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(54) Title: METHODS AND APPARATUSES FOR DISPENSING FLUIDS

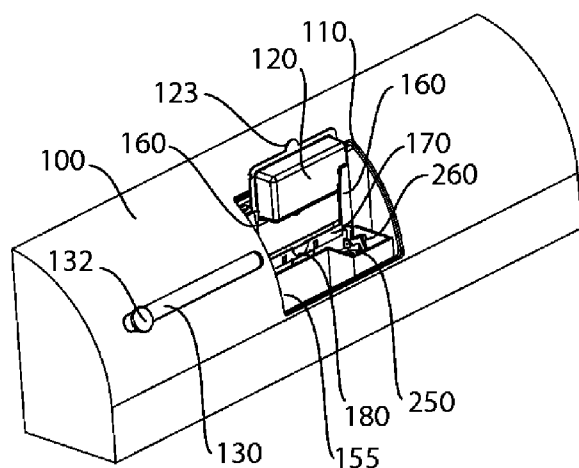


Fig. 1

(57) Abstract: A liquid dispensing system for an appliance may generally comprise a housing comprising a compartment for receiving a cartridge comprising a unit dose, a door slidably connected to the housing movable between an open position, a first actuated position, a second actuated position, and a closed position, a first cutting member connected to the compartment for rupturing a first portion of the cartridge when the door is in the first actuated position, a second cutting member connected to the compartment for rupturing a second portion of the cartridge when the door is in the second actuated position, and a reservoir in fluid communication with the compartment configured to establish a gravity flow from the compartment to the reservoir. Methods of making and using the liquid dispensing system are also described.



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METHODS AND APPARATUSES FOR DISPENSING FLUIDS

FIELD OF THE INVENTION

The present invention relates to apparatuses and methods for dispensing fluids and, more particularly, to apparatuses and methods for dispensing liquids to an appliance or other machine such that the appliance or other machine may use the liquid during an operating cycle.

BACKGROUND OF THE INVENTION

Various appliances or other machines may be configured to receive fluids. Suitable appliances and machines may include, but are not limited to, laundry machines, such as a washer and a dryer, fabric treatment devices, and hard surface cleaning devices. The fluids may comprise liquids, including, but not limited to, detergents, fabric softeners, bleaches, fragrances, and any other suitable liquid. The appliances or machines may use the fluids in various operating cycles. For example, a fluid container including the fluid may be manually inserted into the appliances or machines, the fluid may be manually poured into a receiving area of the appliances or machines, or the fluid may be manually poured into a treatment area, such as, for example, a washing basin.

Conventional appliances or machines configured to use fluids in various operating cycles and methods of using the same may not be efficient. For example, conventional appliances or machines may increase the likelihood of spillage and/or leakage. Conventional appliances or machines may not be user friendly and/or user safe. For example, conventional appliances or machines may suffer from time consuming and/or complex preparation. Conventional appliances or machines may not be configured to accommodate specific fluid containers. Using the wrong fluid or operating cycle may cause performance deterioration and/or improper fluid distribution.

Accordingly, more user friendly and/or efficient apparatuses and methods for dispensing fluids are desirable.

SUMMARY OF THE INVENTION

In various embodiments, a passive liquid dispensing system for an appliance may generally comprise a housing comprising a compartment for receiving a cartridge comprising a unit dose, a door slidably connected to the housing movable between an open position, a first actuated position, a second actuated position, and a closed position, a first cutting member

connected to the compartment for rupturing a first portion of the cartridge when the door is in the first actuated position, a second cutting member connected to the compartment for rupturing a second portion of the cartridge when the door is in the second actuated position, and a reservoir in fluid communication with the compartment configured to establish a gravity flow from the compartment to the reservoir. The cartridge may be a rigid cartridge comprising at least one engagement surface configured to engage the compartment and a rupture surface configured to engage with the first cutting member and the second cutting member.

In various embodiments, a liquid dispensing system for an appliance may generally comprise a housing comprising a compartment for receiving a cartridge comprising a unit dose, a door pivotally connected to the compartment movable between an open position and a closed position, at least one compression member adjacent the compartment configured to engage the cartridge, an arm configured to be engaged with the cartridge to move the arm between a first position and a second position, an engagement member configured to engage the arm when the arm is in the second position and the door is in the closed position, a cutting member connected to the arm to rupture a portion of the cartridge when the engagement member is engaged with the arm, and a reservoir in fluid communication with the compartment configured to establish a gravity flow from the compartment to the reservoir.

BRIEF DESCRIPTION OF DRAWINGS

The various embodiments described herein may be better understood by considering the following description in conjunction with the accompanying drawings.

FIG. 1 includes a perspective view of a fluid dispensing system according to various embodiments described herein.

FIG. 2 includes a cross-sectional view of the fluid dispensing system of FIG. 1.

FIG. 3 includes a back view of the fluid dispensing system of FIG. 1.

FIG. 4 includes a perspective view of a cartridge according to various embodiments described herein.

FIG. 5 includes a perspective view of a fluid dispensing system according to various embodiments described herein.

FIG. 6 includes a top view of the fluid dispensing system of FIG. 5.

FIG. 7 includes a side view of the fluid dispensing system of FIG. 5.

FIG. 8 includes a cross-sectional view of the fluid dispensing system of FIG. 5.

FIG. 9 includes an exploded view of a fluid dispensing system according to various embodiments described herein.

FIGS. 10A and 10B include a side view and a top view, respectively, of a cartridge according to various embodiments described herein.

DETAILED DESCRIPTION OF THE INVENTION

Certain exemplary embodiments will now be described to provide an overall understanding of the principles of the structure, function, manufacture, and use of the devices and methods described herein. One or more examples of these embodiments are illustrated in the accompanying drawings. Those of ordinary skill in the art will understand that the devices and methods specifically described herein and illustrated in the accompanying drawings are non-limiting exemplary embodiments and that the scope of the present invention is defined solely by the claims. The features illustrated or described in connection with one exemplary embodiment may be combined with the features of other embodiments. Such modifications and variations are intended to be included within the scope of the present invention.

Various appliances or other machines (hereinafter referred to as “appliances”) may be configured to receive and/or withdraw a liquid from a container, such as, for example, a cartridge comprising a unit dose of liquid. Suitable appliances for use herein include, but are not limited to, a fabric refreshing cabinet, a clothing treating apparatus, and a hard surface treating system, such as, for example, a dish washer and an automatic car wash system. Suitable appliances may be generally described in U.S. Provisional Patent Application Serial No. 60/076,321, entitled “Cabinet Device”, filed on June 27, 2008; U.S. Patent Application Serial No. 12/564,946, entitled “Method and Apparatus for Dispensing Fluids”, filed on September 23, 2009; U.S. Patent No. 6,189,346, entitled “Clothes treating apparatus”, issued on February 20, 2001; U.S. Patent No. 6,321,941, entitled “Consumer safe fitment for connecting a reservoir to a dispensing appliance”, issued on November 27, 2001; U.S. Patent No. 6,386,392, entitled “Reservoirs for use with cleaning devices”, issued on May 14, 2002; U.S. Patent No. 6,390,335, entitled “Device with improved fitment system”, issued on May 21, 2002; U.S. Patent No. 6,971,589, entitled “Device with improved fitment system”, issued on May 21, 2002; and U.S. Patent No. 6,971,589, entitled “Reclosable fitment for connecting a reservoir to a dispensing appliance”, issued on May 6, 2008.

The appliance may use the liquid during an operating cycle. For example, the cartridge may comprise a unit dose of fluid to enable one operating cycle of the appliance. In various embodiments, the operating cycle may comprise a washing cycle, a drying cycle, a refreshing cycle, a sanitization cycle, and/or any other suitable cycle. In various embodiments, the liquid may comprise a detergent, a bleach, a fabric softener, a fragrance, a wrinkle control liquid, and/or any other suitable liquid. In various embodiments, the liquid may comprise a slurry, a semi-fluid substance (e.g., a flowable paste or a gel), and/or any suitable aqueous solution, such as, for example, water. Suitable liquids may be generally described in U.S. Patent No. 6,491,840, entitled "Polymer Compositions Having Specified pH for Improved Dispensing and Improved Stability of Wrinkle Reducing Compositions and Methods of Use", issued on December 10, 2002; and U.S. Patent No. 6,495,058, entitled "Aqueous Wrinkle Control Compositions Dispensed Using Optimal Spray Patterns", issued on December 17, 2002.

In various embodiments, an appliance may comprise a receiving portion into which a liquid dispensing system may be inserted. The liquid dispensing system may be formed integral with the receiving portion of the appliance and configured to receive a cartridge comprising a unit dose of liquid. The receiving portion may be configured to receive the liquid dispensing system in one of a horizontal orientation, a substantially horizontal orientation, a vertical orientation, a substantially vertical orientation, and any other suitable orientation, with respect to the appliance. The terms "substantially horizontal" and "substantially vertical" means that the liquid dispensing system may be positioned at angles from 0-15°, 1-11°, 5-12°, and 7° from its horizontal axis or vertical axis. The receiving portion may be positioned at any suitable angle from the horizontal axis or the vertical axis to allow liquid to be transferred from the cartridge.

In various embodiments, the appliance may comprise a user interface. As will be appreciated by those skilled in the art, the user interface may comprise the aggregate means by which users can interact with the appliance, including, for example, any device or computer program portion of the appliance. The use interface may comprise an input, an output, or a combination thereof. The input may allow the user to enter information into the appliance to manipulate or control the operation of the appliance. The output may allow the appliance to produce effects for the benefit of the user. In various embodiments, the input and output may comprise visual, audio, and tactile devices. In one embodiment, the input may be configured as a touch keypad and the output may be configured as a display, light emitting indicator, and/or audible alarm.

Referring to FIGS. 1-3, in various embodiments, a liquid dispensing system for an appliance may generally comprise a housing 100 comprising a compartment 110 for receiving a cartridge 120 comprising a unit dose, a door 130 slidably connected to the housing 100 movable between an open position, a first actuated position, a second actuated position, and a closed position, a first cutting member 140 connected to the compartment for rupturing a first portion of the cartridge 120 when the door 130 is in the first actuated position, a second cutting member 150 connected to the compartment 110 for rupturing a second portion of the cartridge 120 when the door 130 is in the second actuated position, and a reservoir 155 in fluid communication with the compartment 110 configured to establish a gravity flow from the compartment 110 to the reservoir 155. The liquid dispensing system may comprise a passive liquid dispensing system. In various embodiments, a passive liquid dispensing system may dispense the fluid from the cartridge 120 solely by gravity flow. In various embodiments, the liquid dispensing system may comprise a mechanical system lacking electrical means to dispense the fluid and/or dispense the fluid to the appliance solely by gravity flow. In various embodiments, the liquid may be gravity feed from the cartridge to a pump to dispense the fluid the appliance.

In various embodiments, the compartment 110 may comprise a track 160 configured to slidably receive the cartridge 120. The track 160 may comprise at least one rail and/or a slot. In various embodiments, the track 160 may comprise two rails. The cartridge 120 may be slid along the rail and/or the slot between at least a first position and a second position. The cartridge 120 may be at least partially engaged with the compartment 110 when the cartridge is in the first position. The cartridge 120 may be fully engaged with the compartment 110 when the cartridge is in the second position. The track 160 may prevent, or at least inhibit, misalignment of the cartridge 120 and the compartment 110.

In various embodiments, the liquid dispensing system may comprise a blocking plate 170 configured to be engaged with the cartridge 120 to slidably move the blocking plate 170 between a first position and a second position. The blocking plate 170 may be intermediate the compartment 110 and the first cutting member 140 when the blocking plate 170 is in the first position. The blocking plate 170 may be configured to prevent a user from accessing the first cutting member 140 when the blocking plate 170 is in the first position. The blocking plate 170 may be intermediate the cartridge 120 and the first cutting member 140 when the blocking plate 170 is in the first position. The blocking plate may be configured to prevent the first cutting member 140 from rupturing the cartridge 120 when the blocking plate 170 is in the first position. The blocking plate 170 may be configured to allow access to the cartridge 120 by the first cutting

member 140 when the blocking plate 170 is in the second position. The blocking plate 170 may be configured to allow the first cutting member 140 to rupture the cartridge 120 when the blocking plate 170 is in the second position. The blocking plate 170 may remain in the first position if a cartridge 120 is not in the compartment 110 to allow the door, first cutting member 140, and/or second cutting member 150 to move freely. The blocking plate 170 may remain in the first position if a cartridge 120 is not in the compartment 110 to position the door, first cutting member 140, and/or second cutting member 150 in a position other than the cutting position.

In various embodiments, the liquid dispensing system may comprise a blocking plate release mechanism 185. The blocking plate 170 may comprise a pin 180, such as, for example, a blocking plate release pin. The pin 180 may be configured to be engaged with the cartridge 120 to slidably move the blocking plate 180 between the first position and the second position. The pin 180 may be movable between a first position and a second position. The pin 180 may be in the first position when the cartridge 120 is in the first position. The pin 180 may be in the second position when the cartridge 120 is in the second position. In various embodiments, the blocking plate release mechanism 185 may be configured to be engaged with the pin 180. The blocking plate release mechanism 185 may comprise a spring-loaded member (not shown). The spring-loaded member may be biased to position the pin 180 in the first position. The spring-loaded member may be compressed when the pin 180 is in the second position. The blocking plate release mechanism 185 may be configured to retain the blocking plate 170 in the first position when the pin 180 is in the first position. The blocking plate release mechanism 185 may be configured to unlock the blocking plate 170 from the first position when the pin 180 is in the second position. The blocking plate 170 may slidably move to the second position when the pin 180 is in the second position.

In various embodiments, the liquid dispensing system may comprise a compartment latch 190 connected to the compartment 110. The compartment latch 190 may be configured to be engaged with the cartridge 120 to retain the cartridge 120 in the compartment 110. The compartment latch 190 may engage the cartridge 120 when the cartridge 120 is in the second position. The compartment latch 190 may retain the cartridge 120 in the compartment 110 when the cartridge 120 is in the second position and/or when the blocking plate 170 is in the second position. The liquid dispensing system may comprise a release member 195 connected to the compartment latch 190. The release member 195 may be configured to disengage the compartment latch 190 to release the cartridge 120 from the compartment 110. The release member 195 may disengage the compartment latch 190 when the cartridge 120 is in the second

position. The spring-loaded member may return to the biased position when the compartment latch 190 is disengaged. The spring-loaded member may be configured to eject, or at least partially eject, the cartridge 120 when the compartment latch 190 is disengaged.

In various embodiments, the liquid dispensing system may comprise a positioning arm 200 connected to the door 130 to align the cartridge 120 with the first cutting member 130 and/or the second cutting member 150 when the door 130 is in at least one of the first actuated position and the second actuated position. The positioning arm 200 may be configured to engage at least a portion of the cartridge 120 to position the cartridge 120 in the second position. The positioning arm 200 may contact an engagement surface of the cartridge 120. The positioning arm 200 may be configured to position the cartridge 120 in the second position.

In various embodiments, the liquid dispensing system may comprise a cutting member arm 210 having a first end connected to the door 130 and a second end connected to the first cutting member 140. The first cutting member 140 may be fixedly connected to the cutting member arm 210. The cutting member arm 210 may be configured to allow the first cutting member 140 to rupture the cartridge 120 when the door 130 is in the first actuated position. The cutting member arm 210 may be configured to allow the first cutting member 140 to rupture the cartridge 120 simultaneously as the positioning arm 200 contacts the cartridge 120. The cutting member arm 210 may be configured to allow the first cutting member 140 to rupture the cartridge 120 after the positioning arm 200 contacts the cartridge 120. The liquid dispensing system may comprise a cutting member actuation arm 215. The cutting member actuation arm 215 may be intermediate the first end of the cutting member arm 210 and the door 130.

In various embodiments, the liquid dispensing system may comprise a venting member arm 220 comprising a first end configured to engage with the door 130 when the door 130 is in the second actuated position and a second end connected to the second cutting member 150. The second cutting member 150 may be pivotally connected to the compartment movable between a first position and a second position. The venting member arm 220 may comprise a spring-loaded arm. The spring-loaded venting member arm may be biased to position the door 130 in the open position and/or first actuated position. The spring-loaded venting member arm may be biased to position the second cutting member 150 in the first position.

The spring-loaded venting member arm may be configured to move the second cutting member 150 to the second position to rupture the cartridge 120 when the door is in the second actuated position. The venting member arm 220 may be configured to allow the second cutting member 150 to rupture the cartridge 120 simultaneously as the first cutting member 130 ruptures

the cartridge 120. The venting member arm 220 may be configured to allow the second cutting member 150 to rupture the cartridge 120 after the first cutting member 140 ruptures at least a portion, a substantial portion, and/or a complete portion of the cartridge 120. The venting member arm 220 may be configured to allow the second cutting member 150 to rupture the cartridge 120 before or simultaneously as the first cutting member 140 ruptures the cartridge 120. The liquid dispensing system may be characterized by dispensing at least 90%, at least 95%, 99%, at least 99%, or 100%, by volume, of the liquid from the cartridge 120 into the reservoir 155 from 1 second to 30 seconds, 1 second to 10 seconds, 1 second to 8 seconds, 1 second to 5 seconds, or 1 second to 3 seconds. In various embodiments, the liquid dispensing system may comprise a venting member actuation arm 225. The venting member actuation arm 225 may be connected to the door 130. The venting member actuation arm 225 may be configured to engage the venting member arm 220 when the door 130 is in the second actuated position.

In various embodiments, the door may comprise a door actuation door handle 132 connected to the door 130 to allow the user to move the door between the open position, first actuated position, second actuated position, and/or closed position. The door 130 and/or blocking plate 170 may be configured to prevent debris from entering compartment 110 and/or system. The system may comprise a shroud (not shown) to prevent debris from entering compartment 110 and/or reservoir 155. In various embodiments, the system may comprise a cutting member fixedly connected to the housing configured to engage a movable cartridge to rupture the cartridge.

In various embodiments, the liquid dispensing system may comprise at least one lever 230 connected to the compartment 110. The liquid dispensing system may comprise two levers connected to the compartment 110. The at least one lever 230 may be configured to engage the cartridge 120 when the cartridge 120 is in the first position and/or second position. The liquid dispensing system may comprise a guide rail 240 connected to the at least one lever 230. The at least one lever 230 may be configured to be engaged with the guide rail 240 to move the guide rail 240 between a first position when the cartridge 120 is not in the compartment 110 and a second position when the cartridge 120 is in the compartment 110 and/or the cartridge 120 is in the second position.

In various embodiments, the guide rail 240 may be configured to engage the cutting member arm 210 to slidably move the cutting member arm 210 between a first position when the guide rail 240 is in the first position and a second position when the guide rail 240 is in the second position. The first cutting member 140 may be offset from the compartment 110 when the

cutting member arm 210 is in the first position. The guide rail 240 may be configured to not allow the first cutting member 140 to contact the blocking plate 170 when the guide rail 240 is in the first position. For example, the guide rail 240 may prevent the first cutting member 140 from contacting the blocking plate 170 when the cartridge 120 is not in the compartment 110 and the door is in the first actuated position, second actuated position, and/or closed position. The first cutting member 140 may be aligned with the compartment 110 when the cutting member arm 210 is in the second position. The guide rail 240 may be configured to allow the first cutting member 140 to rupture the cartridge 120 when the guide rail 240 is in the second position and/or the cartridge 120 is in the second position.

In various embodiments, the liquid dispensing system may comprise a locking system configured to retain the cartridge 120 in the housing 100 and/or compartment 110 for a duration of an operating cycle or at least a portion of the operating cycle. The locking system may comprise a float 250 positioned in the reservoir 155 movable between a first position when the reservoir 155 lacks fluid and a second position when fluid is in the reservoir 155. The locking system may comprise a float latch 260 connected to the compartment 110 configured to be engaged with the cartridge 120 to retain the cartridge 120 in the compartment 110 when the float 250 is in the second position. The float latch 260 may be configured to retain the cartridge 120 in the housing 100 and/or compartment 110 for the duration of an operating cycle or at least a portion of the operating cycle. In various embodiments, the duration of the operating cycle may be the time for at least 50%, at least 75%, at least 90%, at least 95%, 99%, at least 99%, or 100%, by volume, of the liquid in the reservoir 155 to be dispensed to the apparatus. The float latch 260 may be configured to retain the float 250 in the first position when the blocking plate 170 is in the first position. The float latch 260 may be configured to allow the float 250 to move to the second position when the blocking plate 170 is in the second position.

The system may be configured to prevent a second cartridge from entering the compartment until the liquid is dispensed. As discussed below, the cartridge 120 may comprise a latch lock 124. The float 250 may rise to the second position and engage the float latch 260 when liquid is in the reservoir 155. The float latch 260 may engage the latch lock 124 to retain the cartridge 120 in the compartment 110 until the liquid is evacuated, or at least partially evacuated, from the reservoir 155. The float 250 may return to the first position as the liquid is evacuated from the reservoir 155 and disengage the float latch 260 from the latch lock 124 allowing the used cartridge 120 to be removed and a new cartridge to enter the compartment. In various

embodiments, the reservoir 155 may comprise a reservoir connector 155 to dispense the liquid to the appliance.

In various embodiments, the liquid dispensing system may comprise a vented system. A vented system may be configured to rupture a first portion of the cartridge and a second portion of the cartridge to equalize the pressure between the internal space of the cartridge and the compartment. The first portion may comprise a discharge point to allow fluid to flow from the cartridge. The second portion may comprise a vent to allow air to enter the cartridge. The fluid may flow from the cartridge at atmospheric pressure. The fluid may flow from the cartridge solely by gravity. The vented liquid dispensing system may be characterized by dispensing at least 90%, at least 95%, 99%, at least 99%, or 100%, by volume, of the unit dose. Any fluid remaining in the cartridge may evaporate.

In various embodiments, the cartridge 120 may comprise a rigid, semi-rigid, and/or flexible material, such as, for example, polypropylene, polyethylene, high density polyethylene, low density polyethylene, and/or polyethylene terephthalate. The cartridge 120 may be formed using a extrusion blow molding process, an injection stretch blow molding process, and/or any other suitable process. The cartridge may comprise any suitable shape, such as, for example, a cube, a tetrahedron, a prism, a cylinder, a sphere, a cone, a torus, a pyramid and any combination thereof. Referring to FIG. 4, the cartridge 120 may comprise a rigid cartridge comprising at least one engagement surface 121 configured to engage the compartment 110, and a rupture surface 122 configured to engage with the first cutting member 140 and/or the second cutting member 150. The cartridge 120 may comprise a blocking plate release tab 123 configured to engage the pin 180 and/or blocking plate release mechanism 185 allowing the blocking plate 170 to release and fully engage the cartridge 120 into the compartment 110. The cartridge 120 may comprise a latch lock 124 configured to engage the float latch 260 to retain the cartridge 120 in the compartment 110 when the float 250 is in the second position. In various embodiments, the cartridge 520 may not self seal upon removal.

There are many manufacturers of counterfeit fluid containers, such as, for example, cartridges 120. Further, there is a chance that a user and/or a counterfeit container manufacturer may refill an authentic cartridge 120 and reuse the cartridge 120 multiple times in the appliance and/or system. This may result in financial losses to the manufacturer of the authentic cartridge 120. Also, there is a chance that the performance of the appliance and/or system, such as the wash quality of clothes, for example, may deteriorate, if a counterfeit container and/or a refilled cartridge 120 is loaded into the system. Furthermore, this counterfeiting may also potentially

lead to a lowering of the brand image of the manufacturer of the authentic cartridge 120, system, and/or apparatus.

In view of the above-discussed issues, in various embodiments, the compartment 110 and/or cartridge 120 may comprise various interlocking features configured to prevent, or at least minimize opportunities for, inserting a counterfeit and/or improper container into the system. In various embodiments, the cartridge 120 may comprise a receiving aperture and the compartment 110 may comprise at least one projection and/or receiving post, or vice-versa, for example, such that the aperture of the cartridge 120 may be engaged with the at least one projection or receiving post. In various embodiments, the compartment 110 may be configured to only receive an authentic cartridge 120. The compartment 110 may comprise a different length and/or a different dimension corresponding to only an authentic cartridge 120 and/or a particular type of cartridge 120. For example, only an authentic cartridge 120 having complimentary features may be able to be inserted into that particular compartment 110 and interlock and/or engage with the various features of the compartment. In various embodiments, the compartment 110 may comprise an interface exclusive to an authentic cartridge.

Referring to FIGS. 5-9, in various embodiments, a liquid dispensing system for an appliance may generally comprise a housing 500 comprising a compartment 510 for receiving a cartridge 520 comprising a unit dose, a door 530 connected to the compartment 510 movable between an open position and a closed position, at least one compression member 540 adjacent the compartment 510 configured to engage the cartridge 520, an arm 550 configured to be engaged with the cartridge 520 to move the arm 550 between a first position and a second position, an engagement member 560 configured to engage the arm 550 when the arm 550 is in the second position and the door 530 is in the closed position, a cutting member 570 connected to the arm 550 to rupture a portion of the cartridge 520 when the engagement member 560 is engaged with the arm 550, and a reservoir 580 in fluid communication with the compartment 510 configured to establish a gravity flow from the compartment 510 to the reservoir 580. In various embodiments, the system may be configured to apply positive pressure to the cartridge 520 to dispense the fluid from the cartridge 520. In various embodiments, the liquid dispensing system may comprise a mechanical system lacking electrical means to dispense the fluid and/or dispense the fluid to the appliance solely by gravity flow.

In various embodiments, the compartment 510 may comprise a recessed cartridge entrance 509. The compartment 510 may comprise a track 514 configured to slidably receive the cartridge 520. The track 514 may comprise at least one rail and/or a slot. In various

embodiments, the track 514 may comprise two rails. The cartridge 520 may be slid along the rail and/or the slot between at least a first position and a second position. The cartridge 520 may be at least partially engaged with the compartment 510 when the cartridge 520 is in the first position. The cartridge 520 may be fully engaged with the compartment 510 when the cartridge 520 is in the second position. The track 514 may prevent, or at least inhibit, misalignment of the cartridge 520 with the compartment 510.

In various embodiments, the arm 550 may be configured to be engaged with the cartridge 520 to move the arm 550 between a first position and a second position. For example the arm 550 may be in the first position when no cartridge 520 is in the compartment 510. The arm 550 may be in the second position when a cartridge 520 is in the compartment 510 and/or the cartridge 520 is in the second position. The engagement member 560 may be configured not to engage the arm 550 when the arm 550 is in the first position and the door 530 is in the closed position. The engagement member 560 may be configured not to engage the arm 550 when the door 530 is in the open position. The engagement member 560 may be configured to engage the arm 550 when the arm 550 is in the second position and the door 530 is in the closed position. The cutting member 570 may be configured to rupture a portion of the cartridge 520 when the engagement member 560 is engaged with the arm 550 and/or the door 530 is in the closed position. The cutting member 570 may be configured not to rupture a portion of the cartridge 520 when the door 530 is in the open position and/or the arm 550 is in the first position.

In various embodiments, the housing 500 may comprise at least one compression spring 545 configured to engage the at least one compression member 540. The at least one compression spring 545 may be biased to apply a positive pressure to the at least one compression member 540. The at least one compression member 540 may be configured to apply a positive pressure to the cartridge 520. The at least one compression member 540 may apply pressure to a portion of the cartridge 520 opposite from the ruptured portion. The at least one compression member 540 may apply pressure to a portion of the cartridge 520 proximate to the ruptured portion. In various embodiments, the pressure applied to the portion of the cartridge 520 proximate to the ruptured portion may be less than or equal to the pressure applied to the portion of the cartridge 520 opposite from the ruptured portion. The positive pressure may cause the fluid to flow from the cartridge 520 in the direction of the rupture.

In various embodiments, the compartment 510 may be intermediate a first compression member 540A and a second compression member 540B. The housing 500 may comprise at least one first compression spring 545A configured to engage the first compression member 540A.

The housing 500 may comprise at least one second compression spring 545B configured to engage the second compression member 540B. The housing 500 may comprise a compression spring post 546 intermediate the at least one compression member 540 and the at least one compression spring 545. The housing 500 may comprise at least one compression spring separator 546. In various embodiments, the positive pressure may be sufficient to cause at least 75%, at least 90%, at least 95%, 99%, at least 99%, or 100%, by volume, of the fluid to flow from the cartridge 520.

In various embodiments, the compartment 510 may be intermediate a first compression member 540A configured to engage the cartridge 520 when the cartridge 520 is in the compartment 510 and a second compression member 540B configured to engage the cartridge 520 when the door 530 is in the closed position. For example, the first compression member 540A may be configured to apply positive pressure to the cartridge 520 when the cartridge is in the compartment 510 and the door 530 is in the open position and/or closed position. The second compression member 540B may be configured to apply positive pressure to the cartridge 520 when the cartridge is in the compartment 510 and the door 530 is in the closed position. The first compression member 540A and/or second compression member 540B may be configured not to apply positive pressure to the cartridge 520 when the door 530 is in the open position.

In various embodiments, the door 530 may be pivotally connected to the housing 500. The housing 500 may comprise at least one door pivot post 501. The housing 500 may comprise an actuation door spring 502. The door 530 may comprise at least one actuation door pivot 531 configured to engage the at least one door pivot post 501 and/or actuation door spring 502. The actuation door spring 502 may be biased to position the door 530 in the open position. The compartment 510 may comprise at least one retaining rail 512. The housing may comprise at least one retaining rail tab 513. The at least one retaining rail 512 configured to engage the at least one retaining rail tab 513 to retain the door 530 in the closed position. The housing 500 may comprise a spring-loaded door latch 504. The door 530 may comprise a door latch 533 configured to engage the spring-loaded door latch 504 to retain the door 530 in the closed position. The door 530 may comprise a door lock 534 configured to engage the housing 500 to retain the door 530 in the closed position. The housing 500 may comprise a door release 503 configured to release the at least one retaining rail 512, door latch 533, door lock 534, and/or spring-loaded door latch 504 from the at least one retaining rail tab 513 and/or housing 500 to allow the door 530 to move to the open position.

In various embodiments, the housing may comprise a catch tray 590 in fluid communication with the reservoir 580. The catch tray 590 may comprise a release opening 521. The catch tray 590 may comprise a catch tray director 591. The catch tray 590 may comprise a transfer duct 592. The catch tray 590 may be configured to collect and/or direct the liquid flowing from the cartridge 520 to the reservoir 580. The liquid may flow from the cartridge 520 through the release opening 521 to the catch tray 590. The catch tray 590 may collect the liquid flowing from the cartridge 520. The liquid may flow from the catch tray 590 to the catch tray director 591. The liquid may flow from the catch tray director 591 to the transfer duct 592. The liquid may flow from the transfer duct 592 to the reservoir 580. In various embodiments, the reservoir 580 may comprise a reservoir connector 585 to dispense the liquid to the appliance.

In various embodiments, the liquid dispensing system may comprise a locking system configured to retain the cartridge 520 in the housing 500 and/or compartment 510 for a duration of an operating cycle or at least a portion of the operating cycle. The locking system may comprise a pivoting reservoir 580 movable between a first position when the reservoir 580 lacks liquid and a second position when liquid is in the reservoir 580, a pin 581 connected to the compartment 510, and a latch 582 connected to the reservoir 580 configured to engage the pin 581 when the reservoir 580 is in the second position to retain the compartment 510 in the housing 500. The latch 582 may be configured to retain the cartridge 520 in the compartment 510 for a duration of an operating cycle or at least a portion of the operating cycle. In various embodiments, the duration of the operating cycle may be the time for at least 50%, at least 75%, at least 90%, at least 95%, 99%, at least 99%, or 100%, by volume, of the liquid in the reservoir 580 to be dispensed to the apparatus.

The system may be configured to prevent a second cartridge from entering the compartment until the liquid is dispensed. For example, the reservoir 580 may pivot from the first position to the second position when liquid is in the reservoir 580. The latch 582 may engage the pin 581 to retain the cartridge 520 in the compartment 510 until the liquid is evacuated, or at least partially evacuated, from the reservoir 580. The reservoir may pivot from the second position to the first position as the liquid is evacuated from the reservoir 580 and disengage the latch 582 from the pin 581 allowing the used cartridge 520 to be removed and a new cartridge to enter the compartment. In various embodiments, the reservoir 580 may comprise a reservoir connector 585 to dispense the liquid to the appliance.

In various embodiments, the cartridge may comprise a rigid, semi-rigid, and/or flexible material, such as, for example, polypropylene, polyethylene, high density polyethylene, low

density polyethylene, and/or polyethylene terephthalate. The cartridge may comprise a laminated foil or a multilayer film. The cartridge 520 may be formed using a file extrusion process, a vertical form fill and seal process, and/or any other suitable process. Referring to FIGS. 10A and 10B, the cartridge 520 may comprise a flexible cartridge comprising at least one engagement surface 521 configured to engage the compartment 510 and a rupture surface 522 configured to engage with the cutting member 570. The cartridge 520 may comprise an arm engagement surface 523 configured to engage the arm 550 allowing the arm 550 to move to the second position and fully engage the cartridge 520 into the compartment 510. In various embodiments, the cartridge 520 may not self seal upon removal.

In various embodiments, a kit may comprise any of the liquid dispensing systems and/or any of the cartridges described herein. The kit may be configured to provide a liquid to an appliance. In various embodiments, the kit may comprise at least one cartridge to be used with a passive liquid dispensing system for an appliance comprising a housing comprising a compartment for receiving a cartridge comprising a unit dose, a door slidably connected to the housing movable between an open position, a first actuated position, a second actuated position, and a closed position, a first cutting member connected to the compartment for rupturing a first portion of the cartridge when the door is in the first actuated position, a second cutting member connected to the compartment for rupturing a second portion of the cartridge when the door is in the second actuated position, and a reservoir in fluid communication with the compartment configured to establish a gravity flow from the compartment to the reservoir.

In various embodiments, the kit may comprise at least one cartridge to be used with a liquid dispensing system for an appliance comprising a housing comprising a compartment for receiving a cartridge comprising a unit dose, a door pivotally connected to the compartment movable between an open position and a closed position, at least one compression member adjacent the compartment configured to engage the cartridge, an arm configured to be engaged with the cartridge to move the arm between a first position and a second position, an engagement member configured to engage the arm when the arm is in the second position and the door is in the closed position, a cutting member connected to the arm to cut a portion of the cartridge when the engagement member is engaged with the arm, and a reservoir in fluid communication with the compartment configured to establish a gravity flow from the compartment to the reservoir.

In various embodiments, a method of supplying liquid to an appliance may generally comprise inserting any of the cartridges described herein into any of the liquid dispensing systems described herein, and causing the liquid to flow from the cartridge to the appliance by

gravity. In various embodiments, the method may comprise inserting a cartridge comprising a unit dose into a housing comprising a compartment for receiving the cartridge when a door slidably connected to the housing is in a first position, sliding the door to a first actuated position to actuate a first cutting member connected to the compartment to rupture a first portion of the cartridge, sliding the door to a second actuated position to actuate a second cutting member connected to the compartment to rupture a second portion of the cartridge. The liquid in the cartridge may flow from the cartridge to the compartment by gravity. The liquid may flow from the compartment to a reservoir in fluid communication with the compartment by gravity. In various embodiments, the system may be completely purged after each unit dose is dispensed.

In various embodiments, a method of supplying liquid to a liquid dispensing system may generally comprise inserting a cartridge comprising a unit dose into any of the liquid dispensing systems described herein. The method may comprise inserting a cartridge comprising a unit dose into a housing comprising a compartment for receiving the cartridge; sliding a door pivotally connected to the compartment from an open position and a closed position; engaging the cartridge with a cutting member connected to the compartment to rupture a portion of the cartridge; engaging the cartridge with at least one compression member adjacent the compartment to cause fluid to flow from the cartridge to the compartment. The liquid may flow from the compartment to a reservoir in fluid communication with the compartment by gravity. In various embodiments, the system may be completely purged after each unit dose is dispensed.

In various embodiments, the liquid dispensing system may be configured to enable safe and/or consumer friendly placement of the cartridge into the system. The liquid dispensing system may be characterized by minimized technical complexities and/or consumer complexities. The liquid dispensing system may be configured to prevent a cartridge not configured to be used with the system from being positioned in the compartment and/or system. The liquid dispensing system may be configured to prevent a second cartridge from being positioned in the compartment when a cartridge is in the compartment. The liquid dispensing system may be configured to reduce or eliminate leakage from the cartridge, compartment, and/or system when the cartridge is removed from the compartment and/or system. The liquid dispensing system and/or cartridge may be configured to prevent liquid from entering the apparatus unless a cartridge is in the compartment.

The dimensions and values disclosed herein are not to be understood as being strictly limited to the exact numerical values recited. Instead, unless otherwise specified, each such dimension is intended to mean both the recited value and a functionally equivalent range

surrounding that value. For example, a dimension disclosed as “40 mm” is intended to mean “about 40 mm”.

All documents cited in the Detailed Description of the Invention are incorporated herein by reference; the citation of any document is not to be construed as an admission that it is prior art with respect to the present invention. To the extent that any meaning or definition of a term in this written document conflicts with any meaning or definition of the term in a document incorporated by reference, the meaning or definition assigned to the term in this written document shall govern.

While particular embodiments of the present invention have been illustrated and described, it would be obvious to those skilled in the art that various other changes and modifications can be made without departing from the spirit and scope of the invention. It is therefore intended to cover in the appended claims all such changes and modifications that are within the scope of this invention.

CLAIMS

What is claimed is:

1. A passive liquid dispensing system for an appliance, the liquid dispensing system comprising:

a housing (100) comprising a compartment (110) for receiving a cartridge (120) comprising a unit dose;

a door (130) slidably connected to the housing movable between an open position, a first actuated position, a second actuated position, and a closed position;

a first cutting member (140) connected to the compartment for rupturing a first portion of the cartridge when the door is in the first actuated position;

a second cutting member (150) connected to the compartment for rupturing a second portion of the cartridge when the door is in the second actuated position; and

a reservoir (155) in fluid communication with the compartment configured to establish a gravity flow from the compartment to the reservoir.

2. The system of claim 1, wherein the compartment comprises a track (160) configured to slidably receive the cartridge.

3. The system of claim 1 or claim 2 comprising a blocking plate (170) configured to be engaged with the cartridge to slidably move the blocking plate between a first position and a second position, wherein the blocking plate is intermediate the cartridge and the first cutting member when the blocking plate is in the first position, and the blocking plate is configured to allow access to the cartridge by the first cutting member when the blocking plate is in the second position.

4. The system of claim 3 comprising a compartment latch (190) connected to the compartment configured to be engaged with the cartridge to retain the cartridge in the compartment when the blocking plate is in the second position.

5. The system of claim 4 comprising a release member (195) connected to the compartment latch for disengaging the compartment latch to unlock the cartridge from the compartment.

6. The system according to any one of the preceding claims comprising a positioning arm (200) connected to the door to align the cartridge with the first cutting member and the second cutting member when the door is in at least one of the first actuated position and the second actuated position.
7. The system according to any one of the preceding claims comprising:
 - a cutting member arm (210) having a first end connected to the door and a second end connected to the first cutting member; and
 - at least one lever (230) connected to the compartment configured to be engaged with a guide rail (240) to move the guide rail between a first position when the cartridge is not in the compartment and a second position when the cartridge is in the compartment;
 - wherein the guide rail is configured to engage the cutting member arm to slidably move the cutting member arm between a first position when the guide rail is in the first position and a second position when the guide rail is in the second position;
 - wherein the first cutting member is offset from the compartment when the cutting member arm is in the first position and the first cutting member is aligned with the compartment when the cutting member arm is in the second position.
8. The system of according to any one of the preceding claims comprising a venting member arm (220) comprising a first end configured to engage with the door when the door is in the second actuated position and a second end connected to the second cutting member.
9. The system according to any one of the preceding claims, wherein the second cutting member is configured to rupture the second portion of the cartridge after the first cutting member ruptures the first portion of the cartridge.
10. The system according to any one of the preceding claims comprising a locking system comprising:
 - a float (250) positioned in the reservoir movable between a first position when the reservoir lacks fluid and a second position when fluid is in the reservoir;
 - a float latch (260) connected to the compartment configured to be engaged with the cartridge to retain the cartridge in the compartment when float is in the second position.

11. The system of claim 10, wherein the float latch is configured to retain the cartridge in the compartment for a duration of an operating cycle.
12. The system of according to any one of the preceding claims comprising a blocking plate (170) configured to be engaged with the cartridge to slidably move the blocking plate between a first position and a second position, wherein the float latch is configured to retain the float in the first position when the blocking plate is in the first position, and the float latch is configured to allow the float to move to the second position when the blocking plate is in the second position
13. The system according to any one of the preceding claims comprising a vented system characterized by dispensing about 99%, by volume, of the unit dose.
14. The system according to any one of the preceding claims, wherein the cartridge is a rigid cartridge comprising:
 - at least one engagement surface (121) configured to engage the compartment; and
 - a rupture surface (122) configured to engage with the first cutting member and the second cutting member.

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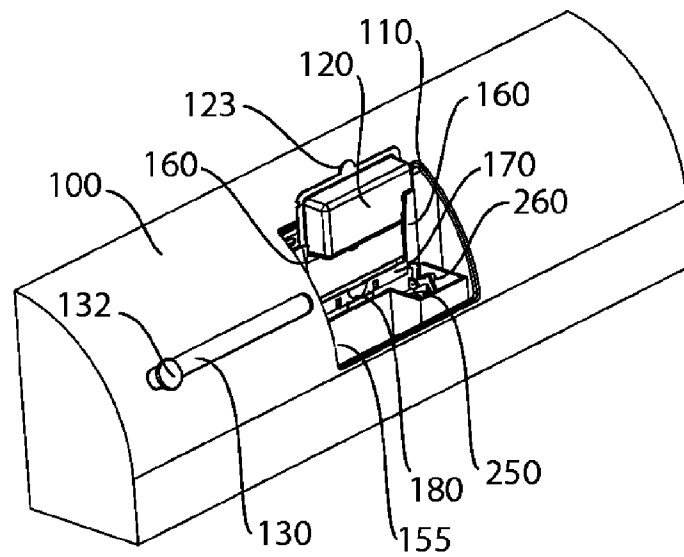


Fig. 1

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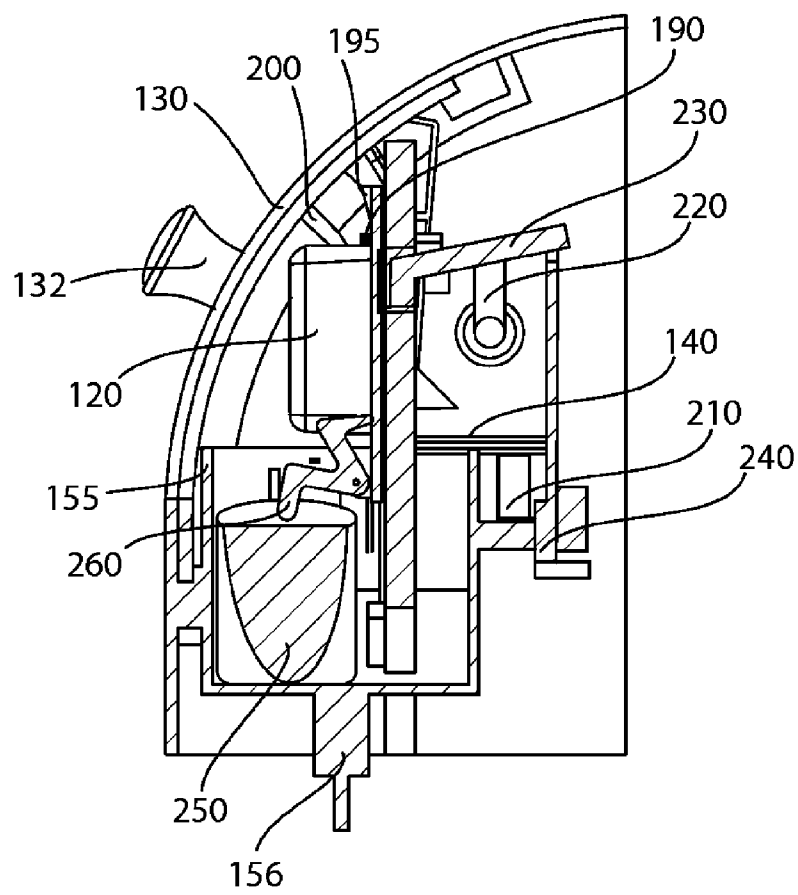


Fig. 2

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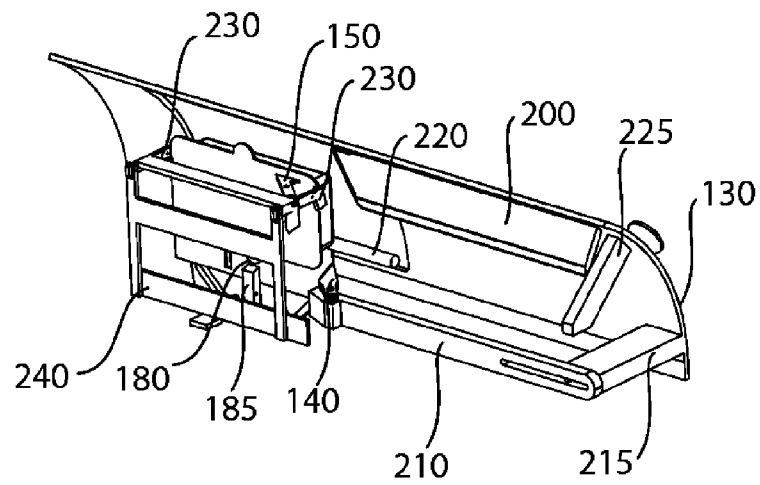


Fig. 3

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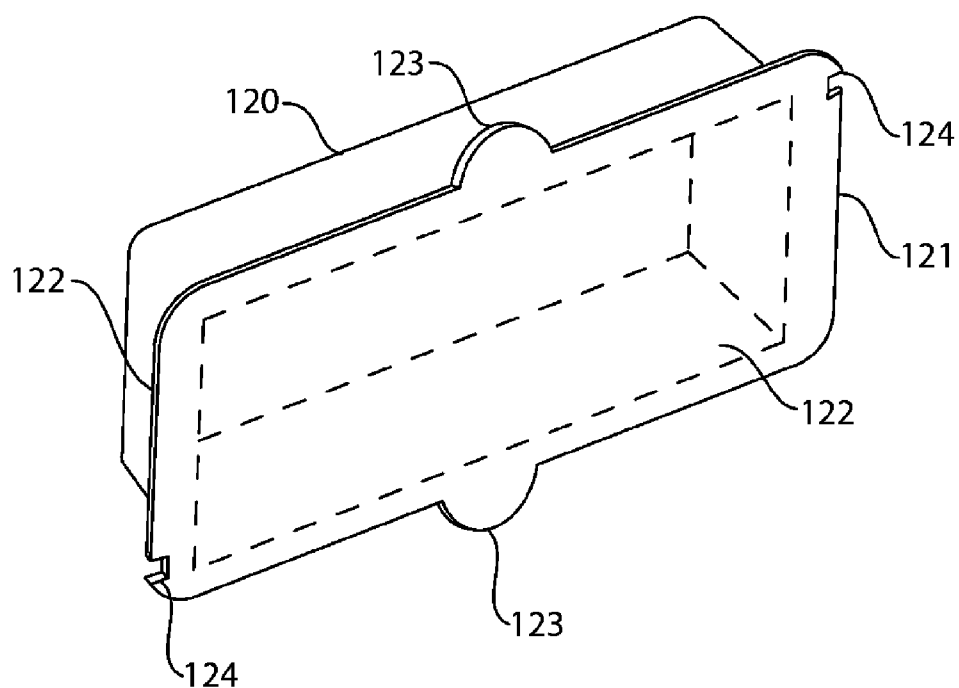


Fig. 4

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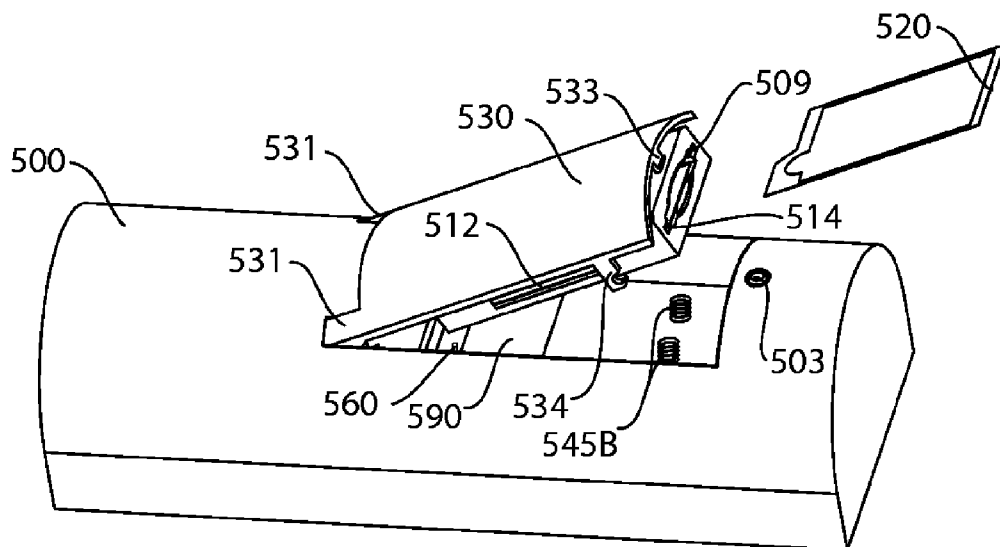


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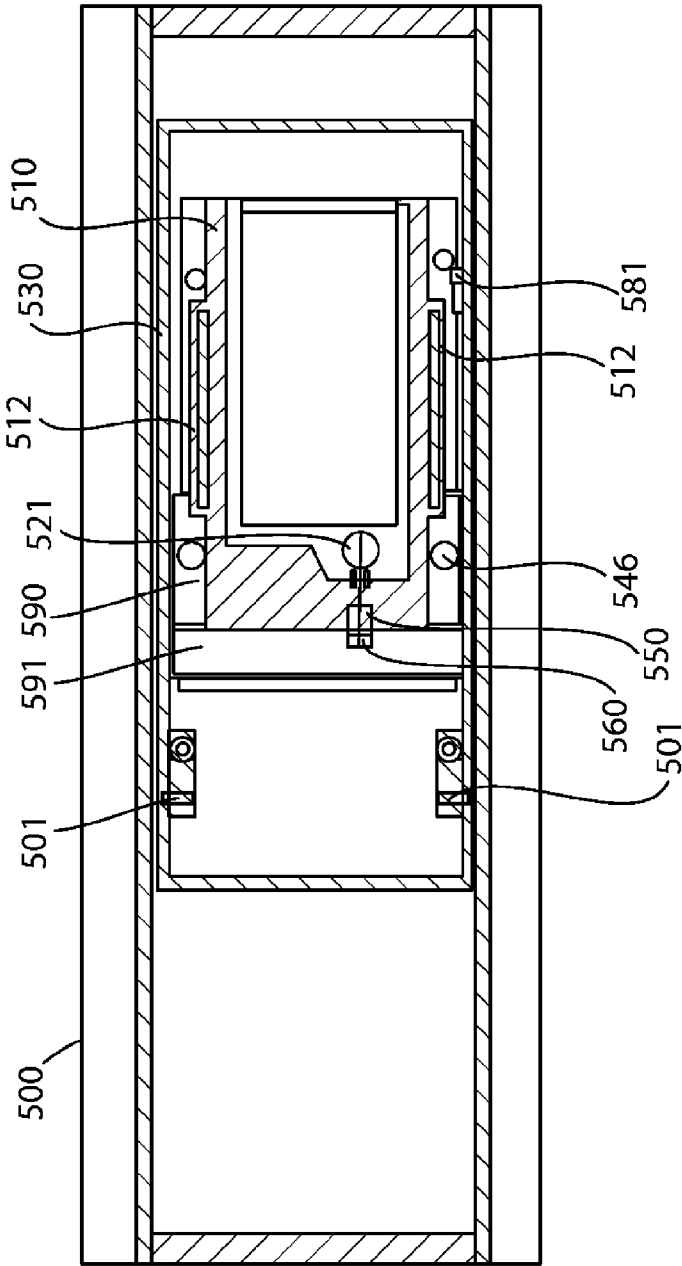


Fig. 6

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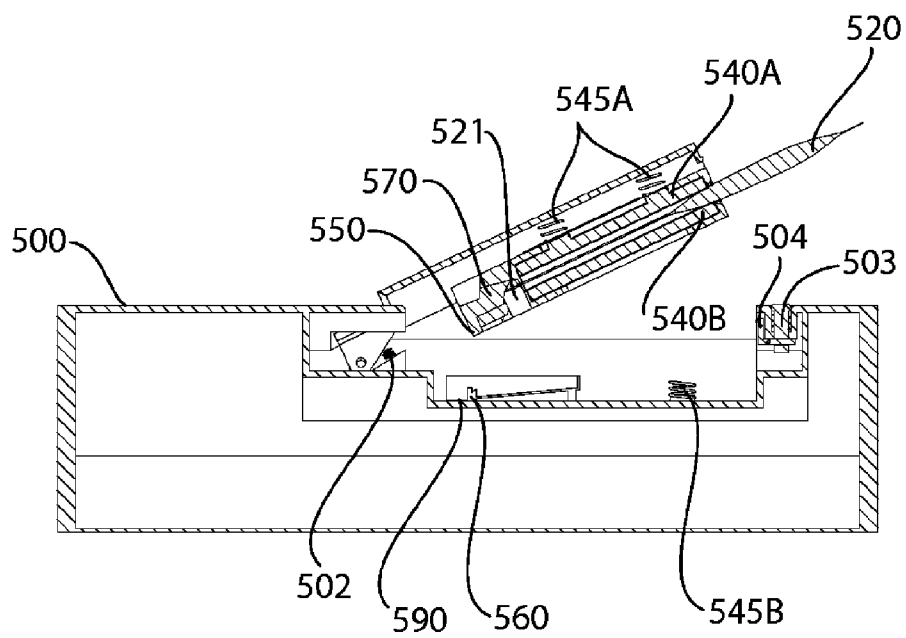


Fig. 7

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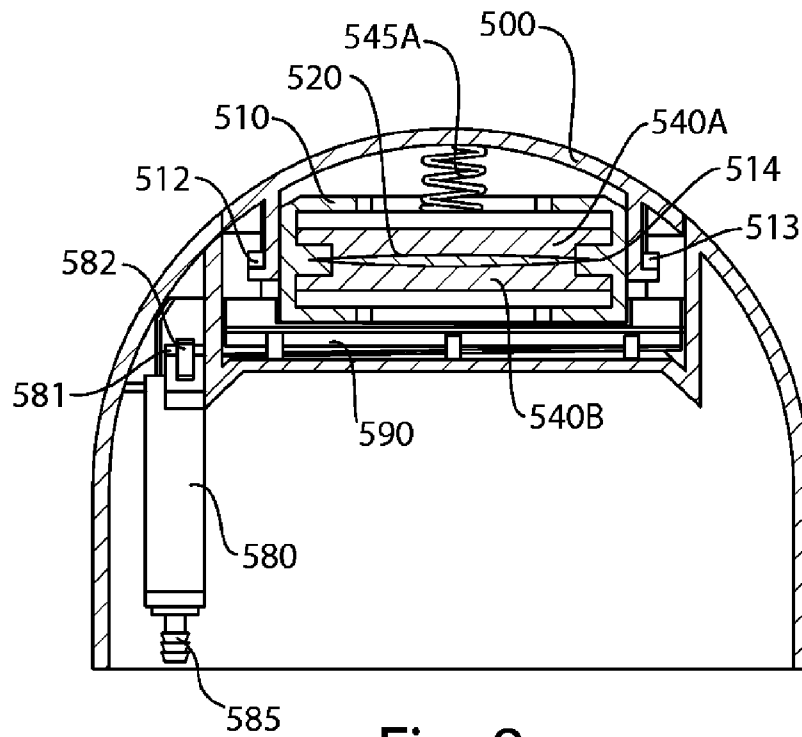


Fig. 8

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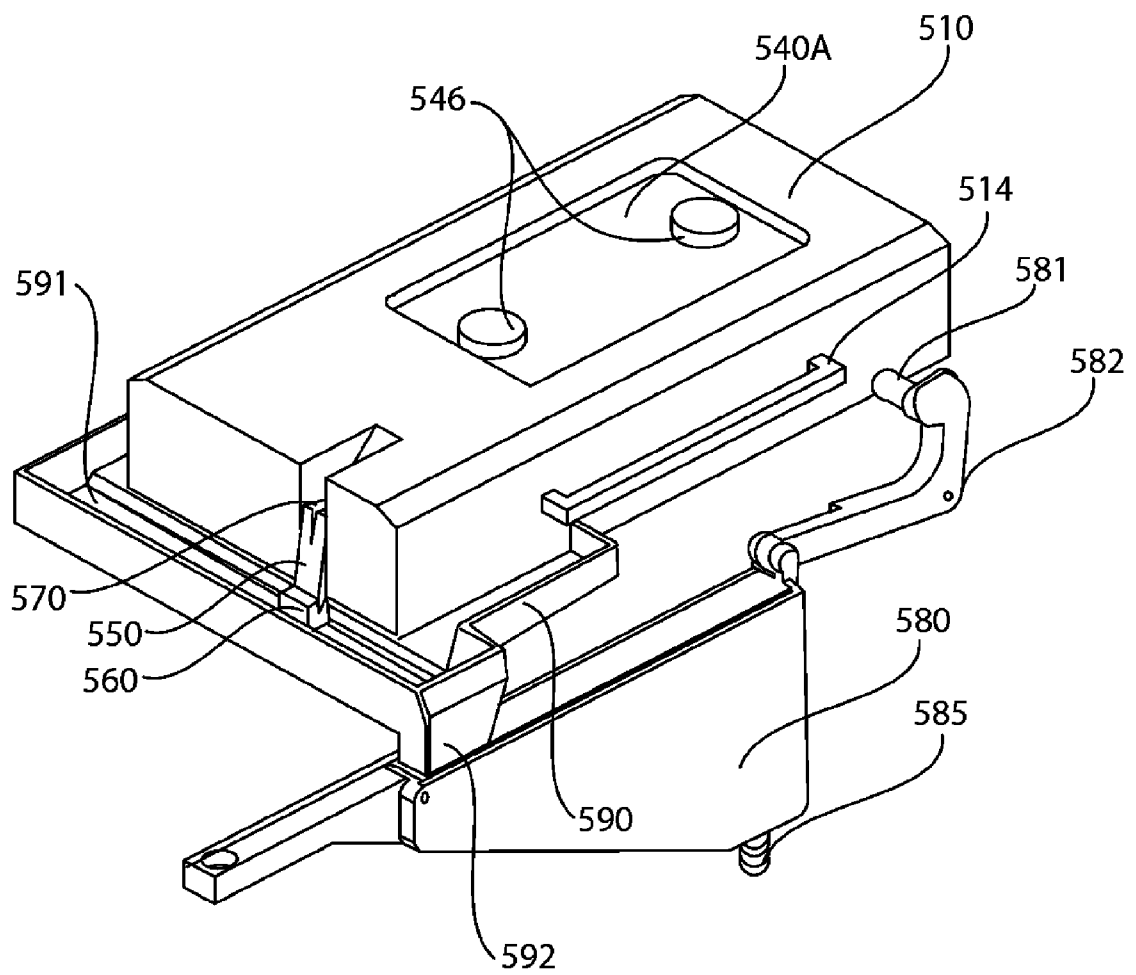


Fig. 9

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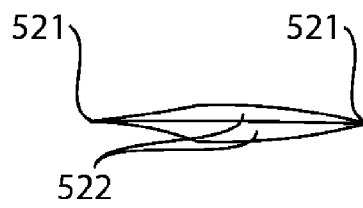


Fig. 10A

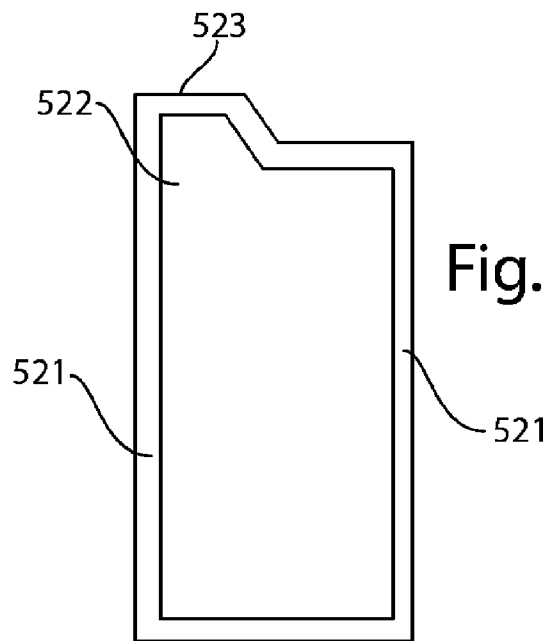


Fig. 10B