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Caruso

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(54) **SPRING-BIASED FLIP TOP CASE FOR AN AEROSOL CANISTER**

(71) Applicant: **The GPM Group, LLC**, Tonawanda, NY (US)

(72) Inventor: **Albert P. Caruso**, Tonawanda, NY (US)

(73) Assignee: **Avanti U.S.A. Ltd.**, Tonawanda, NY (US)

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(51) **Int. Cl.**

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B65D 83/56	(2006.01)
B65D 83/38	(2006.01)

(52) **U.S. Cl.**

CPC ***B65D 83/56*** (2013.01); ***B65D 83/384*** (2013.01)

(58) **Field of Classification Search**

CPC B65D 83/201–83/206; B65D 83/425
USPC 267/158–161, 180, 182; 222/153.02, 222/153.07, 153.11, 402.11
See application file for complete search history.

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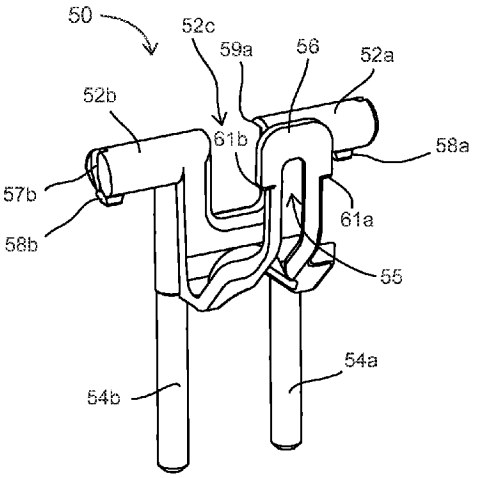
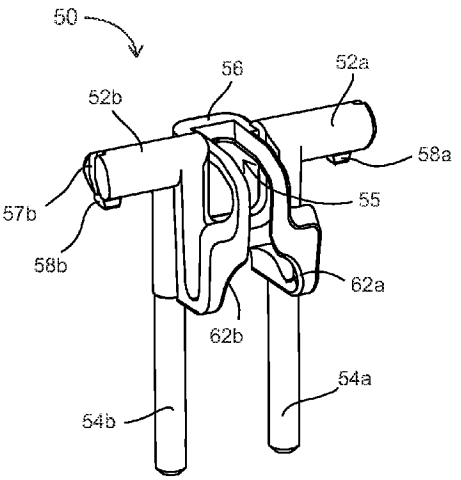
Primary Examiner — Christopher Schwartz
(74) *Attorney, Agent, or Firm* — Simpson & Simpson, PLLC

(57) **ABSTRACT**

A spring mechanism comprising a spring element having a pair of arms separated by a gap, a tapered flexible tongue with an enlarged tip, and a tapered slot extending longitudinally through the tongue, wherein the tapered flexible tongue is operatively arranged to bend such that the tip enters the gap and engages the pair of arms. A case for a canister capable of dispelling material is also disclosed using the spring mechanism to bias a lid in a closed position.

13 Claims, 15 Drawing Sheets





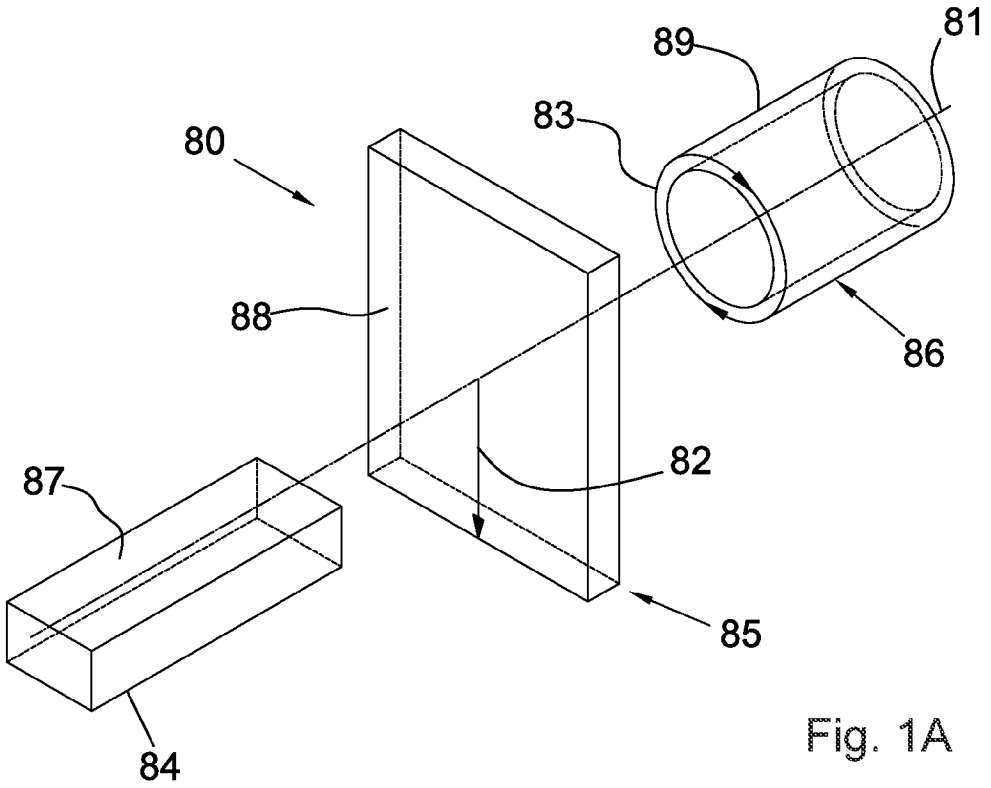


Fig. 1A

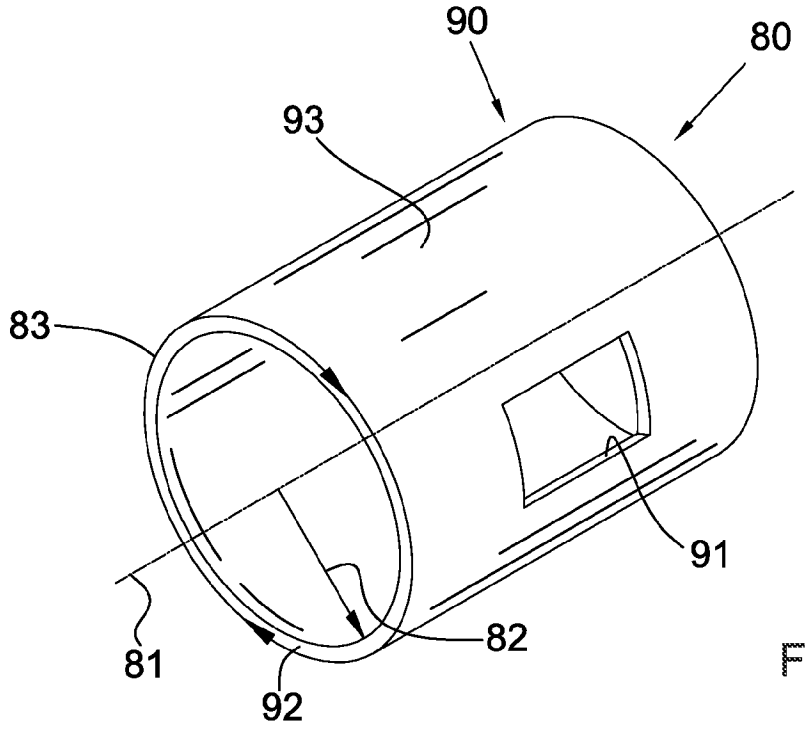


Fig. 1B

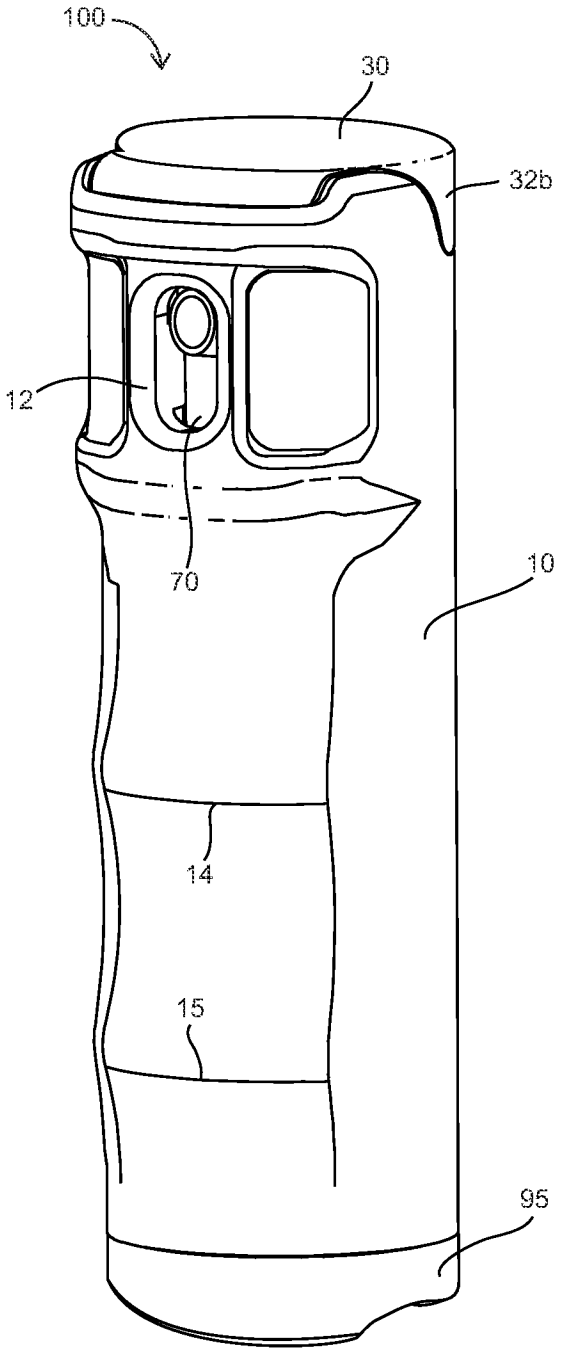


Fig. 2

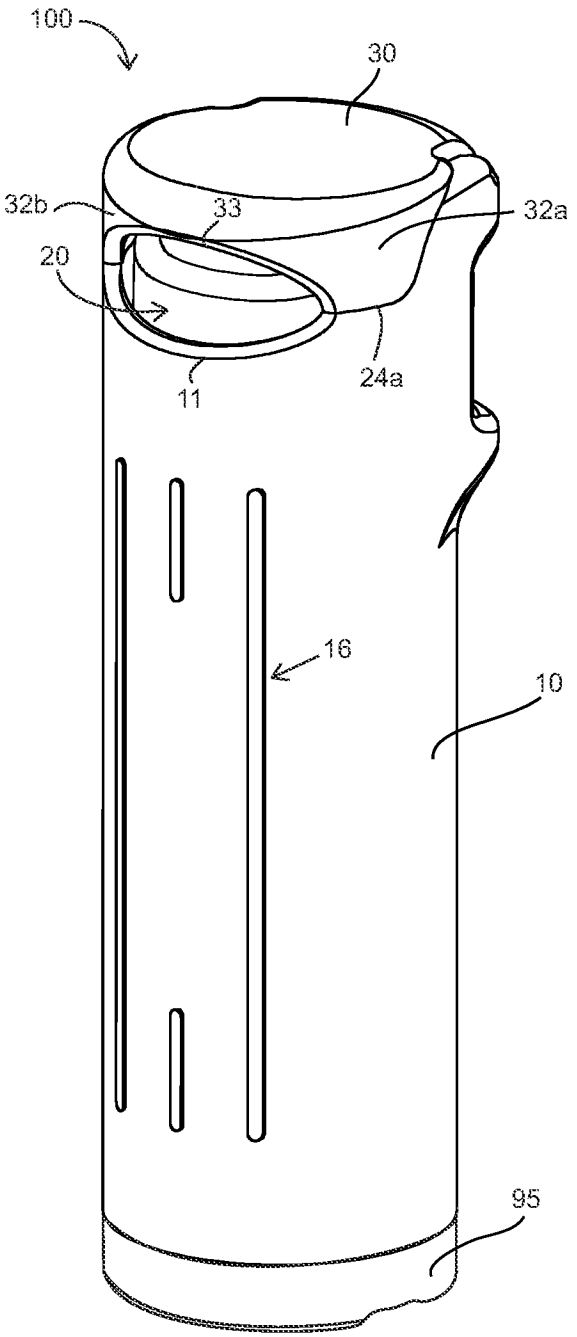


Fig. 3

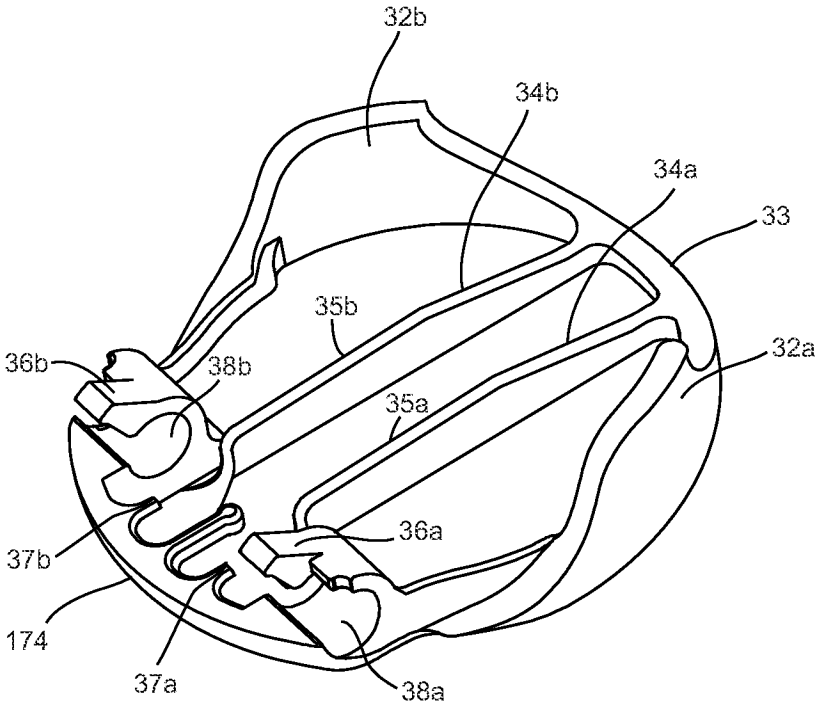


Fig. 4

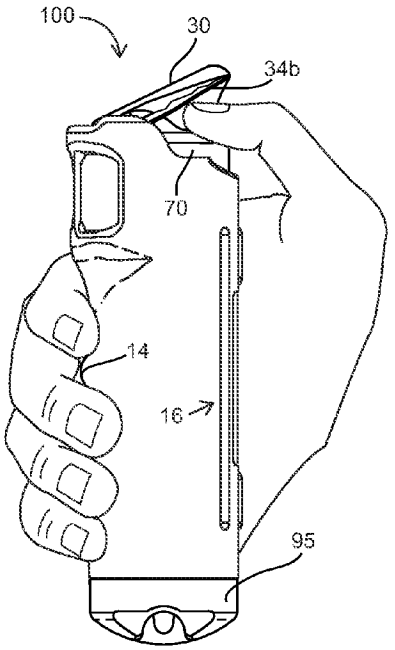


Fig. 5A

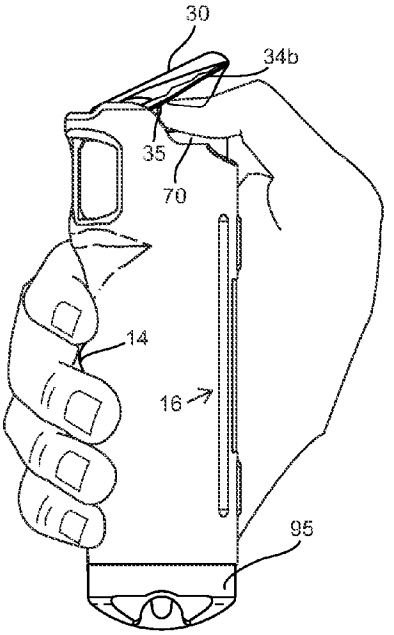


Fig. 5B

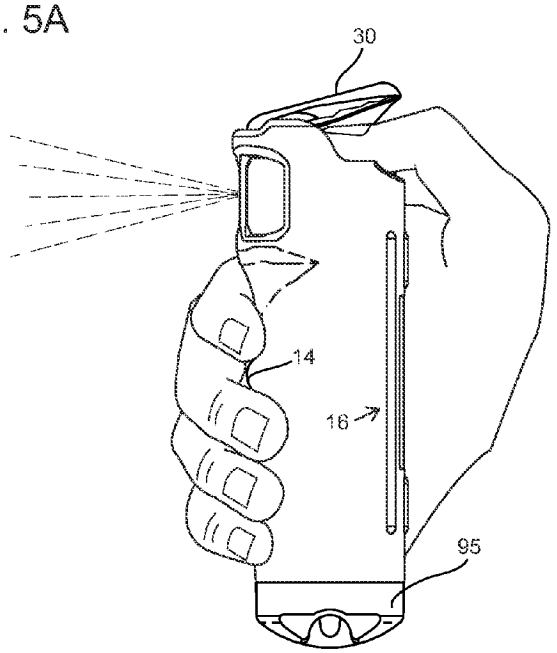


Fig. 5C

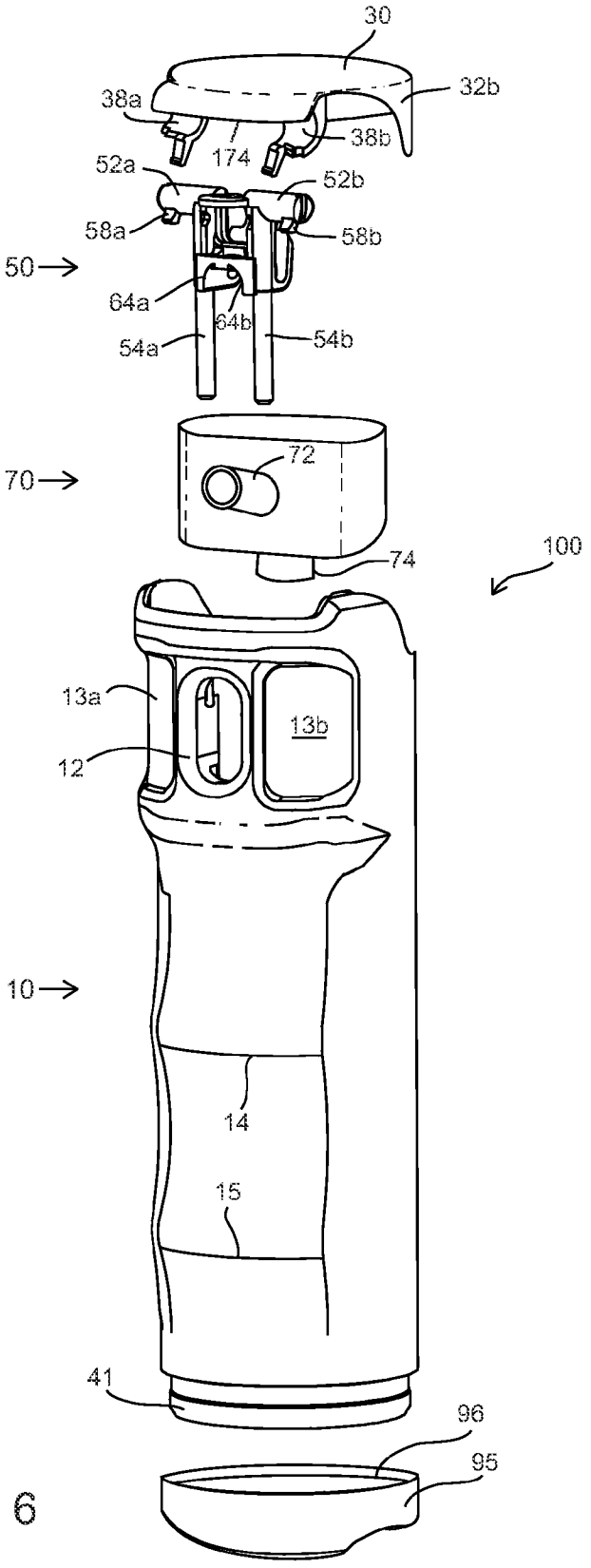

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Fig. 6

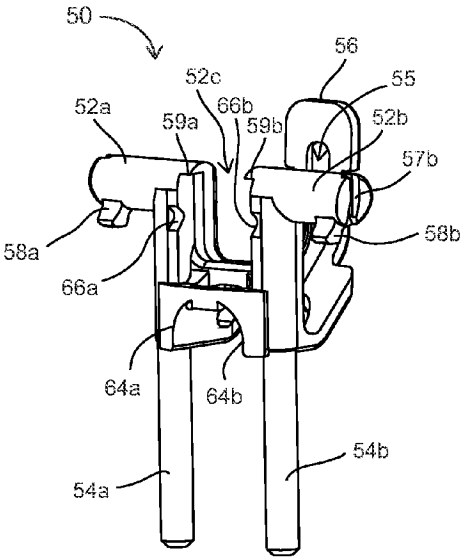

Fig. 7A

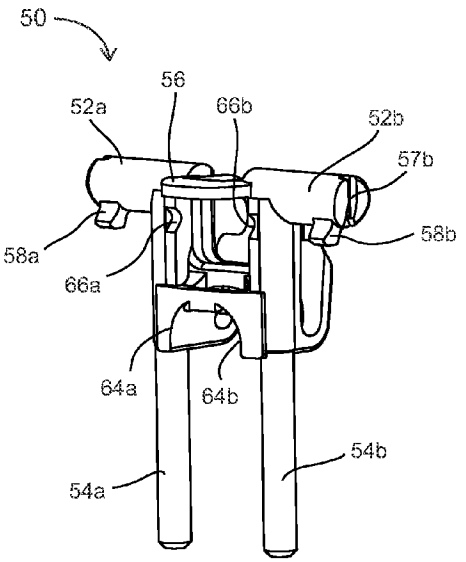

Fig. 7B

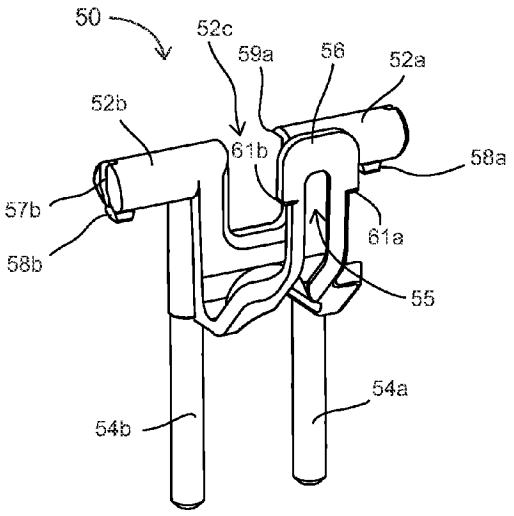

Fig. 7C

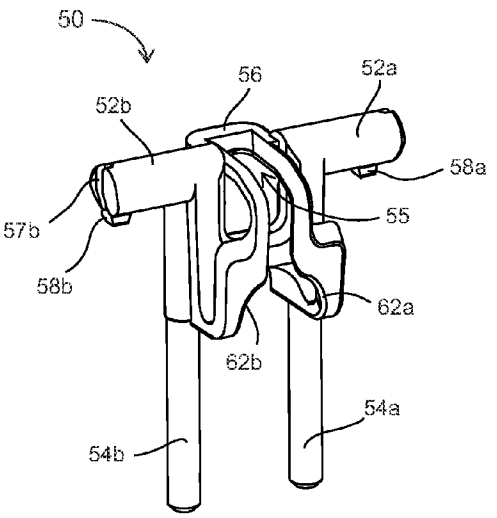

Fig. 7D

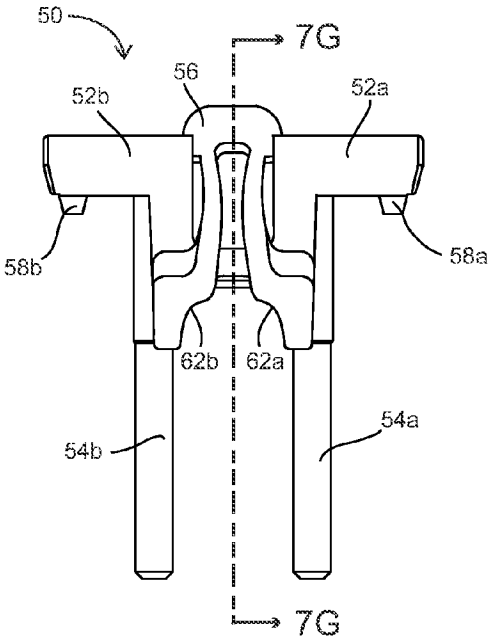

Fig. 7E

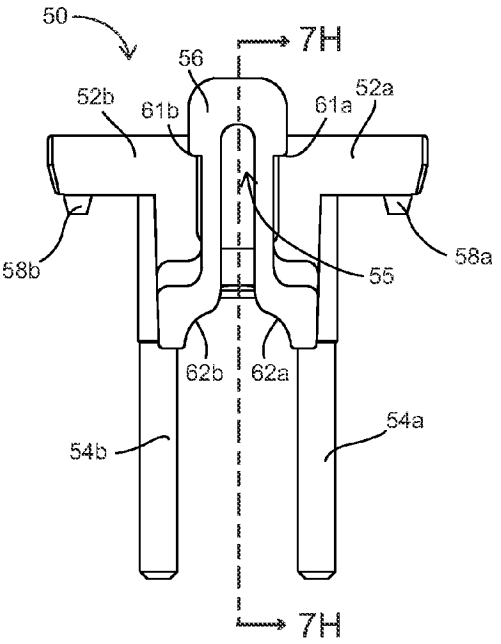

Fig. 7F

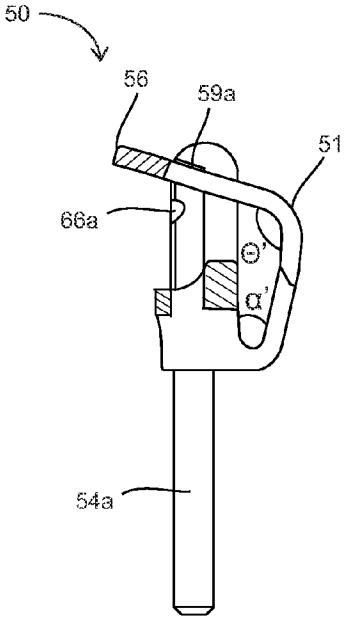

Fig. 7G

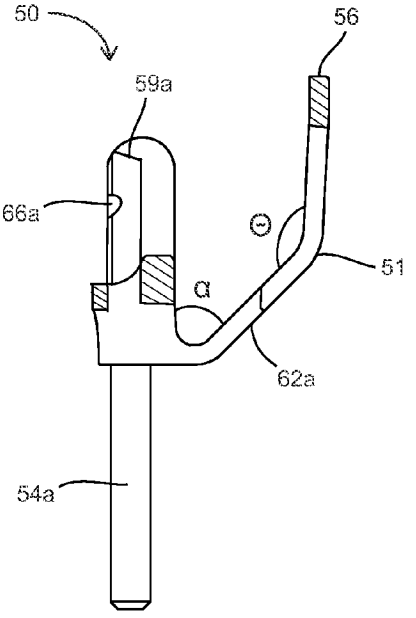

Fig. 7H

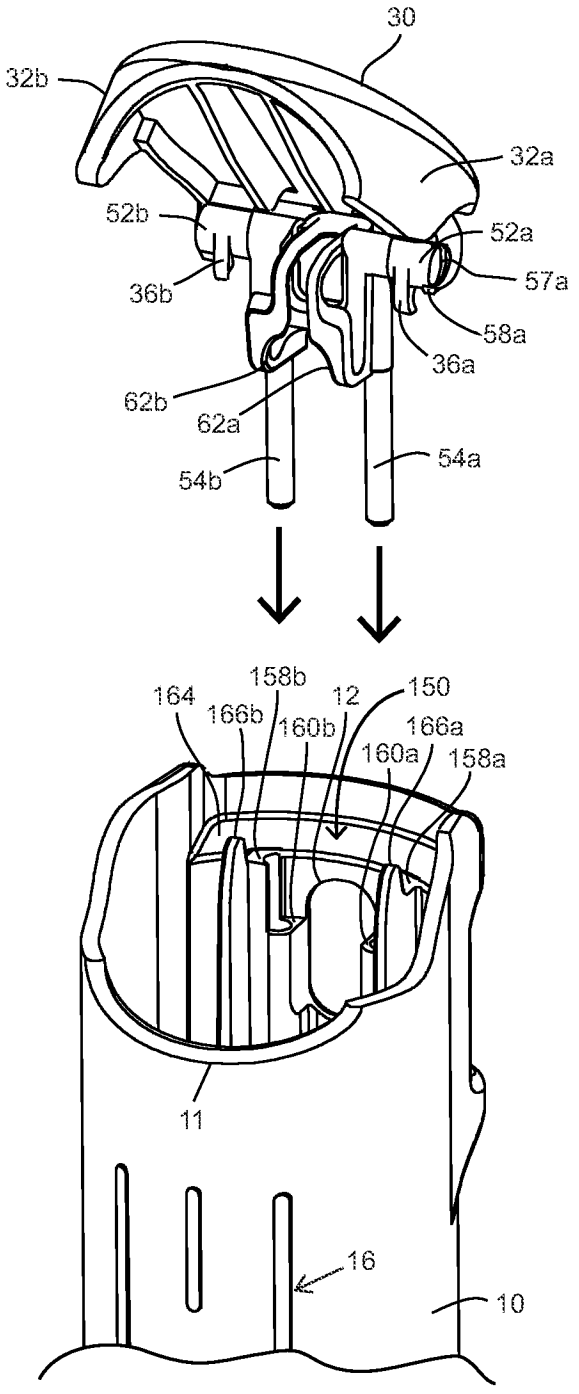
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Fig. 8

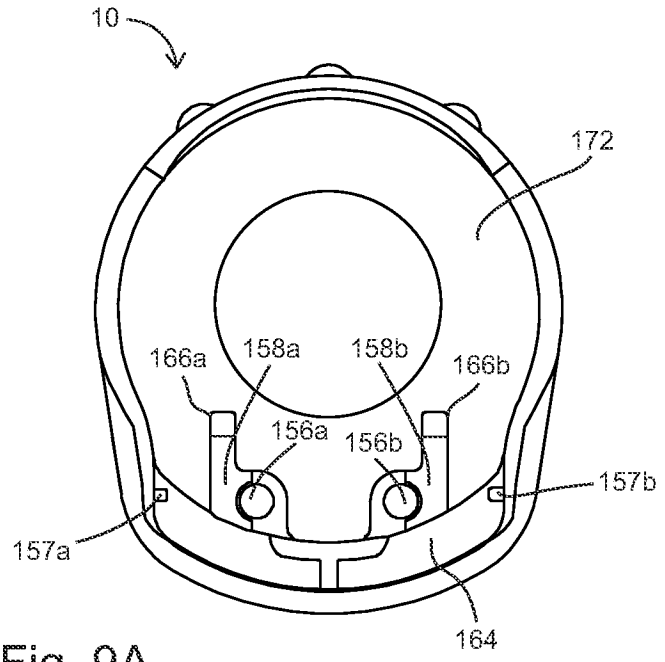
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Fig. 9A

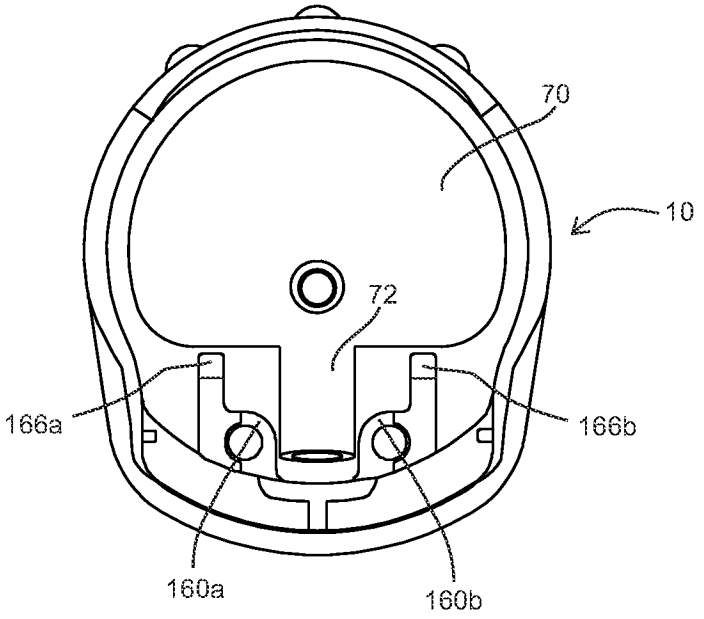
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Fig. 9B

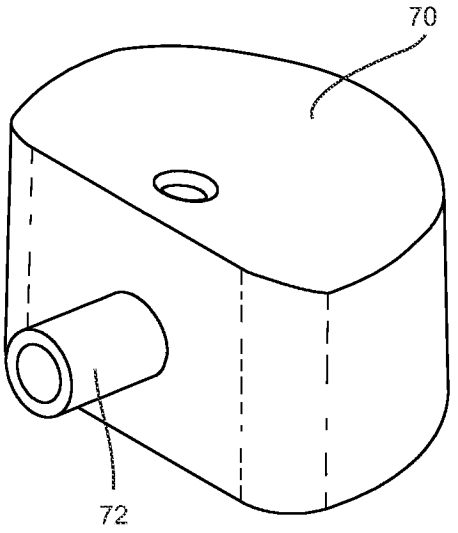

Fig. 10

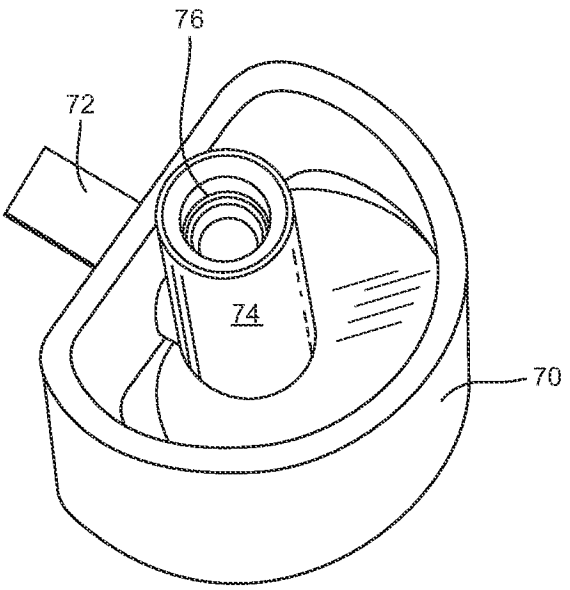

Fig. 11

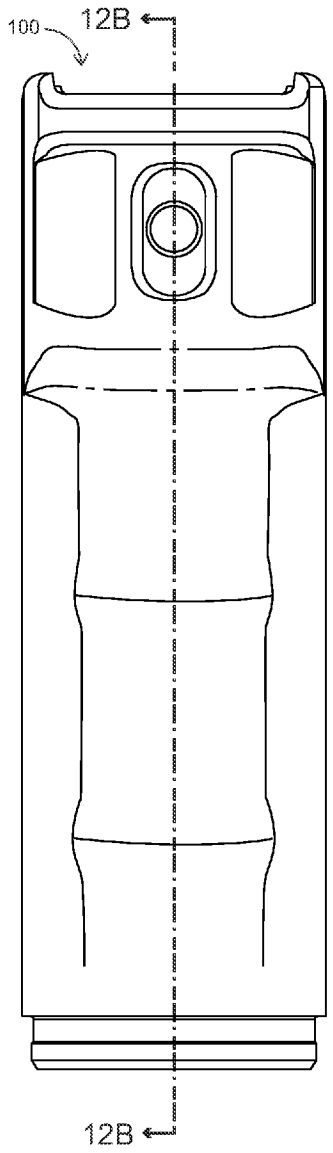

Fig. 12A

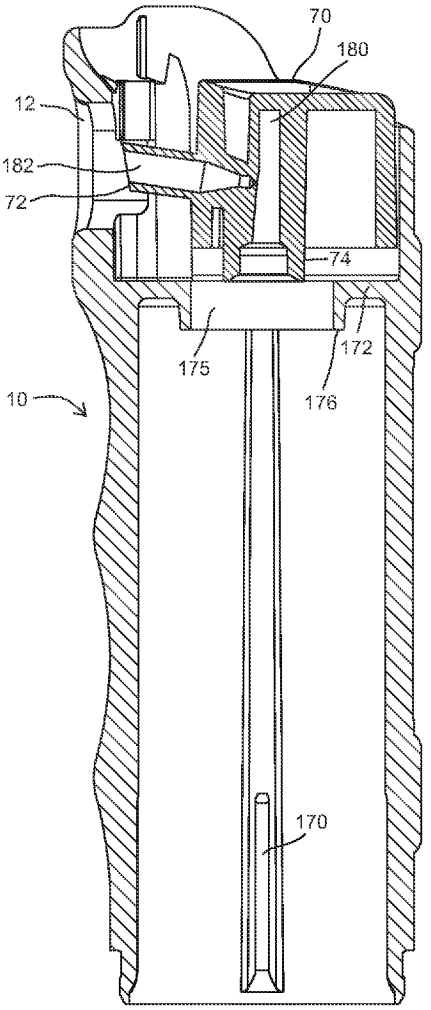

Fig. 12B

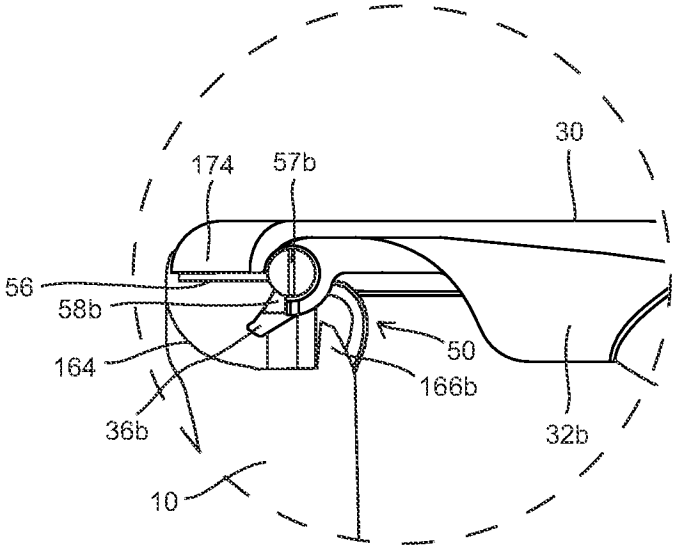

Fig. 13A

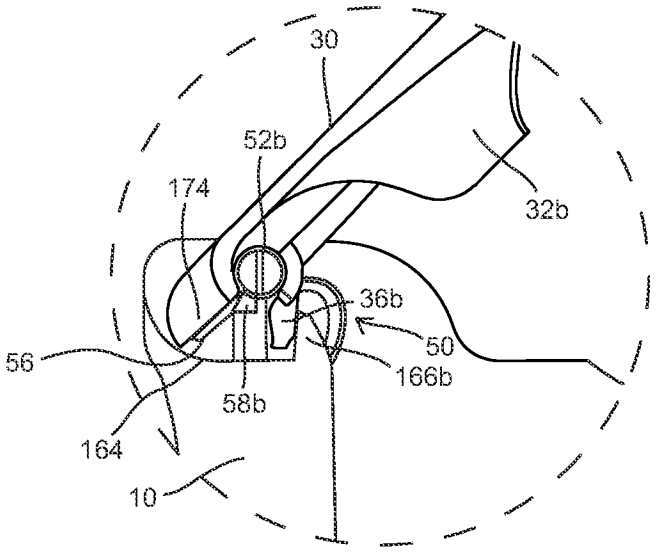

Fig. 13B

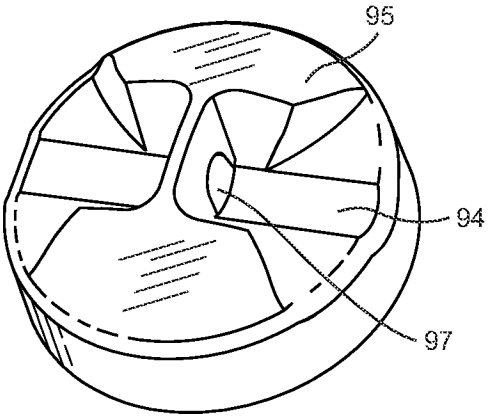

Fig. 14

SPRING-BIASED FLIP TOP CASE FOR AN AEROSOL CANISTER

FIELD OF THE INVENTION

The invention relates generally to a case for an aerosol canister, and, more specifically, to a flip top case for an aerosol canister and, even more specifically, to a spring mechanism for a flip top case for an aerosol canister.

BACKGROUND

Cases for aerosol or spray canisters typically include an actuator to engage the stem of the canister in order to dispel the canister's contents. There are a variety of aerosol dispensers that are used in many applications which include dispensing perfume, air fresheners, personal hygiene products, covering an article with a coat of paint, and dispensing cleaning products, amongst others. One specific application for an aerosol dispenser is as a personal defense device that, for example, directs a chemical repellant spray towards a potential human or animal threat.

Typical lids for dispensing actuators or cases for aerosol and spray canisters are intended to either prevent accidental discharge or provide easy dispensing. With respect to personal defense devices, easy dispensing is crucial to ensure the safety of the user when a threat presents itself. However, the reason personal defense devices are effective is because their chemical contents are indiscriminately extremely painful to anyone who comes into contact with it.

U.S. Patent Application Publication No. 2011/0006083 discloses a dispensing actuator for use on a container having pressurized contents configured for convenient one-handed manipulation and use. The dispensing actuator includes a hingedly moveable flip-open lid, and a laterally moveable button, which can be manipulated so that the button cooperates with the lid to move the lid from a closed position to an opened position. The dispensing actuator in this application further includes an inner, downwardly deflectable actuating element, operatively connected with a dispensing valve of the associated container. Resilient, downward deflection of the actuating element, after opening of the dispensing actuator lid, permits the contents of the container to be conveniently dispensed. Unfortunately, this dispensing actuator requires various movements by the user to spray the contents of the container and return the dispensing actuator to its original position. Pressing the button to open the lid, accurately positioning the user's finger over the actuator, depressing the actuator and then manually closing the lid is cumbersome, time consuming, and possibly dangerous in that the potential victim might not activate the device in time to thwart the threat.

U.S. Pat. No. 5,348,193 describes a case suitable for an aerosol dispenser being used as a personal defense device. The case is described as having a body with a moveable top protective flap to prevent accidental discharge of an aerosol can. The flap uses a spring disposed about a hinge for holding the flap in the closed position. The flap is described as being installed on the case by spreading (i.e., flexing) the material used to make the body of the case in the region of the hinge with a spread tool sufficiently so that the flap may be inserted into the hinge and then allowing the material to substantially return to its original shape. However, this process requires that the installation of the flap be performed soon after molding the case so that the body is sufficiently pliable. Unfortunately, if the flap dislodges from the hinge, the case is then useless to prevent accidental discharge of the chemical because the flap cannot be reassembled after the manufacturing process of the case.

Therefore, there is a long-felt need for an improved case for an aerosol or spray canister that minimizes the number of movements to dispel the canister's contents under pressure. There is also a long-felt need for a case that is simple to reassemble if it breaks. Further, there is also a long-felt need for a spring mechanism used in a flip top case that can be made of plastic in order to minimize manufacturing costs.

SUMMARY

The present invention comprises a spring mechanism comprising a spring element having a pair of arms separated by a gap, a tapered flexible tongue with an enlarged tip, and a tapered slot extending longitudinally through the tongue, wherein the tapered flexible tongue is operatively arranged to bend such that the tip enters the gap and engages the pair of arms.

The present invention also comprises a case for a canister capable of dispelling material comprising a main body to house the canister, the main body having a front aperture, a top lid to cover the main body, a spring non-rotatably secured to the main body and rotatably secured to the top lid, the spring comprising a tapered flexible tongue with an enlarged tip, and a tapered slot extending longitudinally through the tongue, and an actuator to direct dispelled material from the canister out of the main body through the front aperture.

A general object of the present invention is to provide a case with a flip top that minimizes the number of movements required to dispel the contents of the canister.

Another object of the present invention is to provide a spring mechanism to be used in a case with a flip top that can be manufactured out of plastic.

These and other objects, advantages and features of the present invention will be better appreciated by those having ordinary skill in the art in view of the following detailed description of the invention in view of the drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

The nature and mode of operation of the present invention will now be more fully described in the following detailed description of the invention taken with the accompanying figures, in which:

FIG. **1**A is a perspective view of a cylindrical coordinate system demonstrating spatial terminology used to describe the invention;

FIG. **1**B is a perspective view of an object in the cylindrical coordinate system of FIG. **1**A demonstrating spatial terminology used to describe the invention;

FIG. **2** is a front perspective view of a preferred embodiment of the present invention;

FIG. **3** is a rear perspective view of a preferred embodiment of the present invention;

FIG. **4** is a bottom perspective view of the lid of the case of the present invention;

FIG. **5**A illustrates an embodiment of the present invention being used with a thumb partially inserted into the rear opening;

FIG. **5**B illustrates an embodiment of the present invention being used with a thumb fully inserted into the rear opening;

FIG. **5**C illustrates an embodiment of the present invention being used with a thumb fully inserted into the rear opening and depressing the actuator;

FIG. **6** is an exploded view of the embodiment shown in FIG. **2**;

FIG. **7**A is a front perspective view of the uncocked spring element;

FIG. **7**B is a front perspective view of the cocked spring element;

FIG. **7**C is a rear perspective view of the uncocked spring element;

FIG. **7**D is a rear perspective view of the cocked spring element;

FIG. **7**E is a rear view of the cocked spring element shown in FIG. **6**;

FIG. **7**F is a rear view of the uncocked spring element shown in FIG. **6**;

FIG. **7**G is a cross-sectional view of the cocked spring element taken generally along line **7**G-**7**G in FIG. **7**E;

FIG. **7**H is a cross-sectional view of the cocked spring element taken generally along line **7**H-**7**H in FIG. **7**F;

FIG. **8** is a rear view of the body illustrating the engagement mechanism;

FIG. **9**A is a top view of the main body;

FIG. **9**B is a top view of the main body with the actuator in place;

FIG. **10** is a perspective view of the actuator;

FIG. **11** is a perspective bottom view of the actuator;

FIG. **12**A is a front view of the main body with the lid and bottom cap removed;

FIG. **12**B is a cross-sectional view of the main body taken generally along line **12**B-**12**B in FIG. **12**A;

FIG. **13**A is an enlarged fragmentary lateral view of the lid, spring and body engagement mechanisms in a resting position;

FIG. **13**B is an enlarged fragmentary lateral view of the lid, spring and body engagement mechanisms in a loaded position; and,

FIG. **14** is a perspective view of the bottom cap.

DETAILED DESCRIPTION

At the outset, it should be appreciated that like drawing numbers on different drawing views identify identical, or functionally similar, structural elements of the invention. While the present invention is described with respect to what is presently considered to be the preferred aspects, it is to be understood that the invention as claimed is not limited to the disclosed aspect. The present invention is intended to include various modifications and equivalent arrangements within the spirit and scope of the appended claims.

Furthermore, it is understood that this invention is not limited to the particular methodology, materials and modifications described and as such may, of course, vary. It is also understood that the terminology used herein is for the purpose of describing particular aspects only, and is not intended to limit the scope of the present invention, which is limited only by the appended claims.

Unless defined otherwise, all technical and scientific terms used herein have the same meaning as commonly understood to one of ordinary skill in the art to which this invention belongs. Although any methods, devices or materials similar or equivalent to those described herein can be used in the practice or testing of the invention, the preferred methods, devices, and materials are now described.

FIG. **1**A is a perspective view of cylindrical coordinate system **80** demonstrating spatial terminology used in the present application. The present invention is at least partially described within the context of a cylindrical coordinate system. System **80** has a longitudinal axis **81**, used as the reference for the directional and spatial terms that follow. The adjectives "axial," "radial," and "circumferential" refer to an orientation parallel to axis **81**, radius **82** (which is orthogonal to axis **81**), and circumference **83**, respectively. The adjectives "axial," "radial" and "circumferential" also refer to an orientation parallel to respective planes. To clarify the disposition of the various planes, objects **84**, **85**, and **86** are used. Surface **87** of object **84** forms an axial plane. That is, axis **81** forms a line along the surface. Surface **88** of object **85** forms a radial plane. That is, radius **82** forms a line along the surface. Surface **89** of object **86** forms a circumferential plane. That is, circumference **83** forms a line along the surface. As a further example, axial movement or disposition is parallel to axis **81**, radial movement or disposition is parallel to radius **82**, and circumferential movement or disposition is parallel to circumference **83**. Rotation is with respect to axis **81**.

The adverbs "axially," "radially," and "circumferentially" refer to an orientation parallel to axis **81**, radius **82**, or circumference **83**, respectively. The adverbs "axially," "radially," and "circumferentially" refer to an orientation parallel to respective planes.

FIG. **1**B is a perspective view of object **90** in cylindrical coordinate system **80** of FIG. **1**A demonstrating spatial terminology used in the present application. Cylindrical object **90** is representative of a cylindrical object in a cylindrical coordinate system and is not intended to limit the present invention in any manner. Object **90** includes axial surface **91**, radial surface **92**, and circumferential surface **93**. Surface **91** is part of an axial plane, surface **92** is part of a radial plane, and surface **93** is a circumferential surface.

FIG. **2** is a front perspective view of case **100** of the present invention. Case **100** generally comprises main body **10**, actuator **70**, top lid **30**, bottom cap **95**, and spring element **50** (shown in FIG. **6**) connecting lid **30** with main body **10**. Case **100** and its constituents are preferably made out of molded plastic, however any material such as metal, rubber, elastomeric material, or a combination of any materials among its constituent parts may be used as appreciated by a person having ordinary skill in the art.

Main body **10** is cylindrical in nature and is adapted to enclose a canister containing a substance under pressure. In a preferred embodiment, case **100** is dimensioned with an axial length and a radius to engage a canister of pepper spray. However, it should be understood that case **100** may be manufactured with any combination of axial lengths and radii dictated by the type of canister that case **100** is to encompass.

Still referring to FIG. **2**, main body **10** has circumferential aperture **12** to enable nozzle **72** (labeled in FIG. **10**) of actuator **70** to direct any dispelled material outward through case **100**. Aperture **12** is slightly elongated in the axial direction to accommodate the upward and downward movement of nozzle **72** when a user depresses actuator **70** to actuate the expulsion of the material within the canister and then releases actuator **70** to cease the expulsion of material. Further, finger ridges **14** and **15** are molded into main body **10** in order to create a better grip for the user and to increase the user's comfort while gripping case **100**.

FIG. **3** is a rear perspective view of case **100**. Protruding axial grips **16** are molded onto the rear of main body **10** in order to engage the user's palm and to further increase the user's grip while holding case **100**. Rear opening **20** is generally ellipsoidal in shape with its top arcuate curve defined by the rear of lid **30** and its bottom arcuate curve defined by the rear of main body **10**. Lateral lid wings **32***a* and **32***b* of lid **30** are shaped to extend axially downward to engage main

body **10** and create interface **24** such that lid **30** disengages main body **10** at the vertices of the transverse diameter of rear opening **20**.

FIG. **4** shows the bottom of lid **30**. Lateral wings **32***a* and **32***b* rest on top of the rear of main body **10** (shown in FIG. **2**), and curved receptacles **38***a* and **38***b* rotatingly engage spring **50** (shown in FIG. **6**) near the front of main body **10**. Lid tabs **36***a* and **36***b* create a mechanical stop with their respective apices **166***a* and **166***b* (best illustrated in FIGS. **14**A and **14**B) of main body **10**. The bottom of lid **30** also has rear sloped guides **34***a* and **34***b* contiguous with their respective horizontal guides **35***a* and **35***b*. The guides facilitate the insertion of the user's finger or thumb into rear opening **20** (shown in FIG. **3**), as will be described further with respect to FIGS. **5**A-**5**C.

FIGS. **5**A-**5**C illustrate a canister housed within case **100** and in the process of being used by a user. The left lateral lid wing has been removed from lid **30** in FIGS. **5**A-**5**C in order to better illustrate the user's thumb position. The user is shown holding case **100** with his or her index finger above finger ridge **14**, his or her middle finger below finger ridge **14** and his or her palm proximate to axial grips **16**. To dispel the contents of the canister, the user inserts his or her thumb into the rear opening and depresses actuator **70**.

FIG. **5**A illustrates the user initially inserting his or her thumb into the rear opening. While the user's thumb is partially inserted into the rear opening, the tip of the user's thumb slides along the rear sloped guides **34***a* (shown in FIGS. **4**) and **34***b*. Lid **30** is biased toward its closed position (shown in FIGS. **2** and **3**) by spring **50** (FIG. **6**) so the user is opposing this force initially in order to open the lid. Sloped guides **34***a* and **34***b* are configured to facilitate the rotation of lid **30** as well as to guide the user's thumb into a central position over actuator **70**. With the sloped guides **34***a* and **34***b* aiding in the rotation of lid **30**, the user can use a single substantially linear radial motion to insert his or her thumb. A single substantially radial motion, as opposed to requiring a prior and separate axial motion to lift the lid, decreases the possibility for the user to fumble while trying to depress actuator **70**. This may become especially important when the canister housed in case **100** contains pepper spray and the user is presented with a threat.

FIG. **5**B illustrates the user with his or her thumb in a central position over actuator **70**. In this position, the tip of the user's thumb engages horizontal guides **35***a* (shown in FIGS. **4**) and **35***b*. The user is now in a position to depress actuator **70**.

FIG. **5**C illustrates the user depressing actuator **70** (visible in FIGS. **5**A and **5**B). In this position, horizontal guides **35***a* (shown in FIGS. **4**) and **35***b* generally rest on top of the user's thumb nail and may provide some downward force because lid **30** is biased in the closed position. While the user is depressing the actuator in the axial direction, finger ridges **14** and **15** (shown in FIG. **2**) help prevent main body **10** from slipping in the axial direction in the user's hand. FIG. **5**C shows material being dispelled from the canister represented by dotted lines.

FIG. **6** is an exploded view of case **100**. A canister (not shown) is inserted axially upwards through the bottom of main body **10**. Bottom cap **95** is then attached to main body **10** in order to prevent the canister from falling out. Bottom cap **95** is secured to main body **10** by circumferential lip **96** engaging circumferential rim **41** of main body **10**. Actuator **10** is inserted axially downwards through the top of main body **10** and engages the stem of the canister via receiving port **74**. Nozzle **72** directs the discharged contents of the canister through circumferential aperture **12** of main body **10**.

Still referring to FIG. **6**, spring **50** is attached to lid **30** by inserting spring arms **52***a* and **52***b* into curved receptacles **38***a* and **38***b*, respectively. Lid **30** is rotatable because curved receptacle **38***a* is rotatable around arm **52***a* and curved receptacle **38***b* is rotatable around arm **52***b*. When lid **30** is rotated to a certain extent, tabs **58***a* and **58***b* abut front edge **174** of lid **30**, thereby limiting rotation between spring **50** and lid **30**. Spring **50** is attached to main body **10** by inserting legs **54***a* and **54***b* into engagement mechanisms located inside main body **10** proximate to indents **13***a* and **13***b*. Spring **50** is inserted into the main body engagement mechanisms with nozzle **72** of actuator **70** between spring legs **54***a* and **54***b*. Spring **50** has curved surfaces **64***a* and **64***b* to accommodate nozzle **72**. Finally, lateral wings **32***a* (shown in FIGS. **3**) and **32***b* rest atop the rear portion of main body **10**.

Generally, with reference to FIGS. **7**A-**7**H, spring element **50** comprises arms **52***a* and **52***b*, legs **54***a* and **54***b*, and tongue **56**. Preferably, arms **52***a* and **52***b* are horizontal and colinear with each other while legs **54***a* and **54***b* are parallel to each other and run vertically in the axial direction when inserted into main body **10** (shown in FIG. **6**). Arm **52***b* has vertical slot **57***b*, and arm **52***a* has an analogous vertical slot (not shown). Slot **57***b* and its analogous vertical slot on arm **52***a* engages rail **157***b* and **157***a* (shown in FIG. **9**A), respectively, on the inside of main body **10**. Slot **57***b* and its analogous slot on arm **52***a* ensure that spring **50** is properly inserted into main body **10** as well as provide stability to arms **52***a* and **52***b* while lid **30** (shown in FIG. **2**) is rotating. Arms **52***a* and **52***b* are separated by gap **52***c*.

Tongue **56** is flexible and provides a biasing torque against lid **30** (shown in FIG. **6**) into a closed position while arms **52***a* and **52***b* are rigid and provide stability within main body **10** (also shown in FIG. **6**). The geometry of tongue **56** enables spring element **50** to be manufactured out of plastic instead of metal requiring an appropriate yield strength that is typically used in spring mechanisms. Tongue **56** has a tapered shaft with an enlarged tip so that tongue **56** yields, or bends, more easily at its shaft. Further, a slot runs longitudinally through tongue **56** and is also tapered to reflect the shape of tongue **56**. The slot enables tongue **56** to bend with the appropriate spring constant for the desired required force.

FIG. **7**A is a front perspective view of spring **50** in an uncocked, or "rest", position meaning that no mechanical energy is stored. Leg grooves **66***a* and **66***b* are near the top of legs **54***a* and **54***b*, respectively, proximate to arms **52***a* and **52***b*, respectively. Leg grooves **66***a* and **66***b* provide another mechanical stop for when lid **30** (shown in FIG. **6**) rotates by engaging nibs **37***a* and **37***b* (shown in FIG. **4**), respectively. The first mechanical stop described above is tabs **58***a* and **58***b* engaging front edge **174** of lid **30**, thereby limiting rotation between spring **50** and lid **30**. Further, arms **52***a* and **52***b* have overhangs **59***a* and **59***b*, respectively. Overhangs **59***a* and **59***b* are simply the result of substantially rectangular grooves on the interior lateral portions of arms **52***a* and **52***b*, and will be explained in further detail with respect to FIG. **7**C. As described above with respect to FIG. **6**, spring **50** has curved surfaces **64***a* and **64***b* to accommodate nozzle **72**.

FIG. **7**B is a front perspective view of spring **50** in a cocked position. In this position, the shaft of tongue **56** is bent and the tip of tongue **56** is configured between colinear arms **52***a* and **52***b*. The tapered shaft and tapered slot **55** of tongue **56** enable tongue **56** to be fitted between arms **52***a* and **52***b* by being narrower than the gap between arms **52***a* and **52***b*. Further, the shaft of tongue **56** may be forcibly squeezed narrower if needed to fit between arms **52***a* and **52***b*. In a preferred embodiment, tongue **56** is held in the cocked position, which will be described in more detail with respect to FIG. **7**C.

FIG. **7**C is a rear perspective view of spring **50** in the uncocked position. In a preferred embodiment, tongue **56** has shoulders **61***a* and **61***b*. Shoulders **61***a* and **61***b* act with overhangs **59***a* and **59***b* in order to hold tongue **56** in the proper cocked position. Overhangs **59***a* and **59***b* are simply the result of substantially rectangular grooves on the interior lateral portions of arms **52***a* and **52***b*. The tops of the rectangular grooves are preferably angled upwards away from tongue **56** (best shown in FIGS. **7**G and **7**H) to fine tune the angle of the bend in tongue **56** when in the cocked position. However, tongue **56** may be held into the cocked position by the underside of lid **30** when attached to lid **30** without the presence of shoulders **61***a* and **61***b* and with overhangs **59***a* and **59***b*.

FIG. **7**D is a rear perspective view of spring **50** in the cocked position. Curved surfaces **62***a* and **62***b* at the base of tongue **56** are to accommodate nozzle **72** (shown in FIG. **6**) on actuator **70** (also shown in FIG. **6**).

FIG. **7**E is a rear view of the cocked spring element shown in FIG. **6**, and FIG. **7**F is a rear view of the uncocked spring element shown in FIG. **6**

FIG. **7**G is a cross-sectional view of the cocked spring element taken generally along line **7**G-**7**G in FIG. **7**E. Angle α' is the cocked angle between the base of spring **50** and leg **54***a*, and angle θ' is the cocked bend angle of bend **51** in the shaft of tongue **56**. Both cocked angles α' and θ' are smaller than the uncocked angles α and θ (shown in FIG. **7**H), which generates tension in the material making up tongue **56** and thereby priming tongue **56** to provide a biasing torque. The tension in bend **51** provides most of the biasing torque for the spring action.

FIG. **7**H is a cross-sectional view of the cocked spring element taken generally along line **7**H-**7**H in FIG. **7**F. In FIG. **7**H, angle α is the uncocked angle between the base of spring **50** having curved surface **62***a* and leg **54***a*. Angle θ is the uncocked bend angle of bend **51** in the shaft of tongue **56**. The top of the substantially rectangular groove of overhang **59***a* is shown angled upwards away from tongue **56** to fine tune the angle of the bend in tongue **56** when in the cocked position.

FIG. **8** illustrates lid **30** attached to a cocked spring **50**, and engagement mechanism **150** of main body **10**. With respect to spring **50**, tongue **56** (shown in FIGS. **7**A-**7**H) is angled toward the front of main body **10**, and legs **54***a* and **54***b* are inserted axially downwards proximal to the front of main body **10**.

Engagement mechanism **150** has a symmetrical set of elements starting with partial through bores (shown as bores **156***a* and **156***b* in FIG. **9**A) in flat platforms **160***a* and **160***b* to snugly receive spring leg **54***a* and **54***b*, respectively. Flat platforms **158***a* and **158***b* extend axially upwards from platforms **160***a* and **160***b* and contain semicircle partial through bores with the lateral interior semicircles unbound by platforms **160***a* and **160***b*. The diameter of the partial through bores in platforms **160***a* and **160***b* are slightly larger than the diameters of the partial through bores in platforms **158***a* and **158***b*. The slightly larger diameters facilitate the insertion of spring legs Ma and **54***b* into the partial through bores of platforms **160***a* and **160***b* by acting as guides and decreasing the precision required for assembly. Apices **166***a* and **166***b* extend radially inward and axially upwards from platforms **158***a* and **158***b*, respectively, and act as mechanical stops to tabs **36***a* and **36***b*, respectively, on lid **30**. Engagement mechanism **150** also has curved surface **164** extending radially inward and sloping axially downward from the front of main body **10**. Curved surface **164** is described in more detail with respect to FIGS. **13**A and **13**B below.

FIG. **9**A is a top view of main body **10**. Lateral rails **157***a* and **157***b* extend into the interior of main body **10** and extend axially downward to curved surface **164**. As was explained above, arm slot **57***b* (shown in FIGS. **7**A-**7**H) and its analog on spring **50** engages rail **157***b* and **157***a*, respectively, to ensure that spring **50** is properly inserted into main body **10** as well as provide stability to spring arms **52***a* and **52***b* while lid **30** (shown in FIG. **2**) is rotating. Partial through-bores **156***a* and **156***b* are shown with a slightly smaller diameter than the partial through bores of platforms **158***a* and **158***b*, respectively. Apices **166***a* and **166***b* extend radially inward from platforms **158***a* and **158***b*, respectively. Main body **10** also has shelf **172** extending radially inward, which will be explained in further detail with respect to FIG. **12**B.

FIG. **9**B is a top view of main body **10** housing actuator **70**. Nozzle **72** is shown to sit between platforms **160***a* and **160***b* and does not extend radially beyond main body **10**. Apices **166***a* and **166***b* extend radially inward to at least partially constrain any radial movement of actuator **70**.

FIG. **10** is a front perspective view of actuator **70** with its nozzle **72**.

FIG. **11** is a bottom rear perspective view of actuator **70** with its nozzle **72**. Actuator **70** engages the canister with receiving port **74** and the substance contained within canister is dispelled through bore **76** within receiving port **74** and redirected through nozzle **72**.

FIG. **12**A is a front view of the main body with the lid and bottom cap removed. FIG. **12**B is a cross-sectional view of the main body taken generally along line **12**B-**12**B in FIG. **12**A. Shelf **172** extends radially inward from main body **10** and has an interior circumferential surface **175**. Circumferential surface **175** has a greater axial length than shelf **172** and extends from the top radial surface of shelf **172** axially downward. Bottom surface **176** rests on top of the canister (not shown). The stem of the canister extends axially upward through shelf **172** and engages receiving port **74** of nozzle **70**. When actuator **70** is depressed, the contents of the canister are dispelled through the canister stem and axially upward into duct **180**. The only outlet for the contents of the canister is into channel **182** of nozzle **72**, thereby directing the contents out of main body **10** through aperture **12**.

Main body **10** also has internal axial ridges (ridge **170** is shown) that extend radially inward to at least partially constrain any radial movement of the canister. The internal axial ridges, such as ridge **170**, accommodate any radial expansion or contraction of the canister throughout its use by allowing the canister to expand in the gaps between the ridge without puncturing the canister and without compromising stability between main body **10** and the canister. In a preferred embodiment, four internal axial ridges are used, but as few as zero may be used and as many may be used without compromising the pressure within the canister.

FIG. **13**A is a magnified view of spring **50** connecting lid **30** and main body **10** in a closed position. Front edge **174** and tongue **56** are shown to be substantially horizontal, which is an angular difference from the sloped top of the substantially rectangular grooves of overhang **59***a* shown in FIGS. **7**G and **7**H. By situating tongue **56** horizontally, tongue **56** is now loaded against front edge **174** and provides a biasing torque to front edge **174** of lid **30** (forcing edge **174** in a generally upwards direction) causing lid **30** to be in the closed position. When in the closed position, interfaces **24***a* (shown in FIG. **3** as between lid wing **32***a* and main body **10**) and **24***b* (not shown) act as the mechanical stop to the rotation of lid **30**. So, like the cocked position of spring **50**, the closed position of lid **30** generates a loaded static state for spring **50**.

FIG. **13**B is a magnified view of spring **50** connecting lid **30** and main body **10** while in the maximum open position. To get to the maximum open position, the user inserts his or her

thumb under lid **30** causing lid **30** to rotate around arm **52***b*. Tongue **56** is pushed in a generally downwards direction causing spring **50** to become loaded against front edge **174**. Curved surface **164** enables front edge **174** to swing down into main body **10**. Bend angle θ' of bend **51** (shown in FIG. **7**G) decreases, which increases the tension in tongue **56**. Increasing or decreasing the bend angle of bend **51** is considered to be dynamic as opposed to static. The maximum open position is also considered dynamic because elements of case **100** (shown in FIG. **2**) do not self-sustain tongue **56** in a position without intervention of the user.

The counter-clockwise rotation of lid **30** in FIG. **13**B is prohibited by various mechanical engagements. Lid **30** is prohibited from further rotation with respect to spring **50** by the abutment of front edge **174** on spring tab **58***b*. Lid **30** is also prohibited from further rotation with respect to spring **50** by the engagement described above with reference to FIGS. **7**A-**7**H where front edge **174** abuts front spring grooves **166***a* and **166***b*. In FIG. **13**B, lid **30** is prohibited from further rotation with respect to main body **10** by the abutment of lid tab **36***b* with apex **166***b*. Also, spring **50** is securely fixed to main body **10** through engagement mechanism **150** (shown in FIG. **8**) interacting with spring legs **54***a* and **54***b* (shown in FIGS. **7**A-**7**H), and lateral rails **157***a* and **157***b* (shown in FIG. **9**B) interacting with arm slots **57***a* and **57***b* (shown in FIGS. **7**A-**7**H).

FIG. **14** is a bottom perspective view of bottom cap **95**. Bottom cap **95** has radial aperture **97** so that case **100** (shown in FIG. **2**) can be attached to a key ring or chain or a string. Groove **94** enables a multitude of attachment accessories such as the key ring, etc., to fit through aperture **97**.

Thus, it is seen that the objects of the present invention are efficiently obtained, although modifications and changes to the invention should be readily apparent to those having ordinary skill in the art, which modifications are intended to be within the spirit and scope of the invention as claimed. It also is understood that the foregoing description is illustrative of the present invention and should not be considered as limiting. Therefore, other embodiments of the present invention are possible without departing from the spirit and scope of the present invention as claimed.

LIST OF REFERENCE NUMBERS

10 Body
12 Circumferential aperture
13 Indents
14 Finger ridge
15 Finger ridge
16 Grips
20 Rear opening
24 Lid-Body rear interface
30 Lid
32 Lateral lid wings
34 Sloped guides
35 Horizontal guides
36 Lid tabs
38 Lid curved receptacles
41 Circumferential lip
50 Spring
52 Arms
54 Legs
56 Tongue
57 Lateral slits
58 Arm tabs
59 Overhangs
61 Tongue tabs
62 Tongue curve
64 Tongue base curve
66 Leg groove
68 Leg larger diameter interface
70 Actuator
72 Nozzle
74 Receiving port
76 Bore
95 Bottom cap
96 Circumferential lip
100 Case
150 Body engagement mechanism
154*s* Support bases
156*s* Partial through-bores
157 Lateral guides
158 Level 1 of partial through bore
160 Level 2 of partial through bore
162 Semicircle partial through bore
164 Curved internal body surface
166 Apices
168 Lateral guides label
170 Body internal ridges
172 Body shelf
174 Front edge of lid

What is claimed is:

1. A spring mechanism, comprising:
a tapered flexible tongue with an enlarged tip and a pair of shoulders extending from the tip;
a spring element having a pair of arms separated by a gap having a pair of overhangs operatively arranged to act as a mechanical stop for said pair of shoulders prohibiting said tongue from rotating out of said gap; and,
a tapered slot extending longitudinally through the tongue,
wherein said tapered flexible tongue is operatively arranged to bend such that said tip enters said gap and engages said pair of arms.

2. The spring mechanism recited in claim **1**, wherein said tongue has a base integral with the arms, the base having a curved inner surface.

3. The spring mechanism recited in claim **2**, wherein the slot extends into the tip and the base, and the curved surface and the slot create a continuous inner surface.

4. The spring mechanism recited in claim **1**, wherein said tongue is made of plastic.

5. The spring mechanism recited in claim **1**, wherein said tongue has a bend traversing said slot.

6. The spring mechanism recited in claim **1**, wherein said tapered slot is hollow.

7. A spring mechanism, comprising:
a spring element having a pair of arms separated by a gap;
a tapered flexible tongue with an enlarged tip; and,
a hollow tapered slot extending longitudinally through the tongue,
wherein said tapered flexible tongue is operatively arranged to bend such that said tip enters said gap and engages said pair of arms.

8. The spring mechanism of claim **7**, wherein the tongue has a base integral with the arms, the base having a curved inner surface.

9. The spring mechanism of claim **8**, wherein the slot extends into the tip and the base, and the curved surface and the slot create a continuous inner surface.

10. A spring mechanism, comprising:
a spring element having a pair of arms separated by a gap;
a tapered flexible tongue with an enlarged tip; and,
a tapered slot extending longitudinally through the tongue,

wherein said tapered flexible tongue is operatively arranged to bend such that said tip enters said gap and engages said pair of arms.

11. The spring mechanism recited in claim **10**, wherein said tongue is made of plastic.

12. The spring mechanism recited in claim **10**, wherein said tongue has a bend traversing said slot.

13. The spring mechanism recited in claim **10**, wherein said tongue has a pair of shoulders and said gap has a pair of overhangs operatively arranged to act as a mechanical stop for said pair of shoulders prohibiting said tongue from rotating out of said gap.

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