perspective, of the proximate end of the shell housing of the embodiment of the invention shown in **Figure 4** configured for counter clockwise (CCW) rotation of the rotatable core;

**Figure 6E** is a frontal view of the shell housing of the embodiment of the invention shown in **Figure 6D** configured for counter clockwise (CCW) rotation of the rotatable core;

**Figure 6F** is a perspective view, from the distal end, of the shell housing of the embodiment of the invention shown in **Figure 6D**;

15 **Figure 7** is a profile view of the distal end of the prior art shell shown in **Figures 1** and **2**;

**Figure 8** is a frontal view of the core head of another embodiment of the invention, viewed from the proximate end of the core;

**Figure 9** is a frontal view, in perspective, of the bottom of the core shown in **Figure 8**, viewed from the proximate end of the core;

20 **Figure 10** is a frontal view of the core shown in **Figures 8** and **9**, inserted into the shell of this embodiment, viewed from the proximate end of the combined core and shell;

**Figure 11** is a frontal view, in perspective, of the bottom of the combined core and shell of **Figure 10**, viewed from the proximate end;

25 **Figure 12** is a rear view, in perspective, of the bottom of the combined core and shell of **Figures 10** and **11**, viewed from the distal end; and

**Figure 13** is a second rear view, in perspective, of the bottom of the combined core and shell of **Figures 10-12**, viewed from the distal end,

in which the embodiments and certain features are described in more detail below.

## **DETAILED DESCRIPTION OF CERTAIN EMBODIMENTS OF THE INVENTION**

A preferred embodiment of the invention is described below having regard to the  
5 example of a tumbler lock as illustrated in **Figs. 4, 5A-5C, and 6A-6C**. For applications  
in which a pin lock of the present invention will be used in retrofit installations, the shell  
assembly will be configured to match the existing furniture cut-out representing the  
available space for installation of the replacement lock. In this example, the profile of  
cylinder 101 is shown as 200 in Fig. 7. It is preferred that the shape of cylinder **208** of  
10 the present invention is designed to match the existing profile in the furniture so that the  
lock can be retrofitted into existing furniture, for example, a storage structure having at  
least one locking compartment.

With reference to **Figs. 4 and 6C**, the preferred pin lock of the present invention  
includes a shell configured as a generally U-shaped cylinder **208** which defines a  
15 chamber housing rotatable core **207**, preferably made from stainless steel. The shell  
head **401** of the shell **208** is configured to securely accommodate protective shell scalp  
**201**. The shell **208** is provided with shoulders **410, 411** extending to intermediate edge  
**412** which defines the transition between the shoulders **410, 411** and vertical sidewalls  
**407, 407A** and vertical end wall **408** joining the sidewalls **407** and **407A**. In this  
20 embodiment, the elevated pinway is illustrated as a modified pin chamber area **404**  
configured to accept snug fitting top cap **209**. The top edges of sidewalls **407, 407A** and  
end wall **408** are preferably beveled to permit a hood, for example, the top cap **209**, to  
be more easily placed and properly aligned with the elevated pinway during assembly of  
the preferred pin lock.

25 Preferably, the top cap **209** is crimped such that a band of the top cap **209** is formed to  
engage with groove **405** to securely hold the top cap **209** in place, closing the second  
linear array of pin slots **450**, after the crimping operation. The top cap **209** functions as a  
pin slot closure and a water resistant hood which inhibits water from entering the pin  
slots **450** and **250** and freezing the pins **217**, retaining pin **218**, springs **216**. The top

cap **209** may be made from a suitable material, preferably a metal suitable for the manufacturing process, such as crimping, in the preferred embodiment, and to meet other product specifications.

In other embodiments, the top cap **209** may be configured so that the top cap is  
5 fastened to an elevated pinway using another manufacturing technique. For example, the top cap may be press-fit, snap-fit, or slide-fit into place so that a preformed band on the top cap engages a detent on the elevated pinway. By way of further example, the detent may be a ridge or a depression formed on the elevated pinway, preferably adjacent the intermediate edge **412**. Upon reading this specification, it will be apparent  
10 to persons skilled in the art that other techniques and features may be used to secure a hood to an elevated pinway of the present invention.

In the preferred embodiment of an assembled pin lock, a drainway is provided to channel water outwardly from the interior of the lock so that the water is removed to avoid, for example, freezing which may damage or render the lock inoperable. In the  
15 preferred embodiment as illustrated in **Figs. 5B** and **6A-6C**, the drainway comprises a drainage channel **212** at the bottom of the shell interior which extends from its distal end **212B**, toward the proximate end of the shell **208**, over drip edge **222**. Drainage channel **212** is configured so that water drains from the distal end **212B** forward to drain through drainage holes **403**, **203A** and **201A**.

20 As shown in **Fig. 5B**, a lower cavity **302** is also provided in the proximate face of the rotatable core **207** so that water may vacate more easily away from the keyway, and thus preventing ice build-up behind an access door such as the illustrated dust shutter door **204**. Preferably, the lower cavity **302** is positioned so that, when the lock is in the locked position, the lower cavity **302** is positioned above drainage hole **403** and shell  
25 drainage hole **201A**. The funnel-like shape (with inwardly sloped side walls) and position of the lower cavity **302** below the dust shutter door **204** also creates a gap below the lower edge of the shutter door **204** to permit less restrictive rotational movement of the dust shutter door **204** when it is pushed open with a customer's key **219**.

The proximate face of the rotatable core **207** is configured to mount and receive the components of the dust shutter assembly **206**. The recesses are adequately shaped and dimensioned to allow the opposite ends of dust shutter pin **202** to engage pin pockets **301A**, **301B** while supporting dust shutter door **204** and torsional spring **205**  
5 within the bracket arms of shutter face plate **203**.

The torsional spring **205** is preferably configured as a dual arm spring urging the dust shutter door **204** toward its closed position, to block debris from entering the opening to the keyway when the lock is not being operated with a key **219**. The dust shutter pin **202** is preferably round to support the preferred, stronger dual arm torsion spring **205** to  
10 improve the closing operation of the dust shutter door **204** particularly when the dust shutter door is impeded by dirt, dust, water or ice. The rounded pin **202** should also rotate more easily even when the dust shutter door or the rounded pin is impeded by dirt or ice.

It is also preferable to avoid accumulation of any water near the rotational range interface defined by, for example, stop **215** which travels within a rotational track defined by cavity **402** as illustrated in **Figs. 5A** and **6B**.  
15

In the prior art pin lock as shown in Fig. 2, stop **601** rotates clockwise from the 3-to-6 o'clock position in stop cavity **602**. The stop cavity is near the bottom of cylinder **101**. Because of its orientation when the prior art lock is in the locked position, this cavity  
20 configuration is prone to buildup of ice adjacent the top of the shell.

In a lock of the present invention designed for clockwise (CW) rotation of the core from a locked to an unlocked position, as illustrated in **Figs. 6A**, **6B** and **6C**, the preferred solution is to move the stop **215** to the 12 o'clock position shown in **Figs. 5A**, **5C**. In the preferred embodiment of the present invention, the stop **215** rotates clockwise (CW)  
25 from a position starting at 12 o'clock and rotating to 3 o'clock. Stop cavity **402** is correspondingly placed at the top of the interior of shell **208** so that ice cannot build up along the interior ceiling of shell **208**. In another variant of the invention illustrated in **Figs. 6D**, **6E** and **6F** in which the lock is designed for counter clockwise (CCW) rotation of the core from a locked to an unlocked position, the preferred solution is to provide a

configuration in which the stop **215** rotates counter clockwise (CCW) from a position starting at 12 o'clock and rotating to 9 o'clock.

In addition to the preferred drainway which may be provided to drain any penetrating water from within the pin lock, it is also preferable to provide water resistant seals to  
5 inhibit the inward flow of rain or other water surrounding the pin lock.

For example, the rotatable core may be lengthened to provide additional mounting space shown as O-ring groove **214** to hold a rubber O-ring **211** as a barrier to inhibit water ingress from the distal end between rotatable core **207** and shell **208**. For example, the rubber O-ring **211** may be mounted within O-ring groove **214** prior to  
10 assembly.

A shell scalp **201** is shown as a rigid protective shroud to be fastened over the proximate face of the shell **208**. The shell scalp is configured to hold the dust shutter assembly **206** in place and to inhibit water ingress from the proximate end, which is often exposed to the elements when the lock is used in outdoor installations. A front  
15 gasket **210** may also be added adjacent the proximate end of the pin lock, between the pin lock shell and a surrounding wall of a storage structure such as a lock box. The gasket material is preferably selected to satisfy a product specification for outdoor use. These are only two examples of the various kinds or seals which may be provided to inhibit water ingress.

20 **Figs. 8-13** illustrate a preferred embodiment of the invention comprising a preferred wafer tumbler lock having a modified stainless steel MIM core **207'** which nests, rotatably, within modified shell **208'**. The fully assembled wafer tumbler lock preferably has a stainless steel shell scalp **201'** which is held in place over the proximate end (face) of the shell **208'** by shell scalp retainers **531, 532**. The shell scalp **201'** may be  
25 secured about the shell head by press fit, snap fit, crimping or another suitable method understood by persons skilled in the art.

With regard to **Figs. 8 and 9**, the core head **277** of core **207'** is provided with a dust shutter cavity **301'**, and pin pockets **301A', 301B'** to receive the components of a dust

shutter assembly which may be similar to the examples (202-206) shown in Fig. 4. In this embodiment, the core 207' is provided with a plurality of wafer tumbler slots 528 (to receive spring loaded reciprocating wafers which wafers are not shown) and a security retainer wafer (or pin) slot 529 to further inhibit unauthorized tampering, or operation or  
5 removal of the core 207'. (However, a security wafer or pin is not shown.)

In this embodiment, the core head 277 is provided with a core head drain hole 302' which is illustrated as being in fluid communication with shell drainage channel 403' which in turn communicates with drainage channel 201A' defined by an opening in the stainless steel shell scalp 201', to provide a drainage outlet to the exterior of the tumbler  
10 lock. Preferably, the core head drain hole 302' is positioned to communicate water flow from behind the dust shutter assembly and from other communicating portions of the core, including the opening to keyway 527.

The drainage channel 201A' may include a drip edge 709 such as, but not limited to, an extended lip or protrusion configured to enhance water movement downwardly and  
15 outwardly from the interior of the tumbler lock. Preferably, the drip edge 709 is configured to direct water away from the lock and away from any outdoor storage structure in which the lock may be installed.

In some embodiments, the drip edge may also include supplementary ridges or other drip enhancing features provided on shell scalp retainers 531, 532 which have been  
20 suitably positioned and configured to promote outward flow of water from within the interior of the tumbler lock, via other portions of the drainway.

In this embodiment, the core head 277 defines a recess 460 extending between recess walls 462, 463 which project outwardly from opposite ends of core head surface 464. When the stainless steel core 207' is inserted within the shell 208', the core head  
25 surface 464, recess walls 462, 463 and a concave interior wall of the shell 208' opposing surface 464, define a chamber 465 which includes the space within recess 460. When the tumbler lock is installed and operated by rotational movement of an operating key inserted into keyway 527, the chamber 465 travels along the concave interior wall of the shell 208', taking with it, any debris, including any water or ice which

may have accumulated or formed within the chamber **465**, for example, when the tumbler lock was in a locked position. Recess shoulders **462'**, **463'** are preferably smoothed, rounded, beveled or otherwise shaped to reduce friction when the core is rotated within the shell **208'**. In a preferred embodiment, the chamber **465** will also be  
5 in fluid communication with other portions of the drainway, to promote outward flow of water from within the tumbler lock assembly, including when the tumbler lock is in the locked position.

The core head **277** may also include a cavity **525**, often, to save MIM material and reduce component weight. Preferably, any cavities within the core **207'** or shell **208'** will  
10 be in fluid communication with other portions of the drainway within the tumbler lock, which may be similar to drainage channel **212**, although persons skilled in the art will appreciate, after reading this specification, that other combinations of drainage features may be provided.

In this invention, the drainway may comprise a single fluid pathway or a plurality of fluid  
15 pathways to channel fluid flow outwardly and downwardly from the tumbler lock, when the tumbler lock is installed. Where a plurality of fluid pathways are provided, the fluid pathways are preferably interconnected for outward fluid communication between the interior of the tumbler lock and the exterior of the tumbler lock via the drain outlet. The drainway may include a plurality of features (for example, those illustrated and  
20 described in **Figs. 4 to 6**, and **Figs. 8 to 13** and the related description) to provide a fluid pathway such as but not limited to one or more of the following features to channel outward fluid flow: a conduit, recess, gap, trough, dripway, drip edge, bore, slot, drain opening, drain outlet, and other fluid communication features.

In some embodiments, the drain opening may comprise the drain outlet, a drip edge,  
25 dripway or other features to provide or promote fluid egress from the interior of the tumbler lock.

Persons skilled in the art will also appreciate that one or more of the features described in association with one embodiment may be selected for use in other embodiments of the invention, including those other embodiments described herein.

### Preferred Materials Choices

While it will be understood that persons skilled in the art will have reasons to select from a wide variety of construction materials, the following materials are preferred for the present invention.

5    **201** Scalp – preferably stainless steel;

**206** Dust Shutter Assembly (**202 – 205**) – preferably stainless steel;

**207** Core and retainer wafer (or pin) provided in retainer slot **529** – preferably stainless steel, preferably MIM (Metal Injection Molded) hardened to appropriate manufacturing specifications selected for the product installation(s);

10   **208** Shell – preferably cast from zinc;

Hex Nut 105, Retaining Clip 505 are preferably plated in Zinc Nickel Alloy (automotive grade plating) to reduce rusting; and

Pins 113 and Retaining Pin 126, or other tumbler configurations and retainers are preferably made of stainless steel.

15    Preferably, the tumbler lock is treated with lubrication during assembly.

Persons skilled in the art will appreciate that the foregoing description was directed to specific embodiments of the invention. However, many other variations and modifications of the invention are also possible. Preferred embodiments of the invention have been described with regard to the appended drawings. It will be apparent to those skilled in the art that additional embodiments are possible and that such embodiments will also fall within the scope of the appended claims.

20

Various materials may be used to manufacture the components of the tumbler lock, storage compartments, storage structures and other embodiments of the present invention, as would be evident to a skilled person.

Also, it should be understood that the above-described embodiments of the present invention, particularly, any "preferred" embodiments, are only examples of implementations, which are merely set forth to better understand the principles of the invention. Many variations and modifications may be made to the above-described embodiment(s) of the invention as will be evident to those skilled in the art. Additional  
5 embodiments and variations are possible and such embodiments and variations will fall within the scope of the appended claims.

In this document where a list of one or more items is prefaced by the expression "such as" or "including", or is followed by the abbreviation "etc.", or is prefaced or followed by  
10 the expression "for example", or "e.g.", this is done to expressly convey and emphasize that the list is not exhaustive, irrespective of the length of the list. The absence of such an expression, or another similar expression, is in no way intended to imply that a list is exhaustive. Unless otherwise expressly stated or clearly implied, such lists shall be read to include all comparable or equivalent variations of the listed item(s), and alternatives to  
15 the item(s), in the list that a skilled person would understand would be suitable for the purpose that the one or more items are listed.

The words "having", "comprises" and "comprising", when used in this specification and the claims, are used to specify the presence of stated features, elements, integers, steps or components, and do not preclude, nor imply the necessity for, the presence or addition  
20 of one or more other features, elements, integers, steps, components or groups thereof.

Nothing in this specification or the claims that follow is to be construed as a promise.

The scope of the claims that follow is not limited by the embodiments set forth in the description. The claims should be given the broadest purposive construction consistent with the description as a whole.

25

**Parts List (of the embodiments described herein)**

In which "SS" indicates stainless steel.

**201** – SS Shell Scalp

**201A** – Shell Drainage Hole

5 **202** – SS Dust Shutter Pin

**203** – SS Dust Shutter Face Plate

**203A** – Dust Shutter Drainage Hole

**204** – SS Dust Shutter Door

**205** – Dual Arm Torsion Spring

10 **206** – Dust Shutter Assembly (Shown as 202 – 205)

**207** – SS MIM Core

**208** – Shell

**209** – Top Cap

**210** – Front Gasket

15 **211** – Rear O-Ring

**212** – Shell Drainage Channel

**212B** – distal end of shell drainage channel

**213** – Hex Nut

**214** – O-Ring Groove

20 **215** – stop

**222** – drip edge

**250** – first linear array of pin slots

**301** – dust shutter cavity

**301A** – pin pocket

5 **301B** – pin pocket

**302** – lower cavity

**401** – shell head

**402** – stop cavity

**403** – drainage hole

10 **404** – pin chamber area

**405** – groove

**407, 407A** – vertical sidewalls

**408** – vertical end wall

**410,411** – shoulders

15 **412** – intermediate edge

**415** – elevated pinway

**450** – second linear array of pin slots

**601** -- stop

**602** -- stop cavity

20

**Figures 8-13**

- 201' SS shell scalp**
- 201A' shell drainage channel**
- 207' SS MIM core**
- 5 **208' Shell**
- 277 core head**
- 301' dust shutter cavity**
- 301A' pin pocket**
- 301B' pin pocket**
- 10 **302' core head drain hole**
- 403' shell drainage channel**
- 460 recess**
- 462, 463 recess walls 462', 463' recess shoulders**
- 464 core head surface**
- 15 **465 chamber**
- 525 cavity**
- 527 keyway**
- 528 wafer tumbler slots**
- 529 security retainer slot**
- 20 **531, 532 scalp retainers**

709 drip edge

1. A tumbler lock extending along a longitudinal axis from an outer face at a proximate end to a distal end, the outer face defining a facial surface, the distal end configured for insertion into a storage structure, the tumbler lock comprising:

a shell for housing a rotatable core having a core head adjacent the proximate end and inward of the facial surface, the shell extending between the proximate end and the distal end,

an interior drainway extending downwardly and outwardly from within the tumbler lock, to channel water ingress adjacent the facial surface, and to channel said water outwardly via a drain opening adjacent the proximate end, and

an interior chamber at the proximate end in water communication with the drainage channel, wherein the chamber is defined by an arcuate gap within a lower interior quadrant of the tumbler lock inward of the facial surface, the interior chamber extending between an outer side surface of the core head and an opposing interior surface of the shell.

2. The lock as claimed in claim 1, the rotatable core defining a linear plurality of tumbler slots communicating with a keyway when an operating key is inserted into the keyway, a set of tumblers in the linear plurality of tumbler slots in coplanar interfacial alignment along an exterior surface of the rotatable core, when in the first position, to permit rotation of the rotatable core, about the axis, within the shell.

3. The lock as claimed in any one of claims 1 or 2, the chamber comprises an arcuate recess defined between the outer side surface of the core head and the opposing interior surface of the shell.

4. The lock as claimed in any one of claims 1 to 3, the chamber extends between (i) a 3 o'clock position and a 6 o'clock position of the rotatable core, or (ii) between the 6 o'clock position and a 9 o'clock position of the rotatable core.

5. The lock as claimed in any one of claims 1 to 4, the chamber defines an arcuate sector within the lower quadrant, the lower quadrant extending between a 3 o'clock position and a 6 o'clock position of the rotatable core.
6. The lock claimed in any one of claims 1 to 5, the chamber defines an actuate sector within the lower quadrant, the lower quadrant extending between a 6 o'clock position and a 9 o'clock position.
7. The lock as claimed in any one of claims 1 to 6, the drainway comprises a core drain extending along a proximate face of the rotatable core, and the core drain communicating with the drain opening.
8. The lock claimed in any one of claims 1 to 7, the drainway comprises a drain slot extending along a lower wall of the shell, adjacent the drain opening and adjacent the proximate end.
9. The lock as claimed in claim 7 or claim 8 when depending from claim 7, the core drain opens between opposing side walls of the drain slot.
10. The lock as claimed in any one of claim 7, claim 8 when depending from claim 7, or claim 9, the core drain defines a core drain diameter of about 0.32 cm.
11. The lock as claimed in any one of claim 8, claim 9 when depending from claim 8, or claim 10 when depending from claim 8 or claim 9, a lower edge of one of the opposing side walls of the drain slot defines a drip edge.
12. The lock as claimed in any one of claims 1 to 11, a portion of the drainway comprises a channel in the lower quadrant in water communication with the arcuate gap.
13. The lock as claimed in any one of claims 1 to 12, comprising a water resistant seal adjacent a distal end of the rotatable core and between the rotatable core and the shell to inhibit water ingress at the distal end of the lock.

14. The lock as claimed in claim 13, the seal having an O-ring configuration for mounting within a groove defined by the rotatable core inward of a distal end of the shell.
15. A storage structure comprising the lock claimed in any one of claims 1 to 14, the lock providing locking access to a privately accessible compartment within the storage structure.
16. The storage structure as claimed in claim 15, for outdoor use exposed to precipitation and in temperatures occasionally ranging below 0 degrees Celsius.
17. The storage structure as claimed in claim 15 or 16 configured as a multi compartment community mailbox wherein each compartment is a lockable storage unit.
18. A wafer lock defining a longitudinal axis extending from an outer face at a proximate end to a distal end, the outer face defining an outer facial surface, the distal end configured for insertion into a storage structure, the wafer lock comprising:
  - a shell for housing a rotatable core having a core head adjacent the proximate end and inward of the outer facial surface, the shell extending between the proximate end and the distal end,
  - an interior drainway extending downwardly and outwardly from within the wafer lock, to receive water ingress adjacent the proximate end, and to channel said water outwardly via a drain opening adjacent the proximate end, the drainway comprising a drainage segment adjacent a proximate face of the core head in water communication between the proximate face of the core head and the drain opening, and
  - an interior chamber at the proximate end of the core head in water communication with the drainage channel, wherein the chamber is defined by an arcuate gap between the core head and an opposing arcuate interior surface of the shell, within a lower interior quadrant of the wafer lock inward of the outer facial surface, the chamber extending between an outer side surface of the core

head within the arcuate gap and the opposing arcuate interior surface of the shell, the chamber being sloped downwardly and outwardly for water communication toward the drain opening.

19. The lock as claimed in claim 18, the drainway comprising a drainage segment adjacent a proximate face of the core head parallel to the outer facial surface, the drainage segment being in water communication between the proximate end of the core head and the drain opening.

20. The lock as claimed in claim 19, the arcuate gap being in water communication with the drainage segment.

21. The lock as claimed in claim 19 or 20, the arcuate gap being downwardly and outwardly sloped for enhanced water communication with the drainage segment.

22. The lock as claimed in any one of claims 19 to 21, the drainage segment defining a cavity extending from a recess in the proximate face of the core head, the drainage segment aligning with the drain opening for water communication when the lock is in a locked position.

23. The lock as claimed in any one of claims 18 to 22, the drain opening comprising an elongated slot parallel to the longitudinal axis.

24. The lock as claimed in any one of claims 18 to 23, the drain opening comprising a drip edge extending downwardly from the outer face.

25. The lock as claimed in any one of claims 18 to 24, the drainway comprising a drainage space extending downwardly between the outer facial surface and the proximate face of the core head, the drainage space being in water communication with the drain opening.

26. The lock as claimed in any one of claims 18 to 25, the proximate face of the core head comprising a movable shutter door biased to inhibit water ingress into a keyway extending inwardly from the shutter door and along the longitudinal axis of the rotatable core.

27. The lock as claimed in any one of claims 18 to 26, comprising a water resistant seal between a distal end of the rotatable core and a distal end of the shell.

28. The lock as claimed in claim 27, the seal comprising an O-ring mounted within a groove defined by the rotatable core inward of the distal end of the shell.

29. A wafer lock extending along a longitudinal axis from an outer face at a proximate end to a distal end, the outer face defining an outer facial surface, the distal end configured for insertion into a storage structure, the wafer lock comprising:

a shell for housing a rotatable core having a core head adjacent the proximate end and inward of the outer facial surface, the shell extending between the proximate end and the distal end,

the rotatable core defining a keyway extending inwardly from the proximate end and along the longitudinal axis, a shutter door at a proximate end of the keyway, the shutter door being movable within a proximate face of the core head and biased to inhibit water ingress into the keyway,

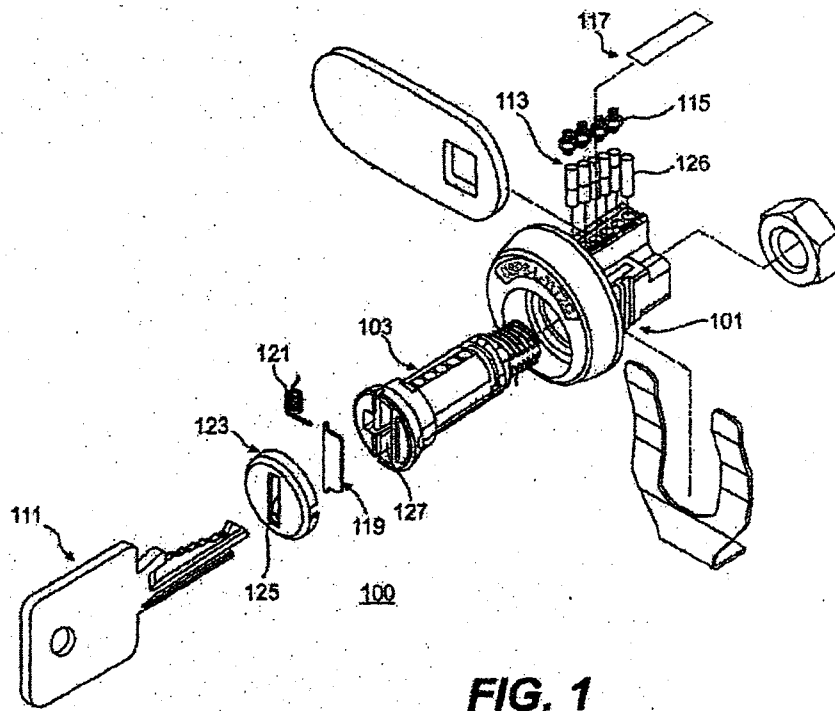
an interior drainway extending downwardly and outwardly from within the wafer lock, to receive water ingress entering across the outer facial surface, and to channel said water outwardly via a drain opening adjacent the proximate end, the drain opening being configured as an elongated slot extending parallel to the longitudinal axis, the drainway comprising a drainage segment adjacent the proximate face of the core head in water communication between the proximate face of the core head and the drain opening, the drainway comprising a drainage space extending downwardly between the outer facial surface and the proximate face of the core head, the drainage space being in water communication with the drain opening, and

an interior chamber at the proximate end of the core head in water communication with the drainage channel, wherein the chamber is defined by an arcuate gap between the core head and an opposing concave interior surface of

the shell, within a lower interior quadrant of the wafer lock inward of the outer facial surface, the chamber extending between an outer side surface of the core head within the arcuate gap and the opposing concave interior surface of the shell, the chamber being sloped downwardly and outwardly for water communication toward the drain opening.

30. The lock as claimed in claim 29, comprising a water resistant seal between a distal end of the rotatable core and a distal end of the shell.
31. The lock as claimed in claim 30, the seal comprising an O-ring mounted within a groove defined by the rotatable core inward of the distal end of the shell.
32. A storage structure comprising the lock claimed in any one of claims 18 to 31, the lock providing locking access to a privately accessible storage compartment within the storage structure.
33. The storage structure as claimed in claim 32, configured for outdoor use exposed to precipitation and in temperatures occasionally ranging below 0 degrees Celsius wherein the chamber at the proximate end of the core head extends between (i) a 3 o'clock position and a 6 o'clock position of the rotatable core, or (ii) between the 6 o'clock position and a 9 o'clock position of the rotatable core.
34. The storage structure as claimed in claim 32 or 33 configured as a multi compartment community mailbox wherein each compartment is a lockable storage unit.

# PRIOR ART



PRIOR ART

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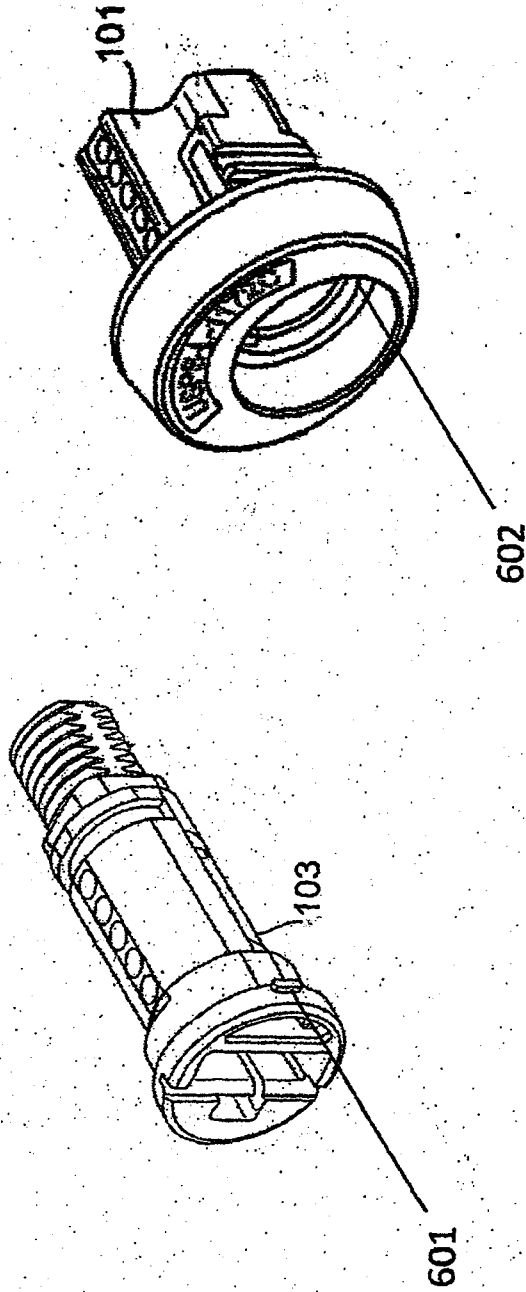


Fig. 2

PRIOR ART

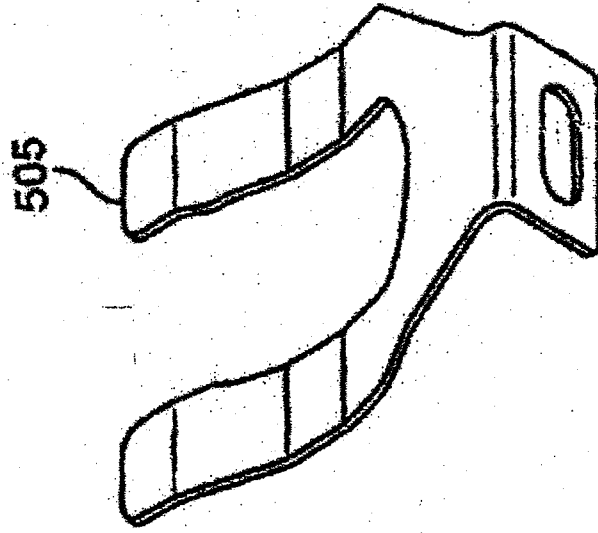


Fig. 3

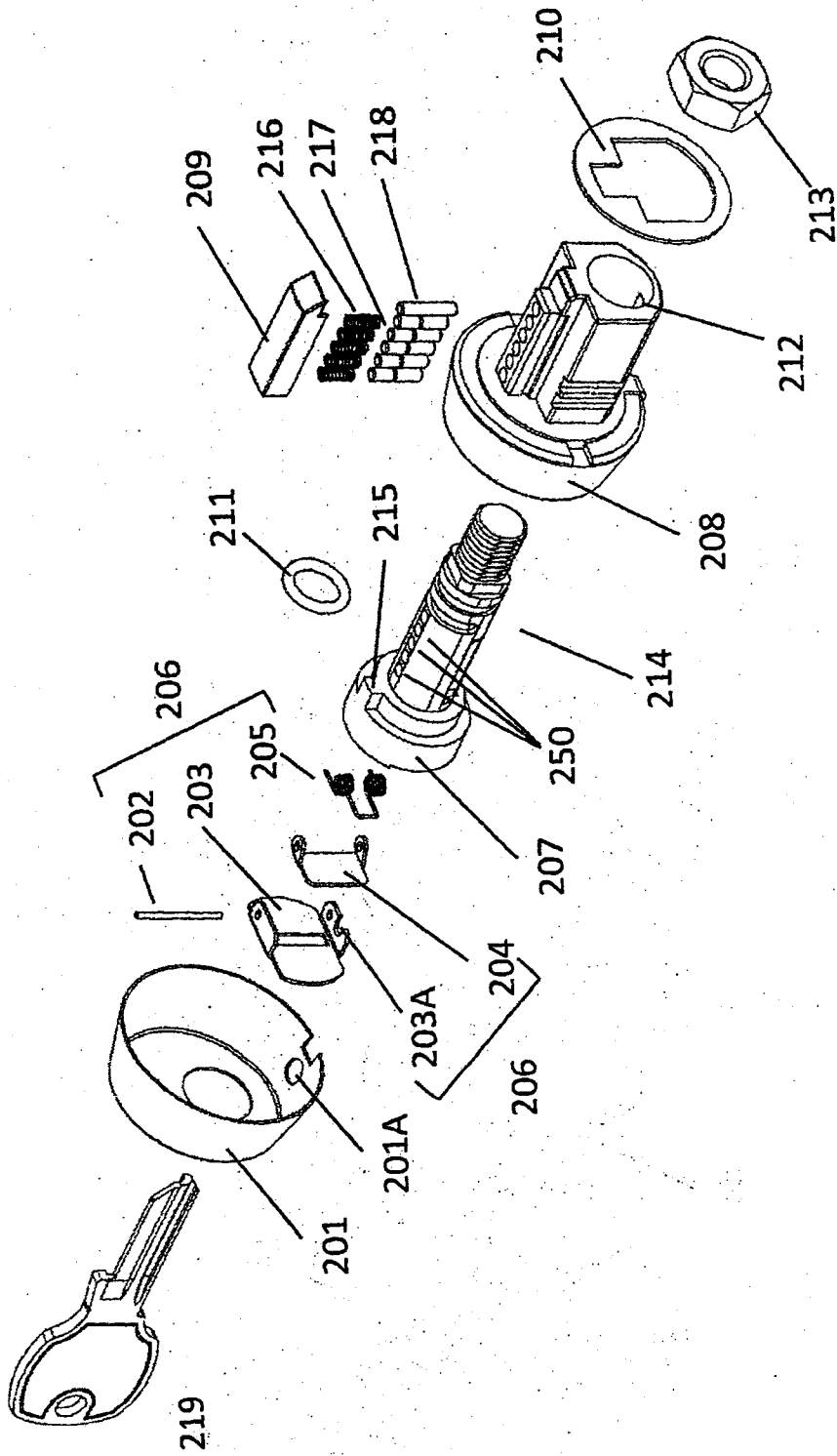


Fig. 4

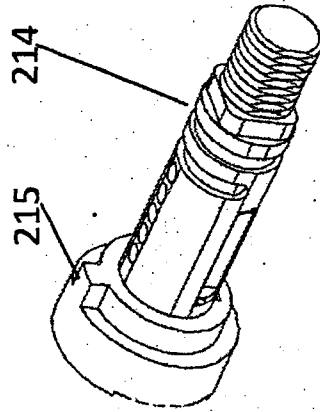


Fig. 5C

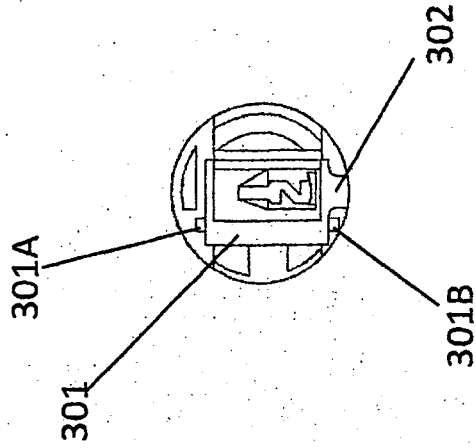


Fig. 5B

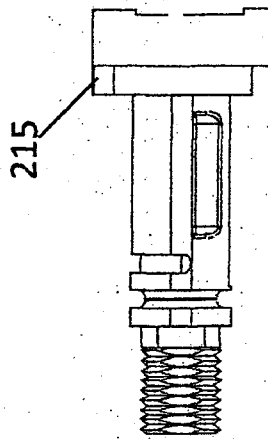


Fig. 5A

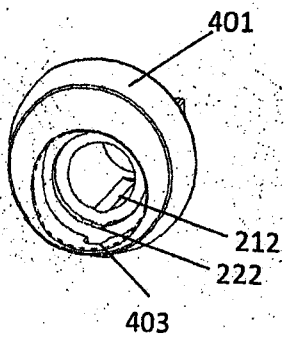


Fig. 6A

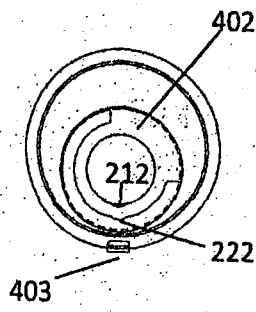


Fig. 6B

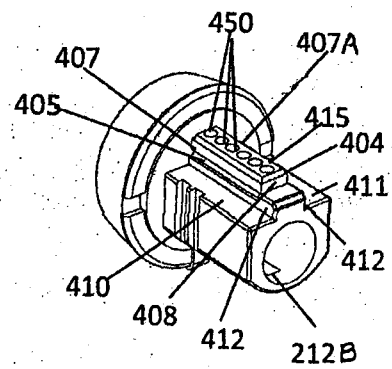


Fig. 6C

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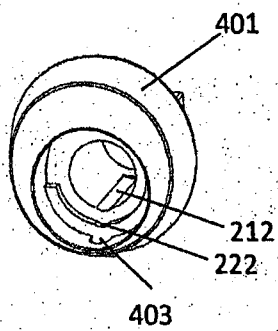


Fig. 6D

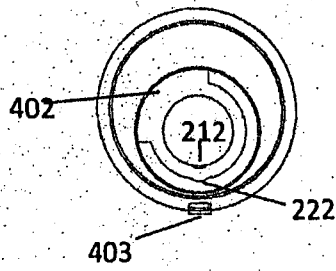


Fig. 6E

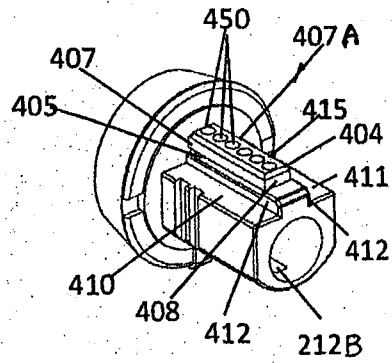


Fig. 6F

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PRIOR ART

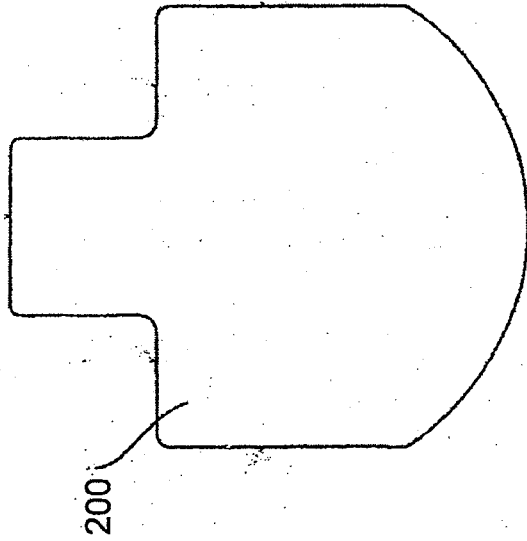


Fig. 7

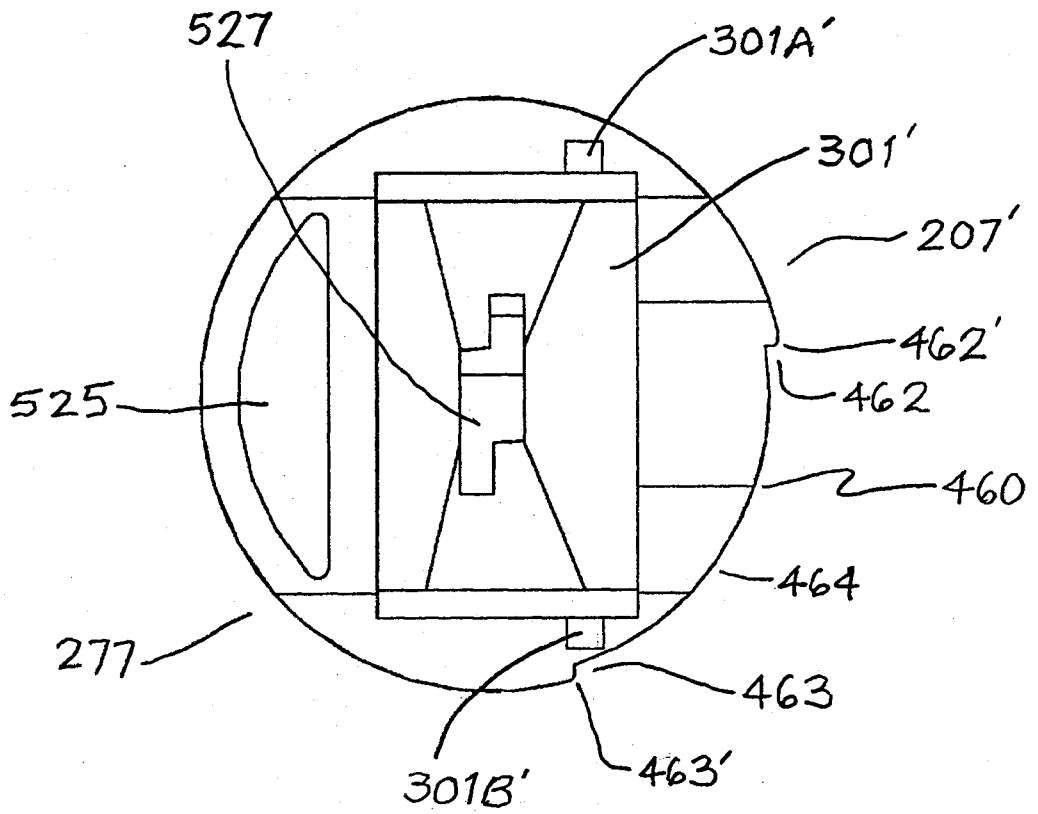


Fig. 8

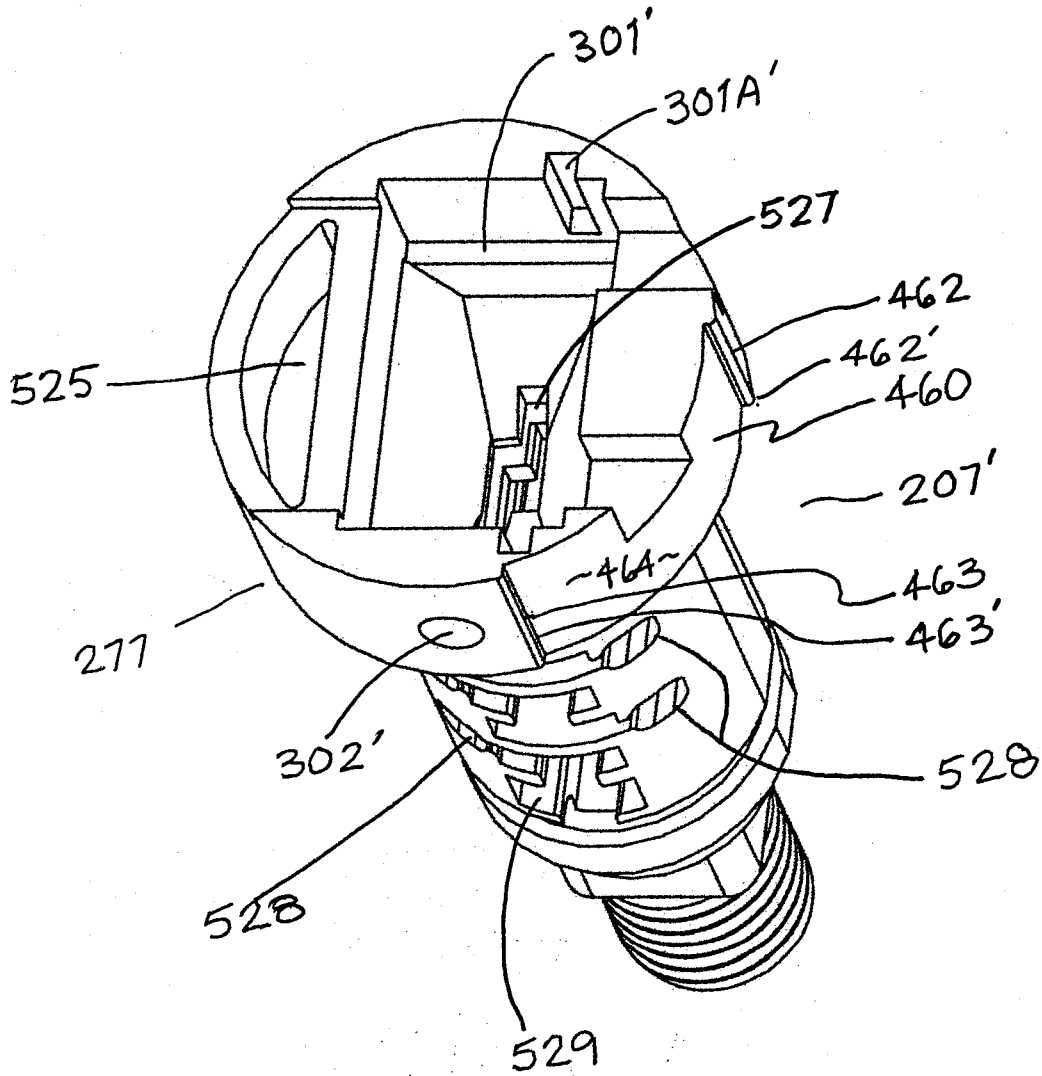


Fig. 9

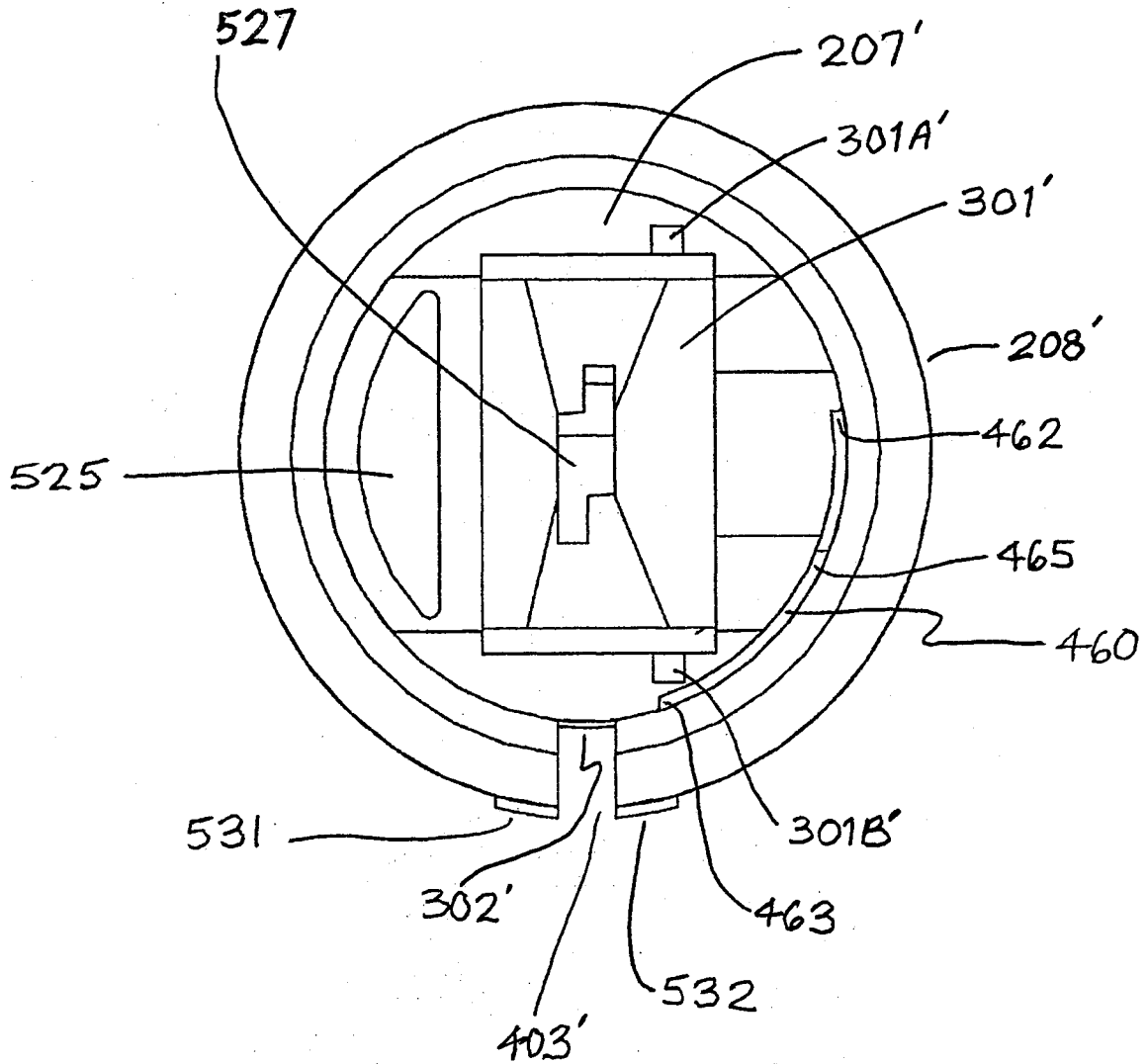


Fig. 10

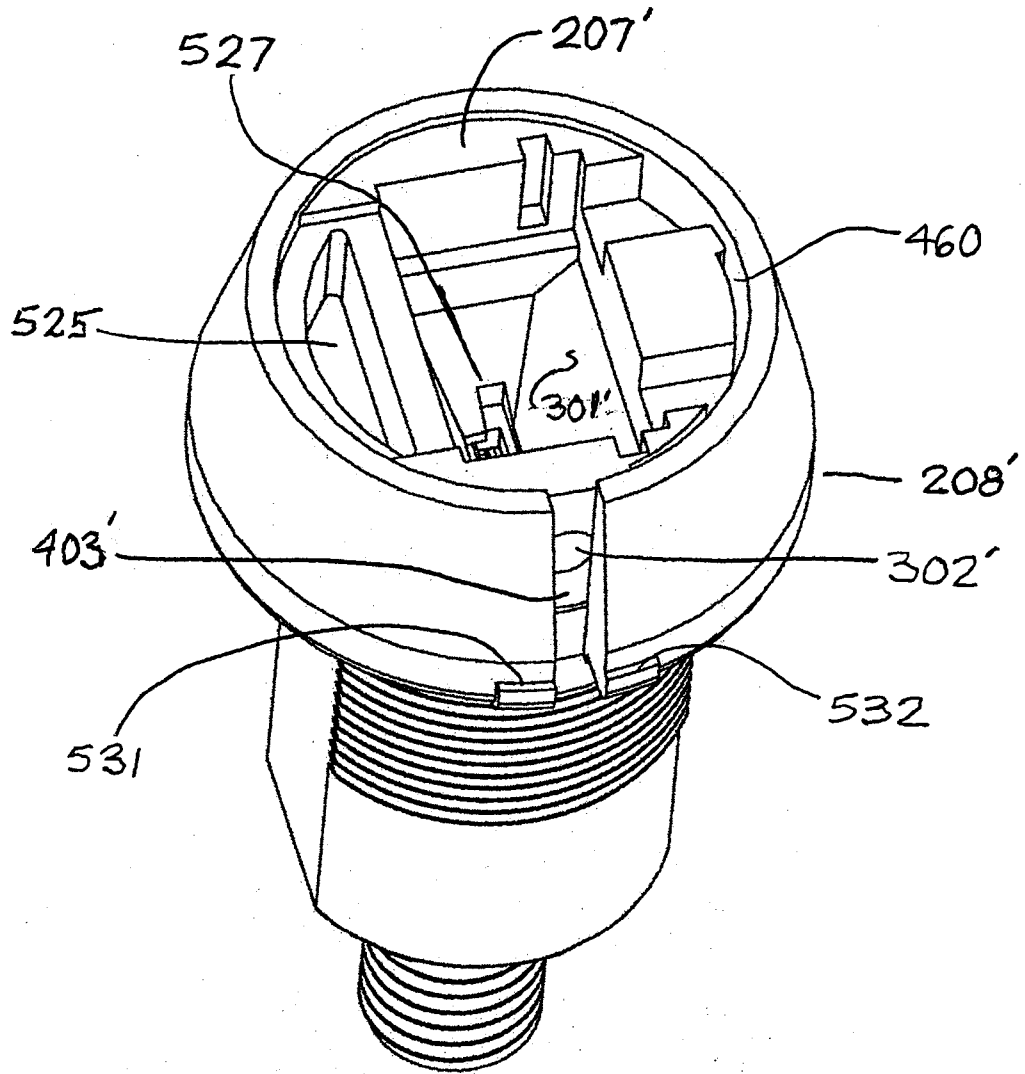


Fig. 11

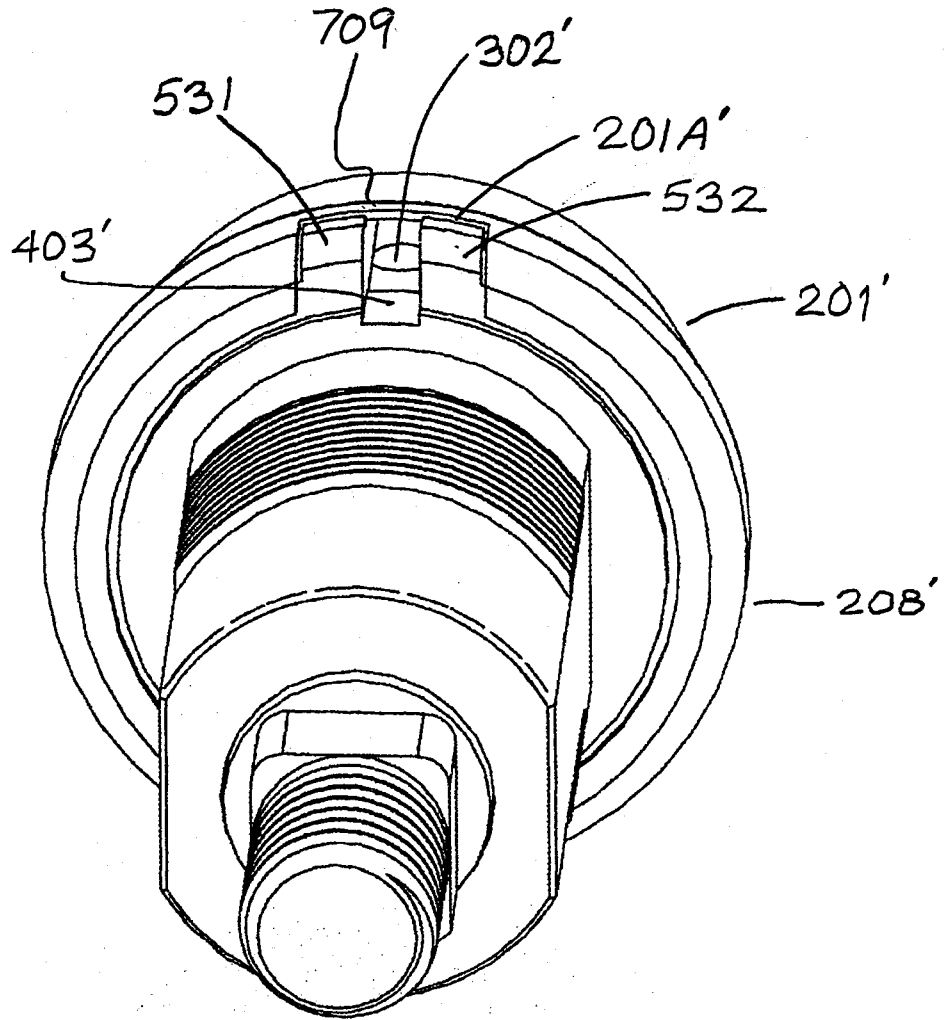


Fig. 12

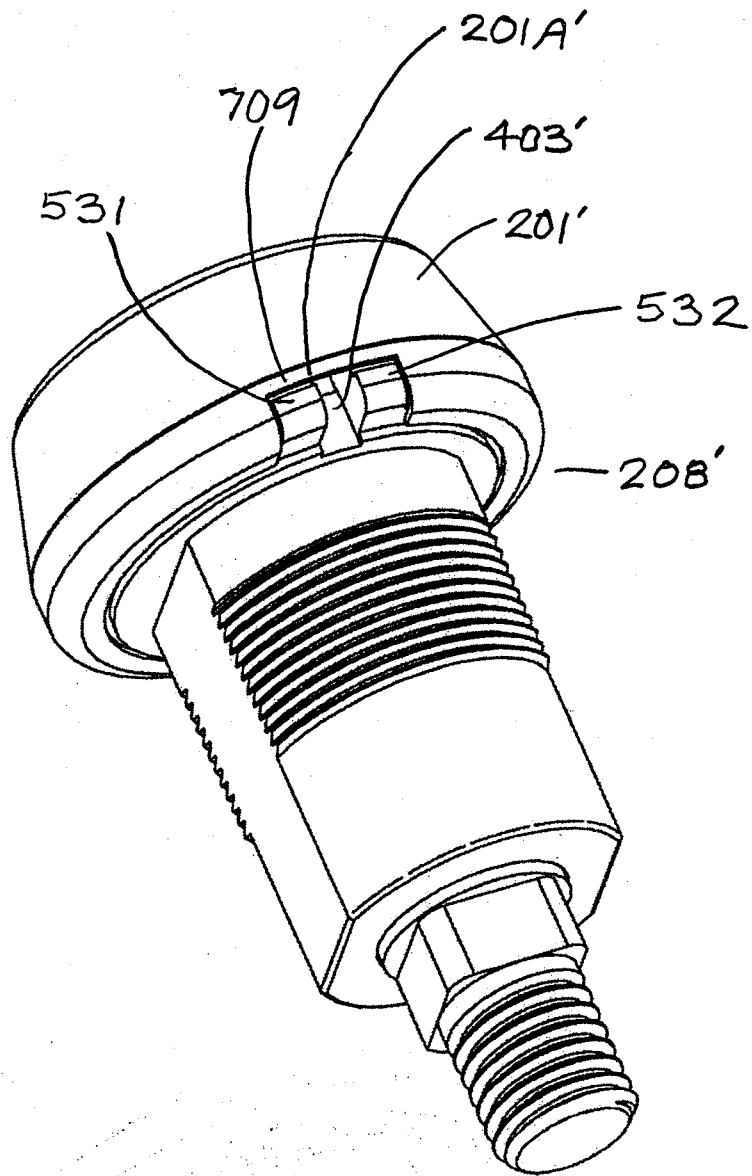


Fig. 13

