US 20130000781A1

(19) United States

(12) Patent Application Publication

(10) Pub. No.: US 2013/0000781 A1

(43) Pub. Date: Jan. 3, 2013

BISCHOFF et al.

(54) METHODS AND APPARATUSES FOR DISPENSING FLUIDS

(76) Inventors: **Corey Michael BISCHOFF**, Cincinnati, OH (US); **Kenneth Eugene Lamb**, Lebanon, OH (US); **Stephan James Andreas Meschkat**, Bad Soden (DE); **Brian Joseph Roselle**, Fairfield, OH (US); **Christopher Lawrence Smith**, Liberty Twp., OH (US); **William Peter Wurzelbacher**, Hamilton, OH (US)

(21) Appl. No.: **13/535,929**

(22) Filed: **Jun. 28, 2012**

Related U.S. Application Data

(60) Provisional application No. 61/502,012, filed on Jun. 28, 2011.

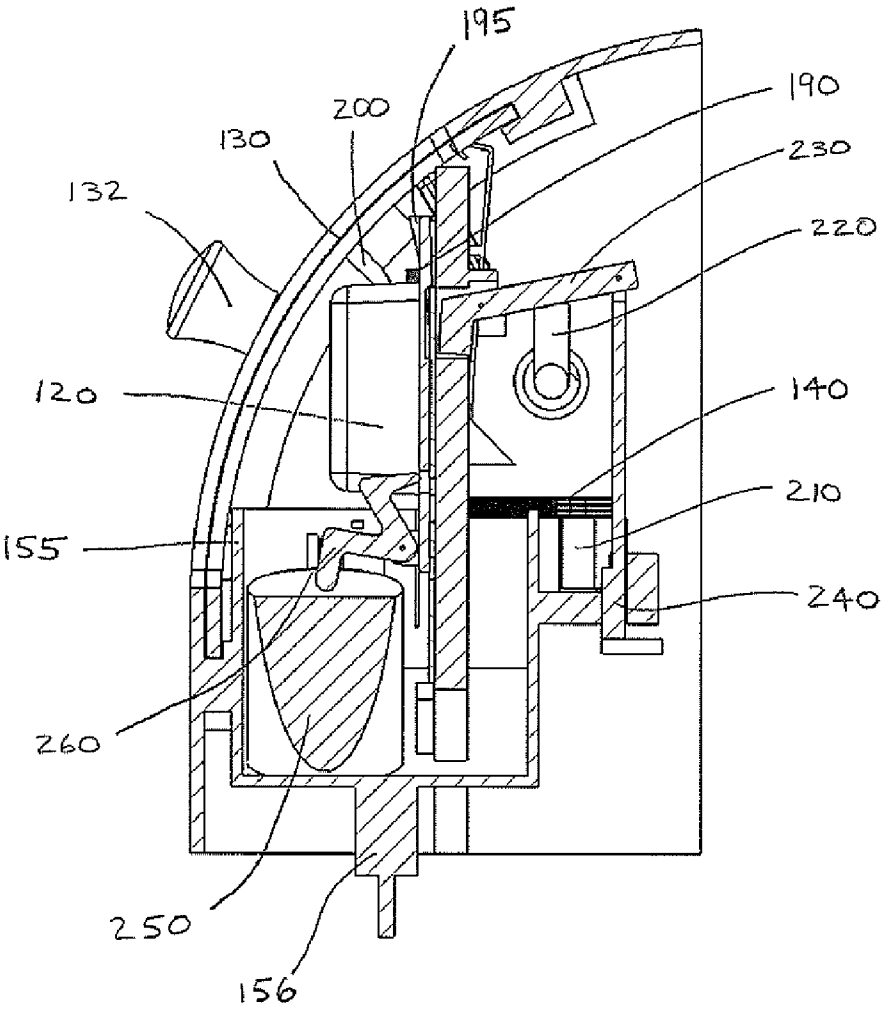
Publication Classification

(51) **Int. Cl.**
B65B 3/06 (2006.01)

(52) **U.S. Cl.** **141/330**

(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.



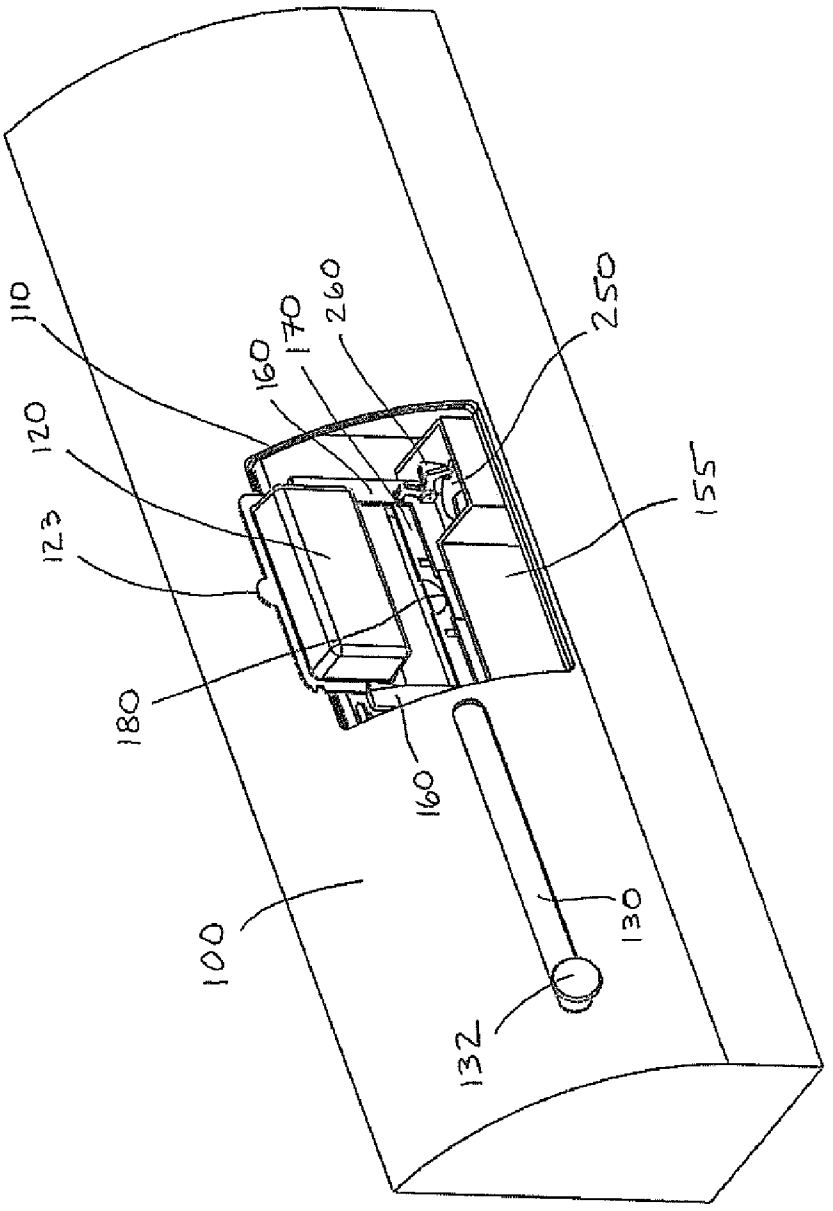


Fig. 1

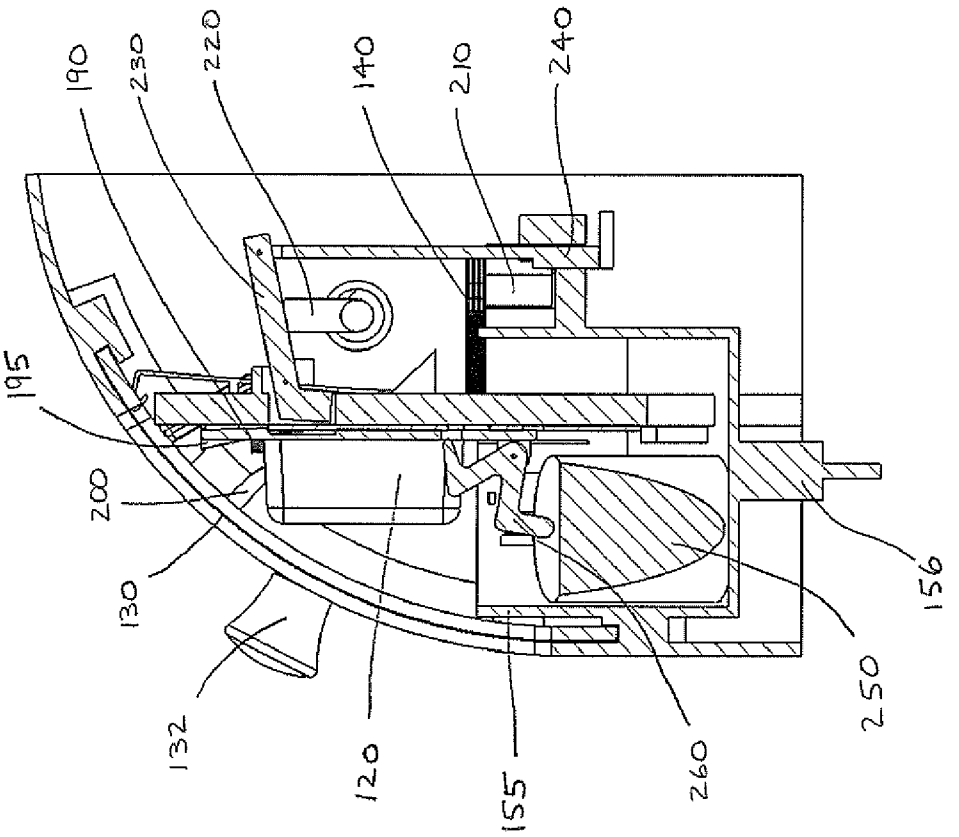


Fig. 2

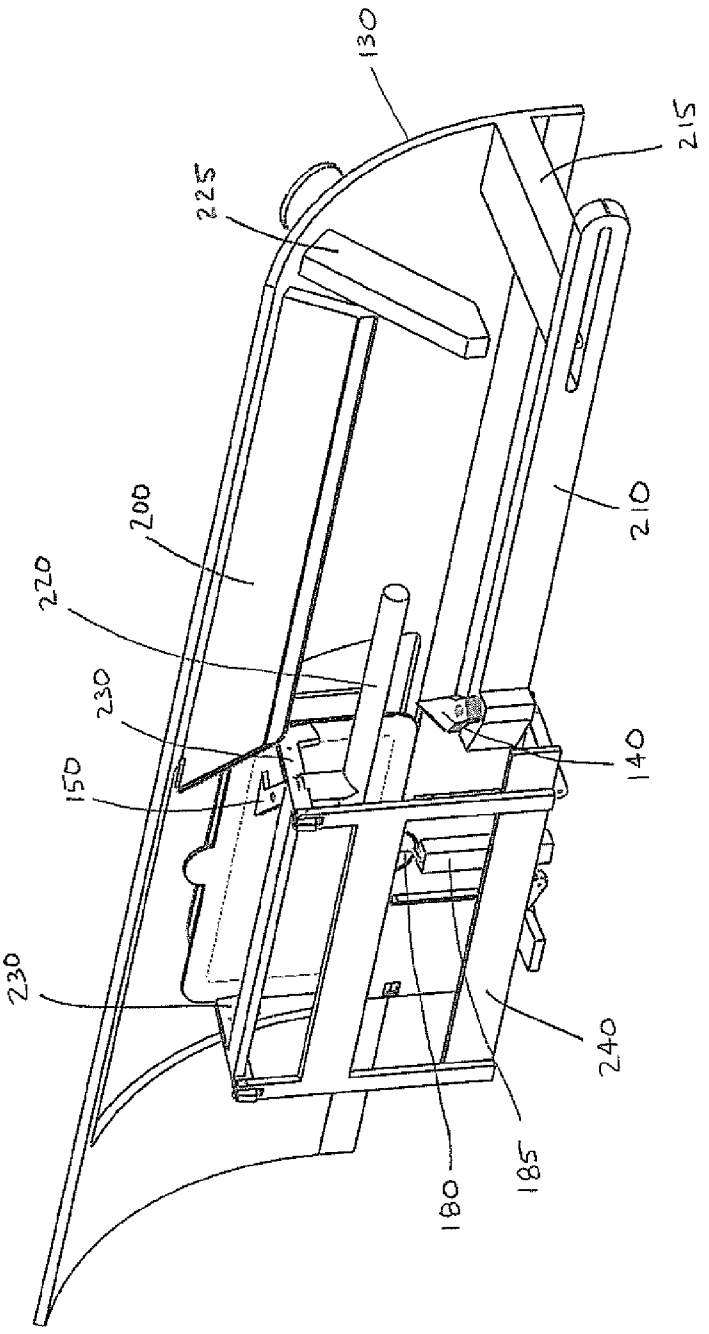


Fig. 3

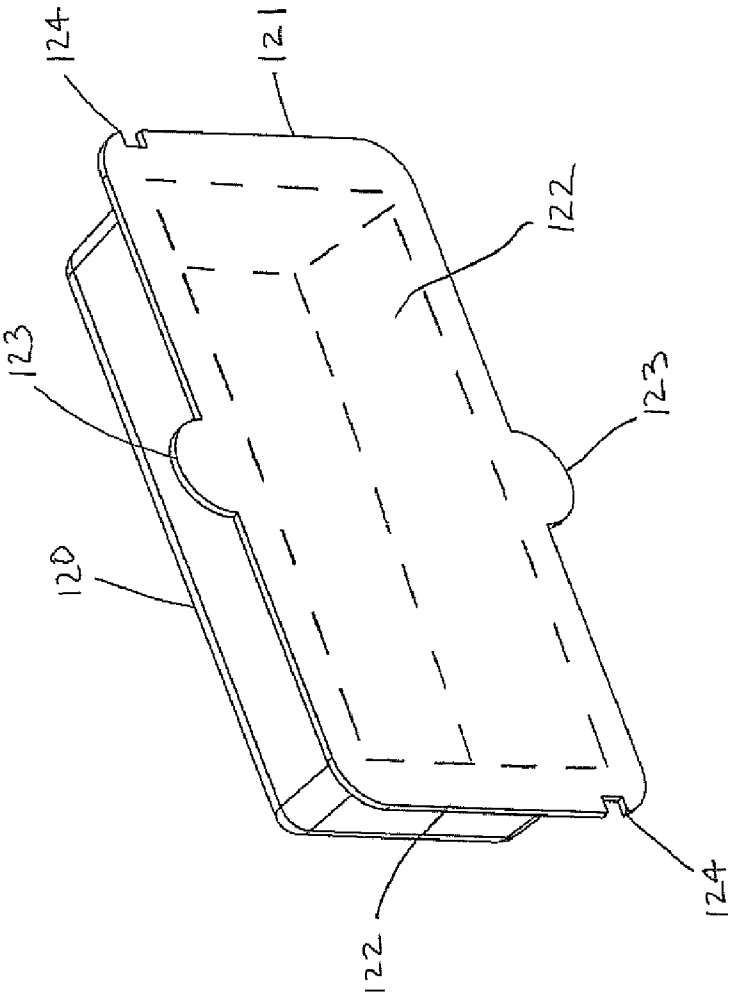


Fig. 4

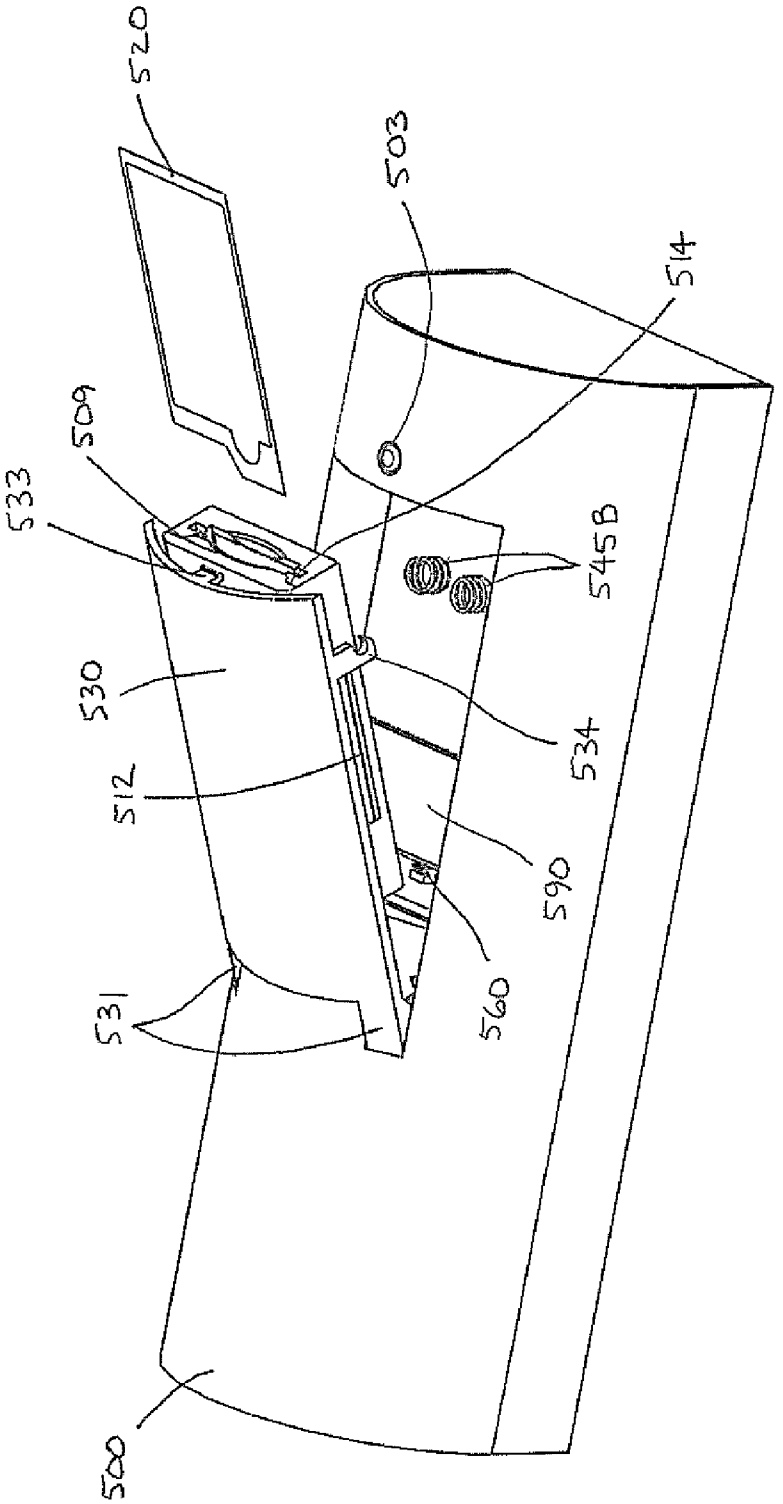


Fig. 5

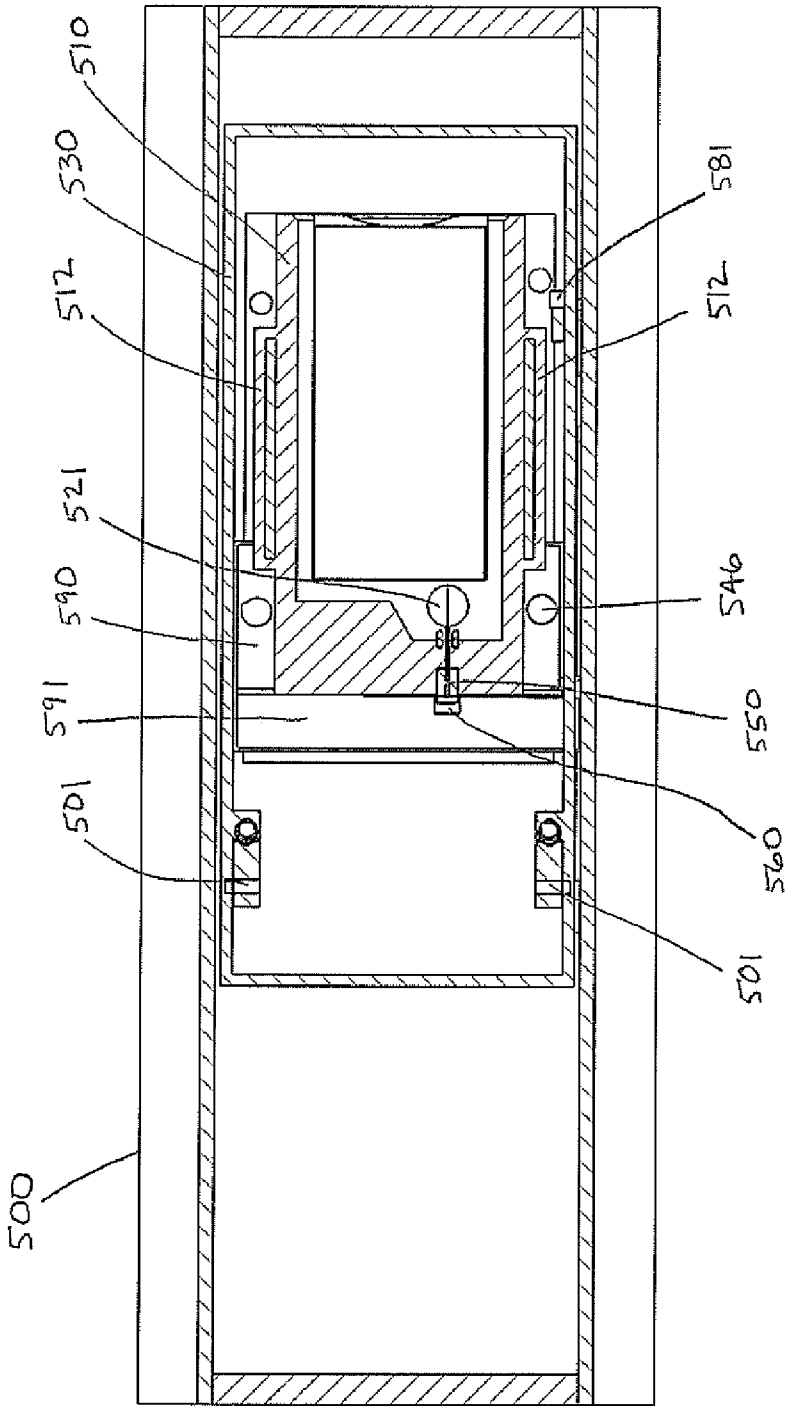


Fig. 6

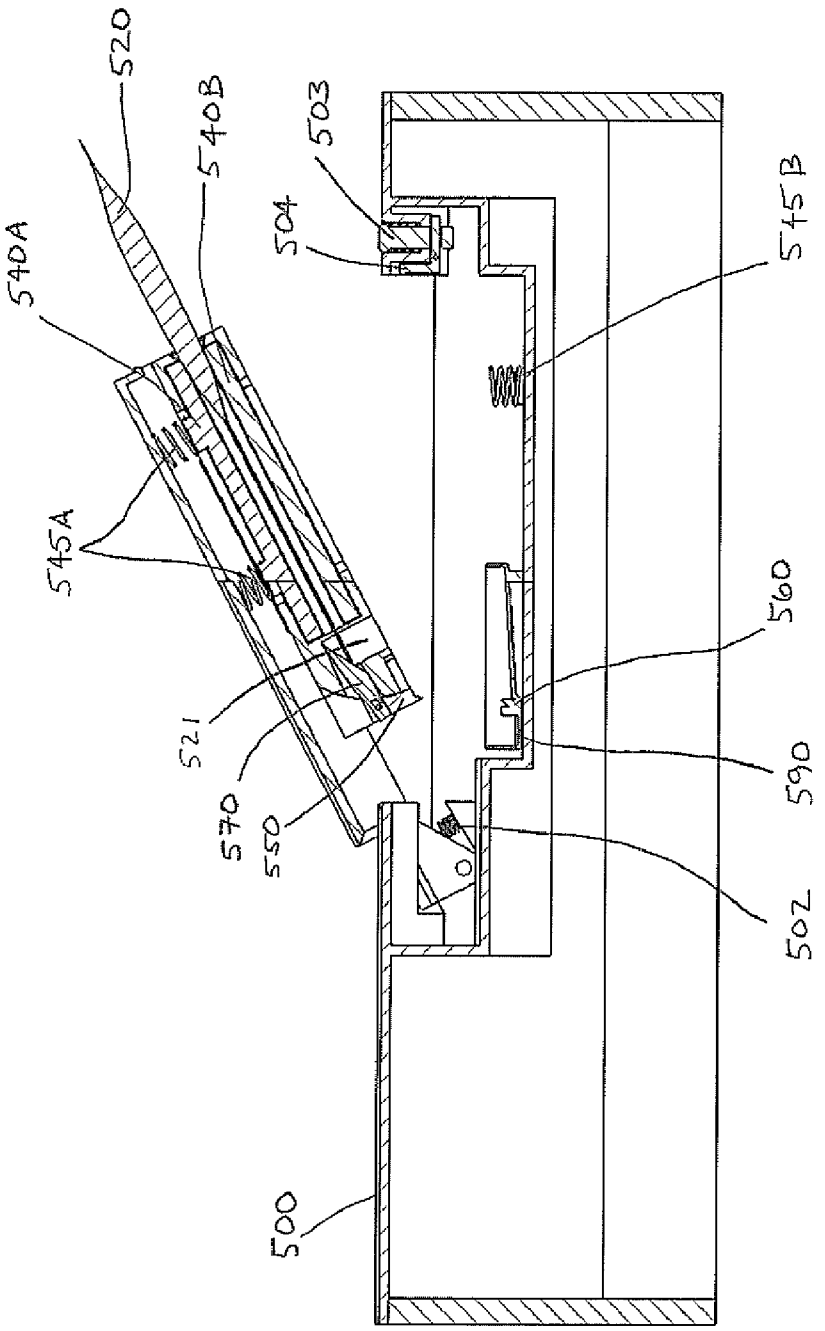


Fig. 7

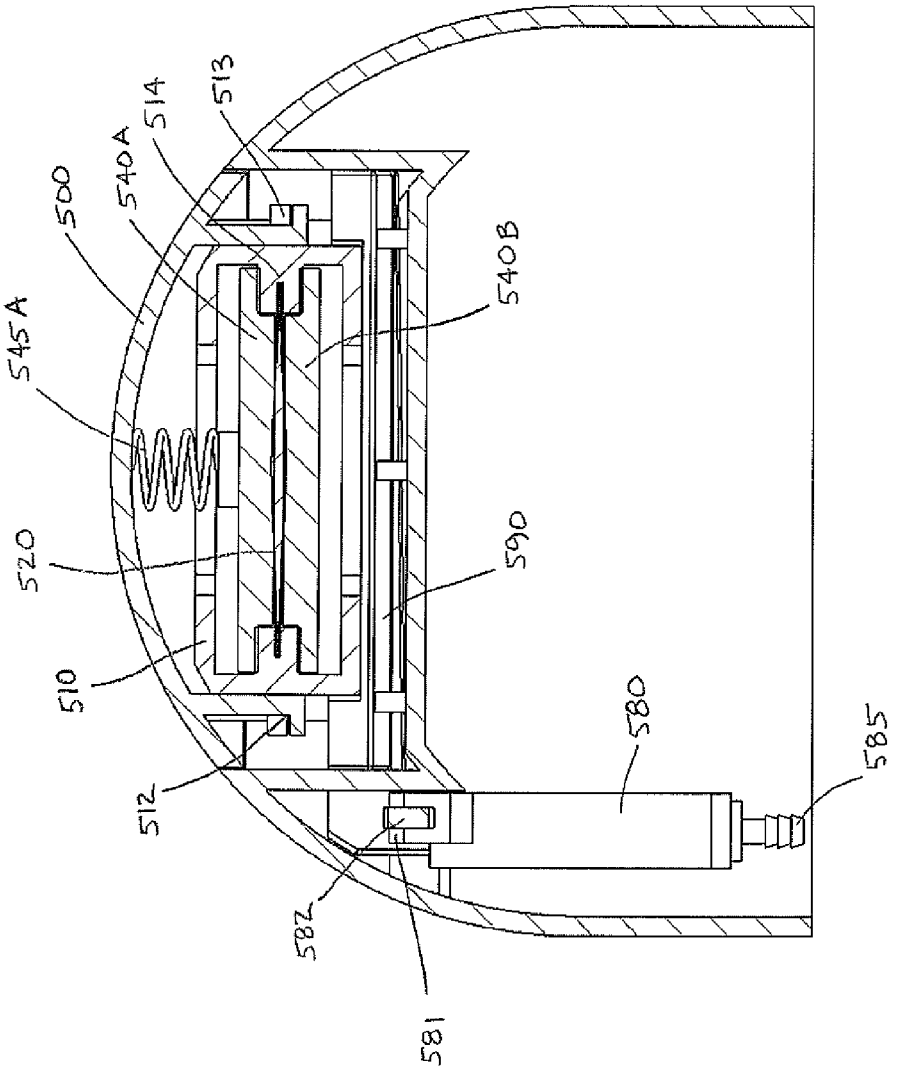


Fig. 8

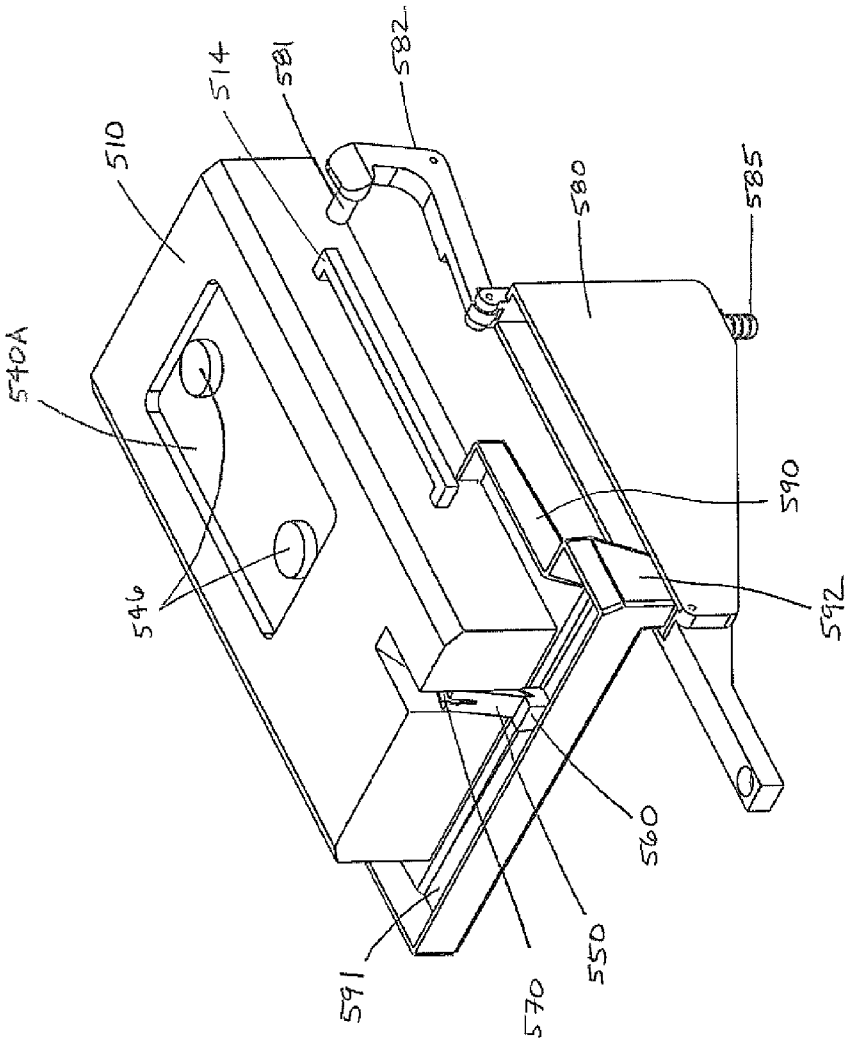


Fig. 9

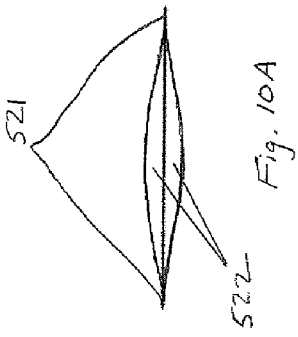


Fig. 10A

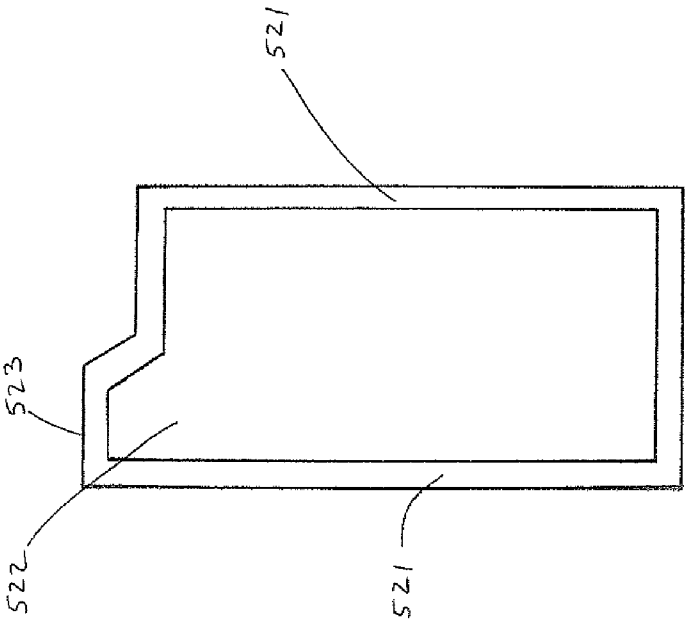


Fig. 10B

METHODS AND APPARATUSES FOR DISPENSING FLUIDS

CROSS REFERENCE TO RELATED APPLICATION

[0001] This application claims priority to U.S. Provisional Application Ser. No. 61/502,012, filed Jun. 28, 2011.

FIELD OF THE INVENTION

[0002] 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

[0003] 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.

[0004] 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.

[0005] Accordingly, more user friendly and/or efficient apparatuses and methods for dispensing fluids are desirable.

SUMMARY OF THE INVENTION

[0006] 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.

[0007] 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

[0008] The various embodiments described herein may be better understood by considering the following description in conjunction with the accompanying drawings.

[0009] FIG. **1** includes a perspective view of a fluid dispensing system according to various embodiments described herein.

[0010] FIG. **2** includes a cross-sectional view of the fluid dispensing system of FIG. **1**.

[0011] FIG. **3** includes a back view of the fluid dispensing system of FIG. **1**.

[0012] FIG. **4** includes a perspective view of a cartridge according to various embodiments described herein.

[0013] FIG. **5** includes a perspective view of a fluid dispensing system according to various embodiments described herein.

[0014] FIG. **6** includes a top view of the fluid dispensing system of FIG. **5**.

[0015] FIG. **7** includes a side view of the fluid dispensing system of FIG. **5**.

[0016] FIG. **8** includes a cross-sectional view of the fluid dispensing system of FIG. **5**.

[0017] FIG. **9** includes an exploded view of a fluid dispensing system according to various embodiments described herein.

[0018] FIGS. **10**A and **10**B include a side view and a top view, respectively, of a cartridge according to various embodiments described herein.

DETAILED DESCRIPTION OF THE INVENTION

[0019] 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.

[0020] 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 Ser. No. 60/076,321, entitled "Cabinet Device", filed on Jun. 27, 2008; U.S. patent application Ser. No. 12/564,946, entitled "Method and Apparatus for Dispensing Fluids", filed on Sep. 23, 2009; U.S. Pat. No. 6,189,346, entitled "Clothes treating apparatus", issued on Feb. 20, 2001; U.S. Pat. No. 6,321,941, entitled "Consumer safe fitment for connecting a reservoir to a dispensing appliance", issued on Nov. 27, 2001; U.S. Pat. No. 6,386,392, entitled "Reservoirs for use with cleaning devices", issued on May 14, 2002; U.S. Pat. No. 6,390,335, entitled "Device with improved fitment system", issued on May 21, 2002; U.S. Pat. No. 6,971,589, entitled "Device with improved fitment system", issued on May 21, 2002; and U.S. Pat. No. 6,971,589, entitled "Reclosable fitment for connecting a reservoir to a dispensing appliance", issued on May 6, 2008.

[0021] 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. Pat. 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 Dec. 10, 2002; and U.S. Pat. No. 6,495,058, entitled "Aqueous Wrinkle Control Compositions Dispensed Using Optimal Spray Patterns", issued on Dec. 17, 2002.

[0022] 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.

[0023] 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.

[0024] 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.

[0025] 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**.

[0026] 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.

[0027] 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** in is 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** in is the second position. The blocking plate **170** may slidably move to the second position when the pin **180** is in the second position.

[0028] 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.

[0029] 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.

[0030] 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**.

[0031] 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.

[0032] 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.

[0033] 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.

[0034] 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.

[0035] 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.

[0036] 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.

[0037] 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.

[0038] 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.

[0039] 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.

[0040] 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.

[0041] 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.

[0042] 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.

[0043] 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**.

[0044] 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.

[0045] 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.

[0046] In various embodiments, the compartment **510** may be intermediate a first compression member **540**A and a second compression member **540**B. The housing **500** may comprise at least one first compression spring **545**A configured to engage the first compression member **540**A. The housing **500** may comprise at least one second compression spring **545**B configured to engage the second compression member **540**B. 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**.

[0047] In various embodiments, the compartment **510** may be intermediate a first compression member **540**A configured to engage the cartridge **520** when the cartridge **520** is in the compartment **510** and a second compression member **540**B configured to engage the cartridge **520** when the door **530** is in the closed position. For example, the first compression member **540**A 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 **540**B 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 **540**A and/or second compression member **540**B may be configured not to apply positive pressure to the cartridge **520** when the door **530** is in the open position.

[0048] 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.

[0049] 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.

[0050] 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.

[0051] 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.

[0052] 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. **10**A and **10**B, 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.

[0053] 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.

[0054] 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.

[0055] 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.

[0056] 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.

[0057] 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.

[0058] 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".

[0059] 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.

[0060] 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.

What is claimed is:

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

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

3. The system of claim **1** comprising a blocking plate 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 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 connected to the compartment latch for disengaging the compartment latch to unlock the cartridge from the compartment.

6. The system of claim **1** comprising a positioning arm 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 of claim **1** comprising:

a cutting member arm having a first end connected to the door and a second end connected to the first cutting member; and

at least one lever connected to the compartment configured to be engaged with a guide rail 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 claim **1** comprising a venting member arm 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 of claim **1**, 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 of claim **1** comprising a locking system comprising:

a float 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 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 claim **10** comprising a blocking plate 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 of claim **1** comprising a vented system characterized by dispensing about 99%, by volume, of the unit dose.

14. The system of claim **1**, wherein the cartridge is 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.

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

a housing comprising a compartment for receiving a cartridge comprising a unit dose;

a door 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.

16. The system of claim **15**, wherein the compartment comprises a track configured to slidably receive the cartridge.

17. The system of claim **15**, wherein the compartment is intermediate a first compression member configured to engage the cartridge when the cartridge is in the compartment and a second compression member configured to engage the cartridge when the door is in the closed position.

18. The system of claim **15** comprising a locking system, the locking system comprising:

a pivoting reservoir movable between a first position when the reservoir lacks liquid and a second position when liquid is in the reservoir;

a pin connected to the compartment; and

a latch connected to the reservoir configured to engage the pin when the reservoir is in the second position to retain the compartment in the housing.

19. The system of claim **18**, wherein the latch is configured to retain the cartridge in the compartment for a duration of an operating cycle.

20. The system of claim **15**, wherein the cartridge is a flexible cartridge comprising:

at least one engagement surface configured to engage the compartment; and

a rupture surface configured to engage with the cutting member.

* * * * *