



US009854757B2

(12) **United States Patent**  
**Carvalho**

(10) **Patent No.:** **US 9,854,757 B2**  
(45) **Date of Patent:** **Jan. 2, 2018**

(54) **POSITION ADJUSTABLE SELF-WATERING APPARATUS FOR CONTROLLABLY DISPENSING WATER AND NUTRIENTS THROUGH CAPILLARY MOTION**

(71) Applicant: **Riki Carvalho**, Makawao, HI (US)

(72) Inventor: **Riki Carvalho**, Makawao, HI (US)

(\*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 133 days.

(21) Appl. No.: **15/073,203**

(22) Filed: **Mar. 17, 2016**

(65) **Prior Publication Data**

US 2017/0265406 A1 Sep. 21, 2017

(51) **Int. Cl.**  
**A01G 27/06** (2006.01)

(52) **U.S. Cl.**  
CPC ..... **A01G 27/06** (2013.01)

(58) **Field of Classification Search**  
CPC ..... A01G 27/00; A01G 27/006; A01G 27/02; A01G 27/04; A01G 27/06  
USPC ..... 47/48.5, 79–81; 220/187  
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

880,968 A \* 3/1908 Bunker ..... A01G 27/04 119/77  
4,115,951 A \* 9/1978 Becker ..... A01G 27/06 220/86.1

4,782,627 A \* 11/1988 Hauk ..... A01G 27/06 47/48.5  
5,329,729 A \* 7/1994 Liang ..... A01G 27/005 47/81  
2002/0020111 A1 \* 2/2002 Rosenberg ..... A01G 27/006 47/48.5  
2004/0139650 A1 \* 7/2004 Haq ..... A01G 27/003 47/48.5  
2009/0288342 A1 \* 11/2009 Hui ..... A01G 27/006 47/79

\* cited by examiner

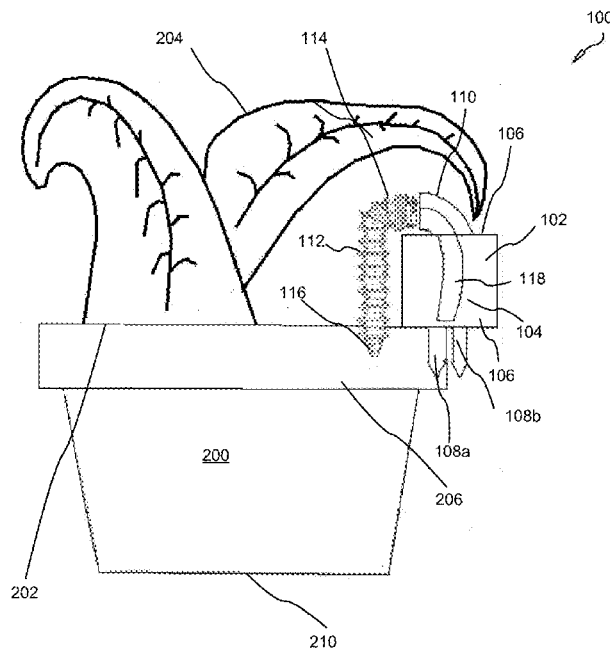
*Primary Examiner* — William V Gilbert

(74) *Attorney, Agent, or Firm* — Steven Rinehart

(57) **ABSTRACT**

A position adjustable self-watering apparatus controllably dispenses water and nutrients by transmitting water from a primary reservoir to a second end of a tube, and selectively dispensing the liquid over a desired region of the soil. Capillary motion through a dual action wick carries the water. The tube adjustably positions over a desired region of soil through multiple means. Anchor rods that support the primary reservoir can selectively couple with correlating reception apertures in the bottom wall of the primary reservoir. Repositioning of anchor rods enables the primary reservoir to move relative to the plant container. Additionally, the tube incrementally and fixedly reorients in multiple directions. Additionally, when the container edge wedges between the anchor rod and the sidewalls of the primary reservoir, the primary reservoir slides along the container edge to a desired region above the soil. A primary reservoir valve helps regulate the flow of the liquid.

**20 Claims, 10 Drawing Sheets**



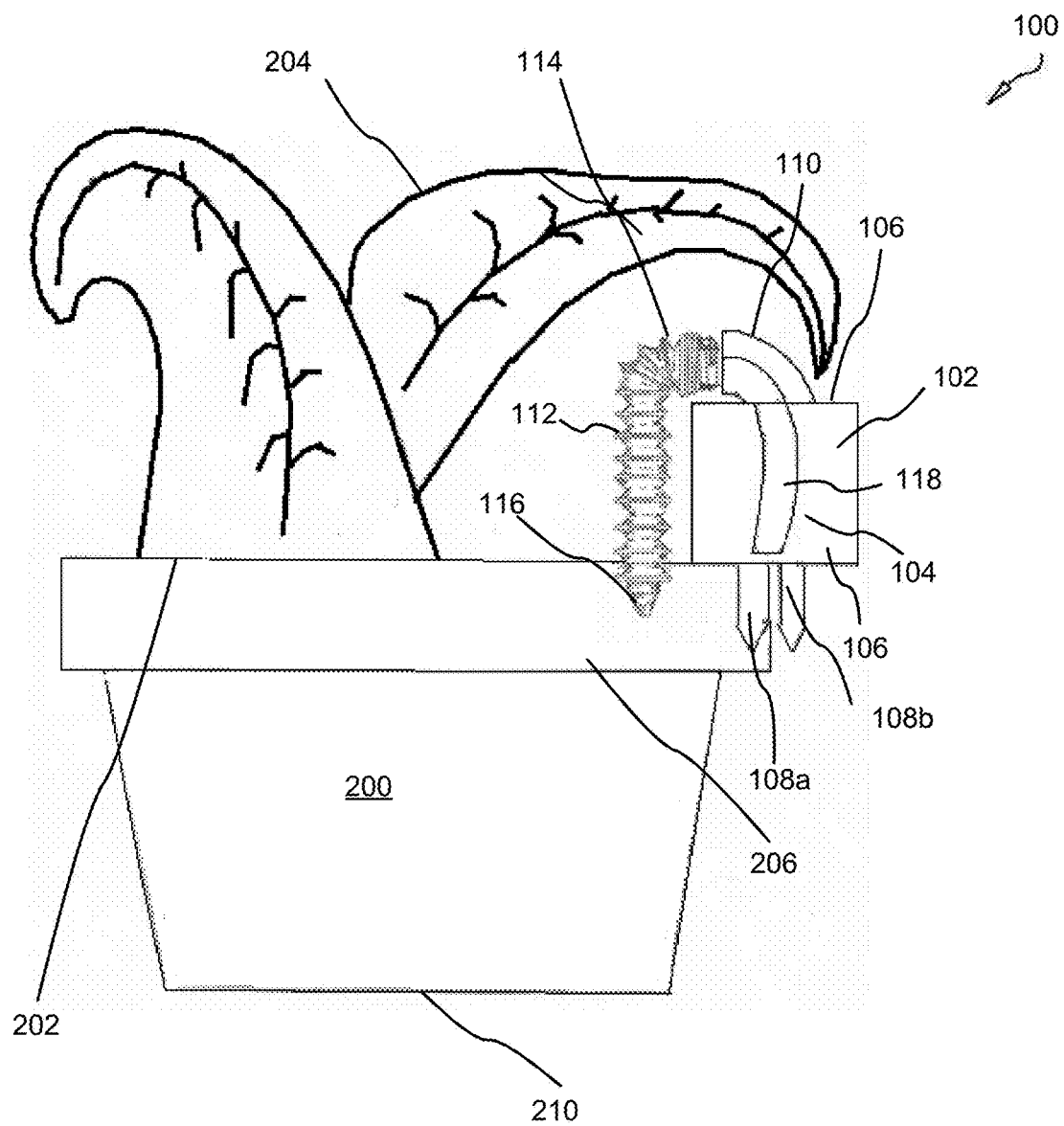


FIG. 1

FIG. 2

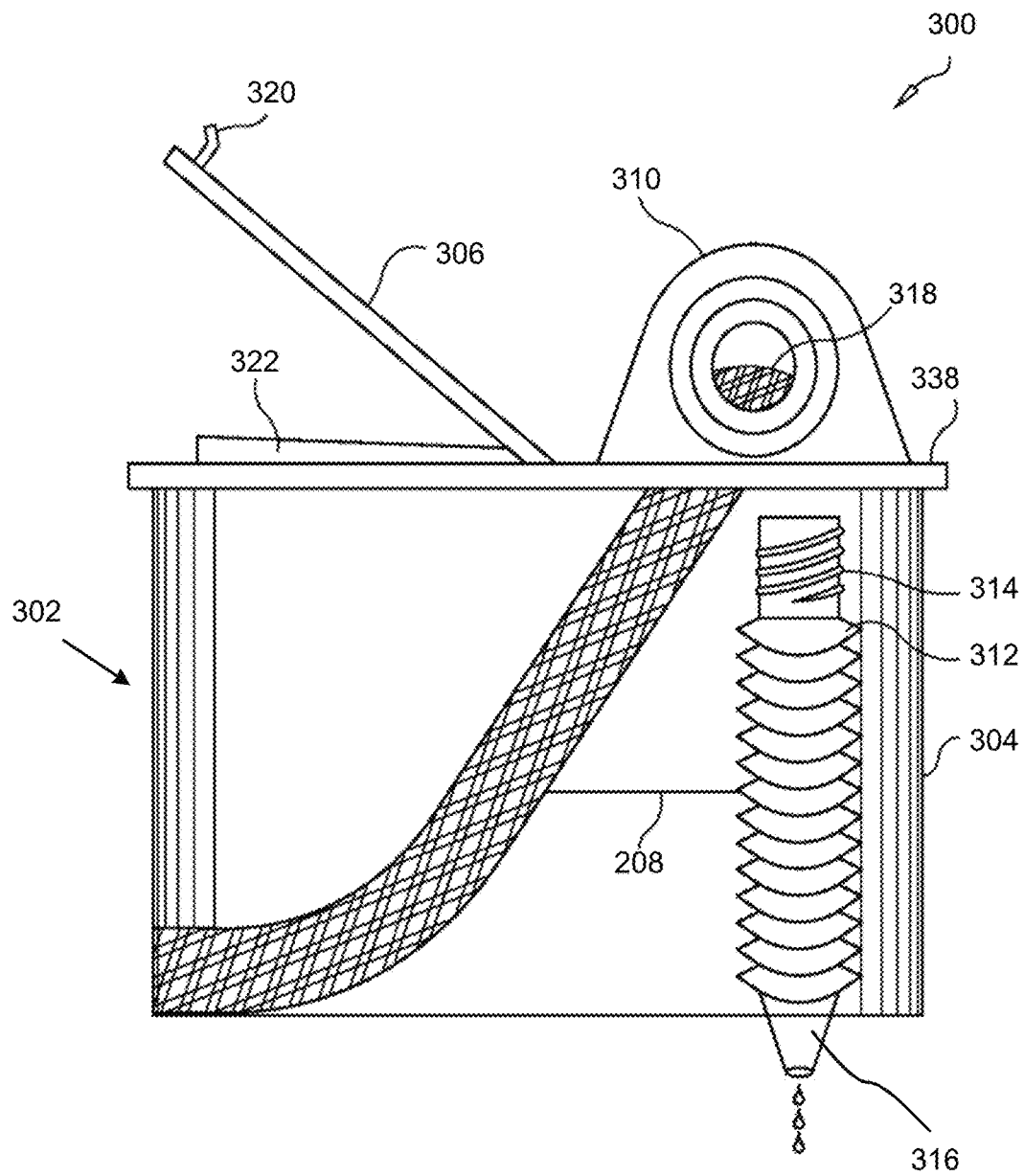


FIG. 3

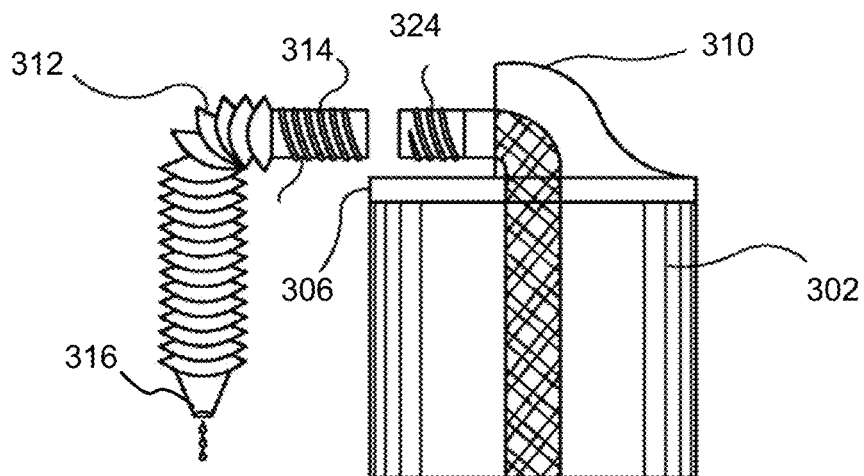


FIG. 4

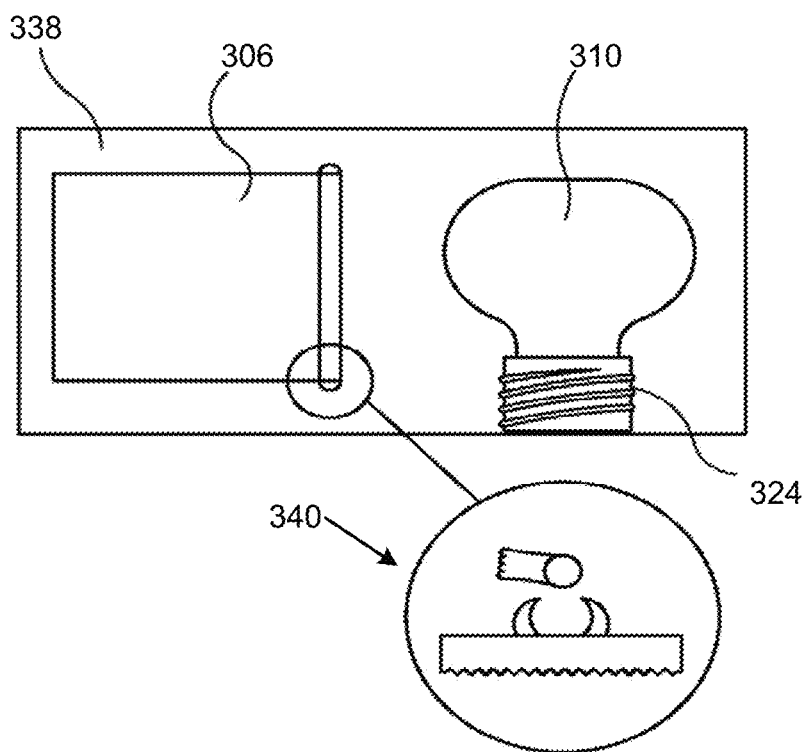


FIG. 5

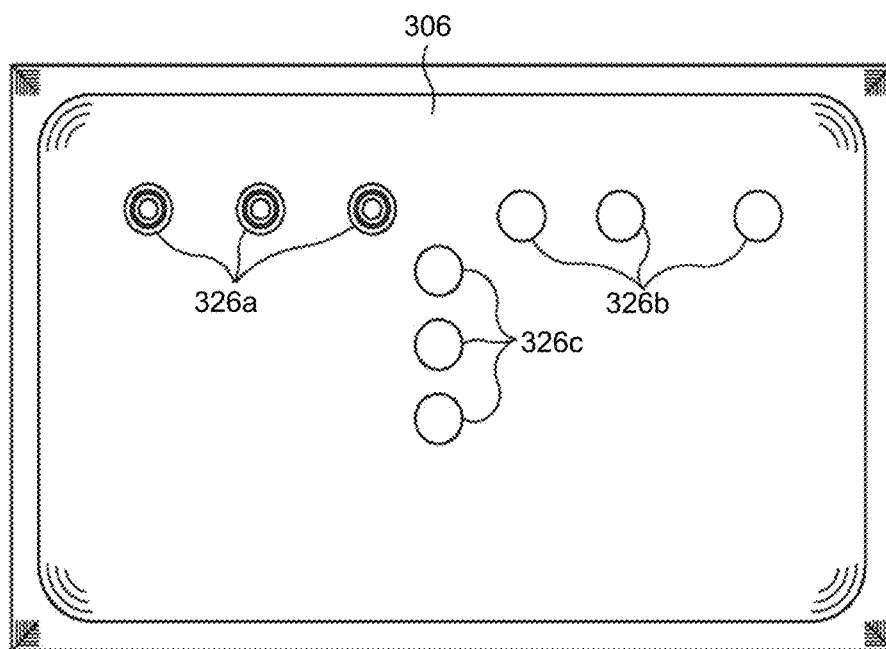


FIG. 6

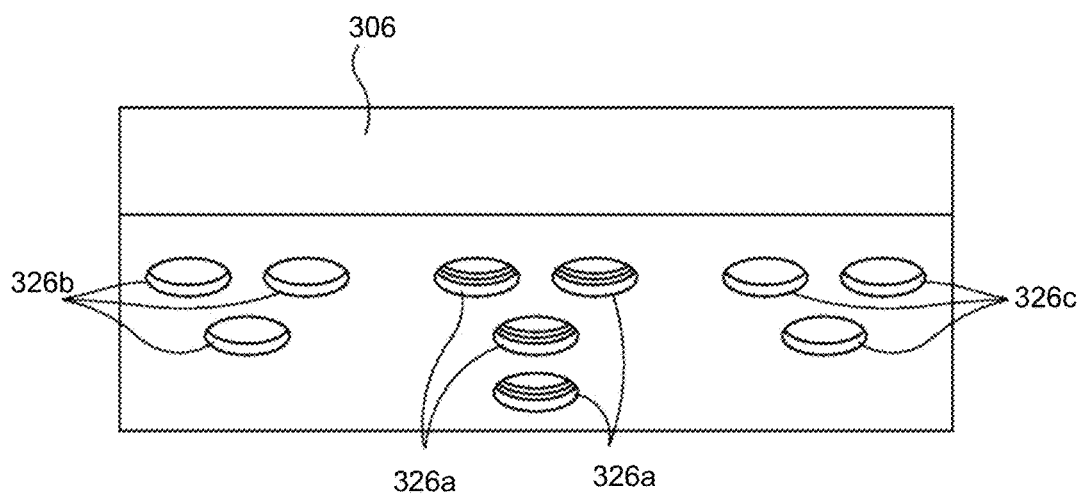


FIG. 7

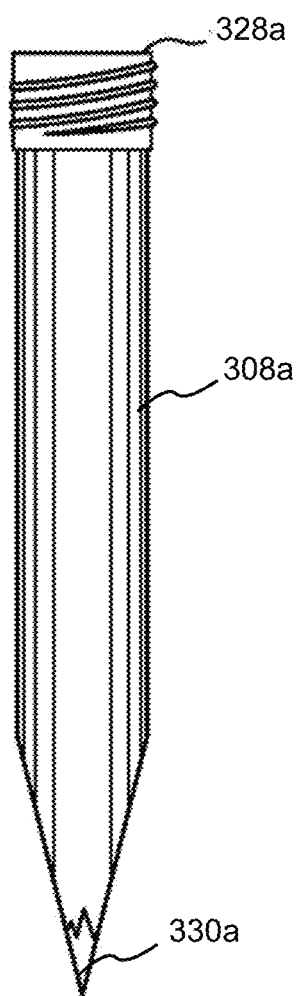


FIG. 8A

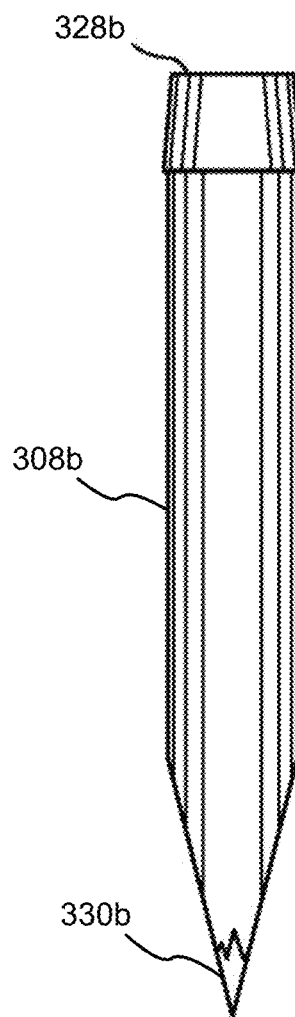


FIG. 8B

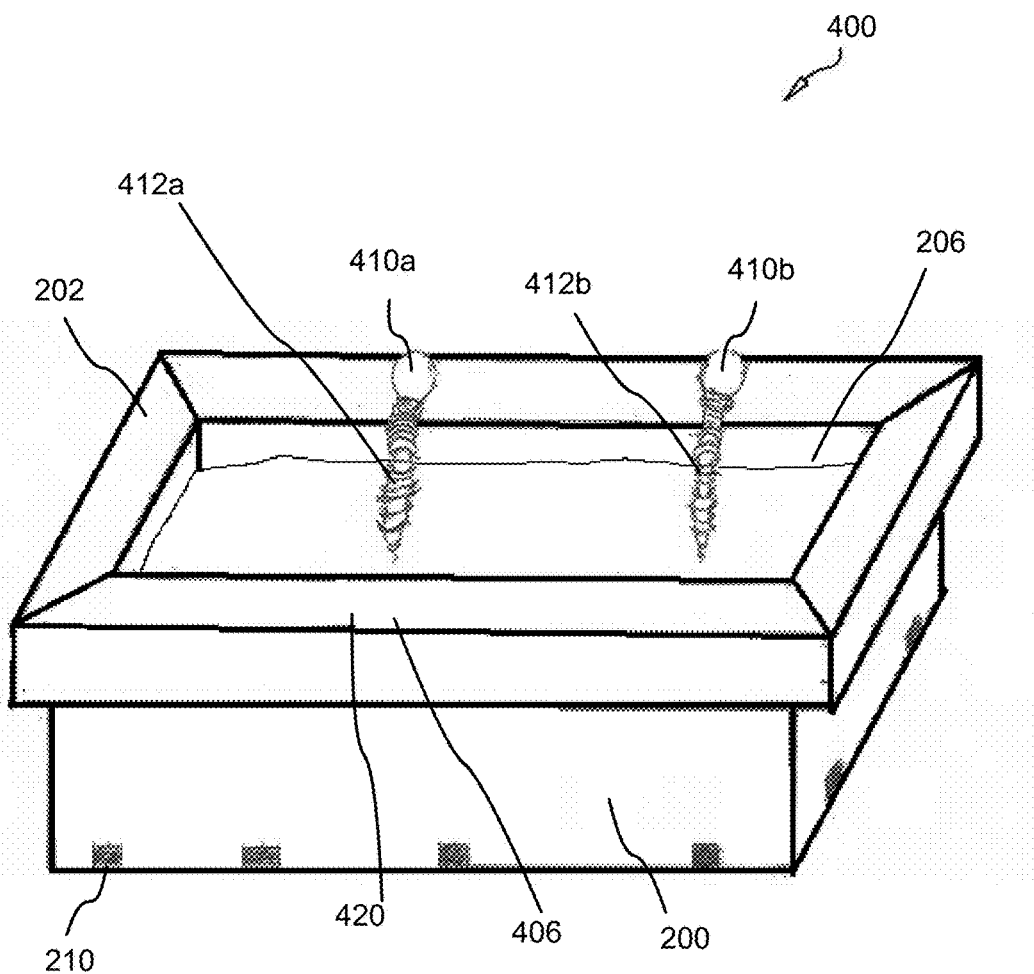


FIG. 9



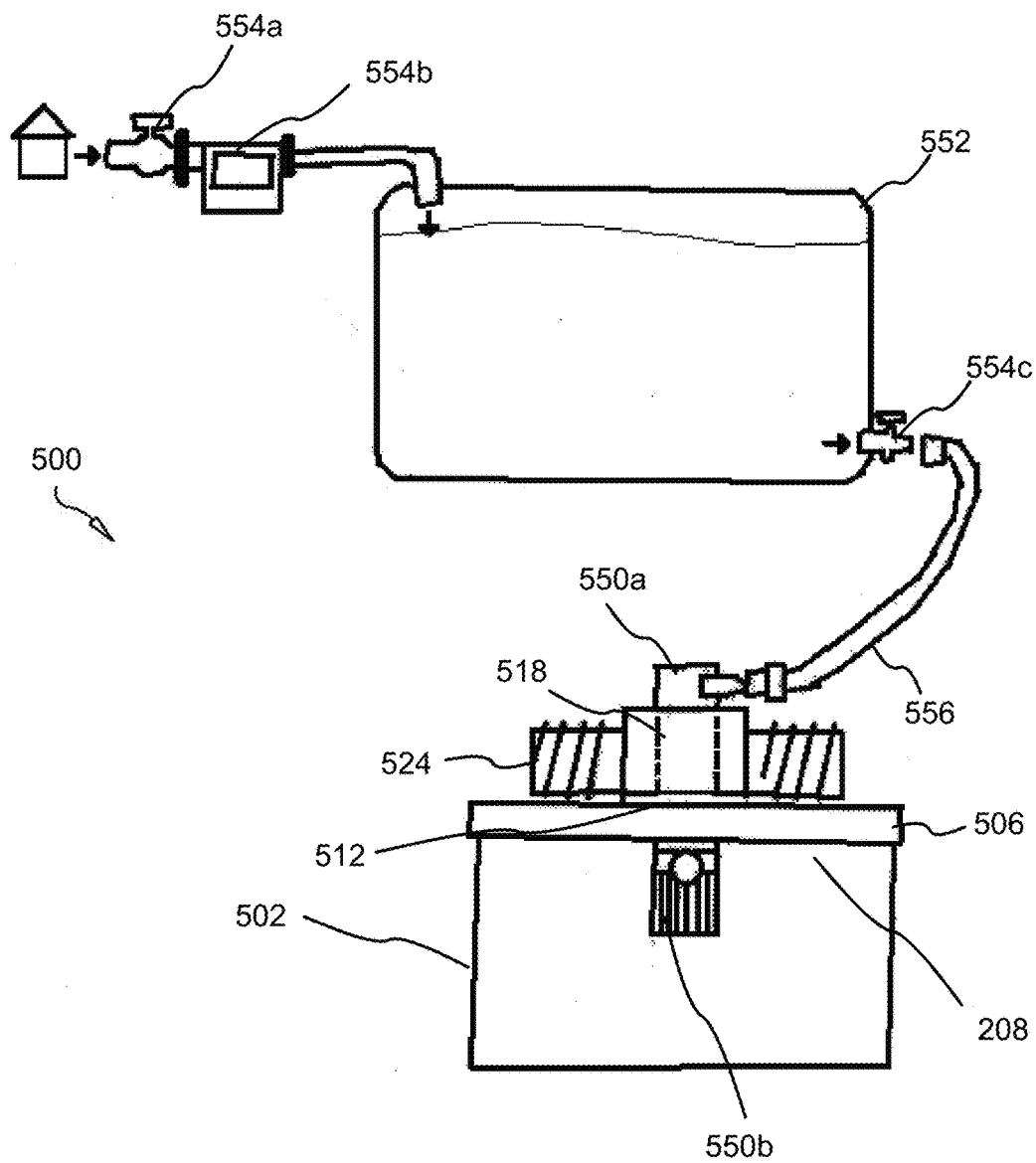


FIG. 10

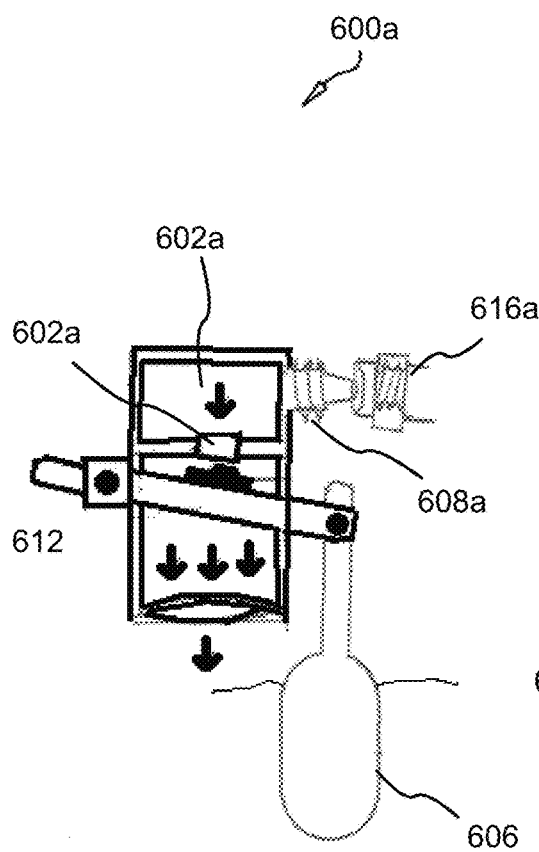


FIG. 11A

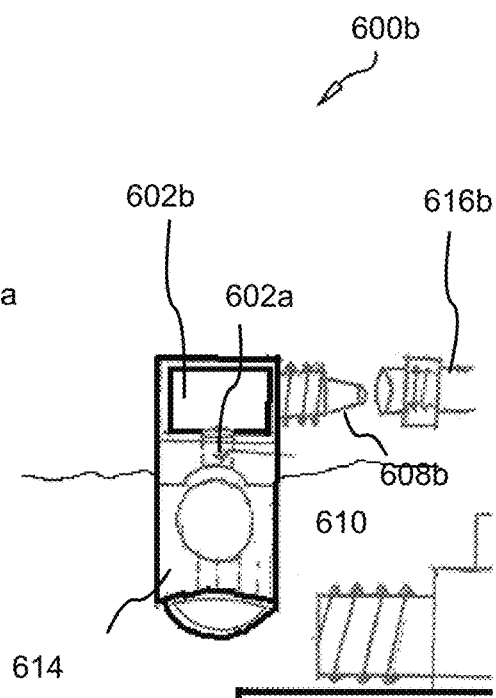


FIG. 11B

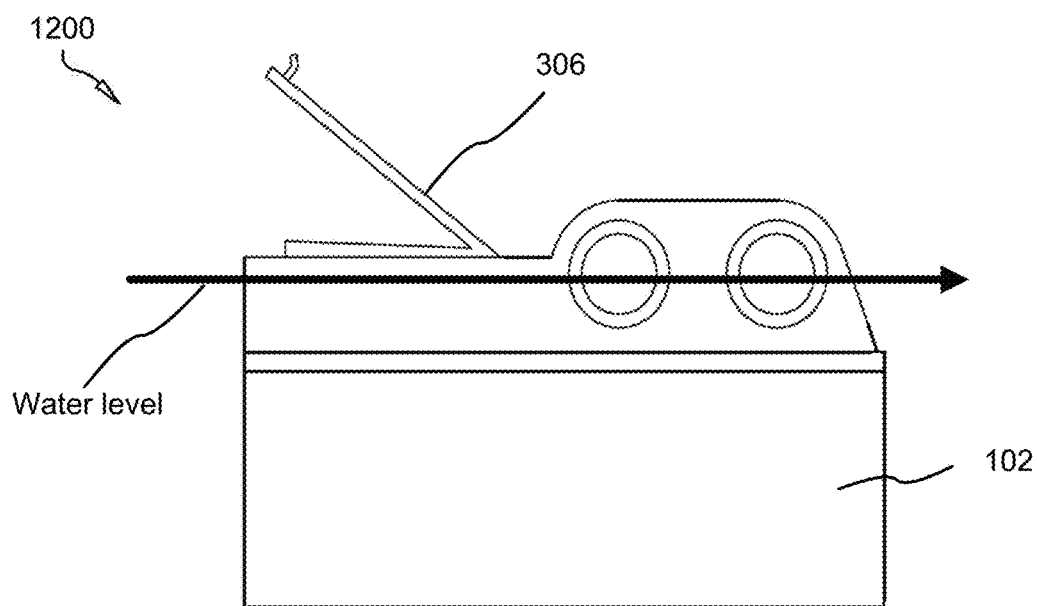


FIG. 12

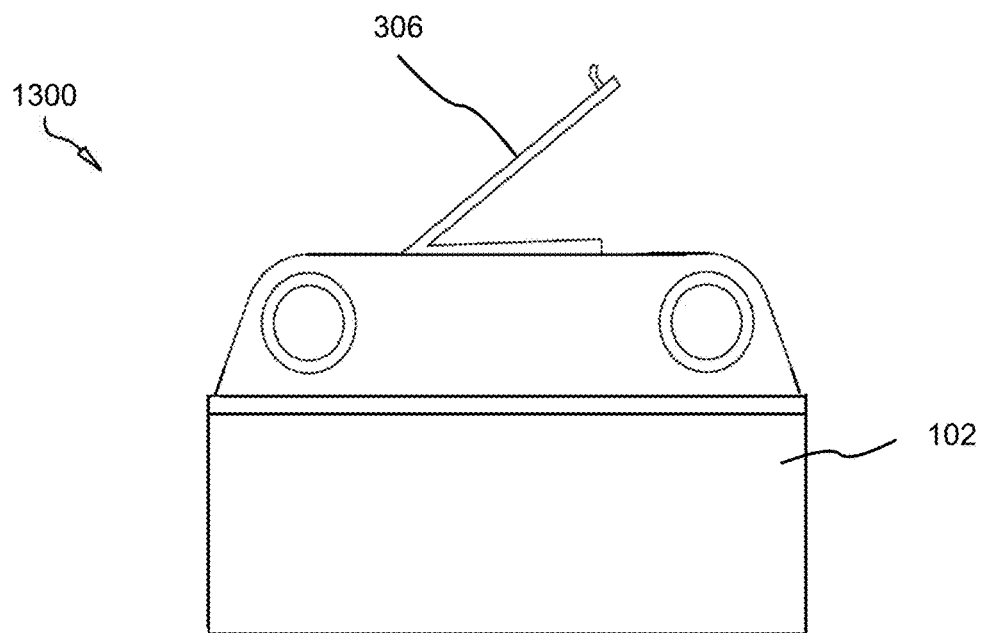


FIG. 13

1

# **POSITION ADJUSTABLE SELF-WATERING APPARATUS FOR CONTROLLABLY DISPENSING WATER AND NUTRIENTS THROUGH CAPILLARY MOTION**

The application claims priority to U.S. Provisional application 62/161,985 filed May 20, 2015 for Riki Carvalho entitled "Position Adjustable Self-Watering Apparatus for Controllably Dispensing Water and Nutrients Through Capillary Motion."

## **FIELD OF THE INVENTION**

This invention relates to a position adjustable self-watering apparatus for controllably dispensing water and nutrients to plants through capillary motion, and more particularly relates to a position adjustable self-watering apparatus that uses capillary motion to controllably dispense water and nutrients to plants, and is supported over the plant by at least one anchor rod that adjustably positions the apparatus relative to the plant for selective positional dispensing, and a tube the incrementally and fixedly reorients over the plant, and a primary reservoir that slides along the edge of a plant container to adjust position over the plant container.

## **BACKGROUND**

### **Description of the Related Art**

Typically, plants are grown in various dwelling, workplace, and entertainment environments to beautify and enrich the appearance of a room or garden. The plants are often located in environments which render them easy to maintain and care for. It is known that plants require regular watering and nutritional enhancement to grow properly. The plants are generally grown in plant containers containing soil. The plant is usually watered from the top while in the plant container, thereby saturating the top of the soil. For some plants and soils, this encourages insects and molds.

In many instances, plants are utilized in environments or situations which render their attention and care difficult or sporadic. For example, such plant enhancements are frequently located in areas which are difficult to access such as upper portions of rooms or building exteriors. Similarly, the plants may be frequently used within the dwelling places of people who travel a great deal, and are therefore absent for prolonged durations.

It is known that in a plant container, such as a flower pot, water is put over the surface of the soil directly. In this manner, the water remains in the plant container for a short period. Excess water put into the plant container is drained away through the drain holes in the base of the plant container. However, regardless of the amount of water put into the plant container, the water will remain for only a short period. Rarely does a person have time to controllably water the plants with small drips of water over a long duration.

Furthermore, in the summer season, the surface soil appears dry despite the fact that water is profusely contained within the soil. In such a case, if the plant container receives water too frequently, the plant's root can rot due to the excess watering. Therefore, the troublesome task of adequately watering a plant exists.

Self-watering devices have been used in the past to controllably water the plant. However, these devices tend to be unreliable, create a mess, and tripping hazards. The user had to guess if the device was working, if the components

2

of the device required replacement, or required a specific soil blend to operate properly. Often, the self-watering devices were bulky and difficult to transport to different plant containers or to different regions of the plant container. Further, the user had to hook the devices up to a charged hose bib that took up space and required complicated components. Thus, a need for a position adjustable self-watering apparatus for controllably dispensing water and nutrients through capillary motion is needed.

## **SUMMARY**

From the foregoing discussion, it should be apparent that a need exists for a position adjustable self-watering apparatus that uses capillary motion to controllably dispense water and nutrients to plants, and is supported over the plant by at least one anchor rod that adjustably positions the apparatus relative to the plant container for selective positional dispensing. Beneficially, such an apparatus would allow for automated dispensing of water and nutrients over a longer duration, with minimal supervision, and selective positioning of the dispensing means relative to the plant container.

The present invention has been developed in response to the present state of the art, and in particular, in response to the problems and needs in the art that have not yet been fully solved by currently available self-watering devices. Accordingly, the present invention has been developed to provide a position adjustable self-watering apparatus for controllably dispensing water and nutrients to plants that overcome many or all of the above-discussed shortcomings in the art.

In one embodiment, the position adjustable self-watering apparatus is configured to carry a liquid, such as water and nutrients, from a primary reservoir to a second end of the tube through capillary motion. The second end of the tube selectively dispenses the liquid onto a desired region of the soil in the plant container. The liquid is transmitted from the primary reservoir to the second end of the tube through capillary motion enabled by a dual feeding wick. At least one primary reservoir valve may also be used to regulate the flow of the liquid.

The apparatus utilizes multiple means to adjust its position relative to the plant container for adjustable dispensing of the liquid over a selected region of the soil. In one positional adjustment of the apparatus, at least one anchor rod supporting the primary reservoir selectively couples with at least one reception aperture in the bottom wall of the primary reservoir to move the primary reservoir relative to the plant container. In another positional adjustment, the tube is configured to incrementally and fixedly orient to a desired direction over a desired region of the soil through a rigid, segmented configuration. In yet another positional adjustment, when the container edge wedges between the anchor rod and the sidewalls of the primary reservoir, the primary reservoir slides along the edge of the plant container to a desired region above the soil.

The position adjustable self-watering apparatus for controllably dispensing water and nutrients to plants is provided with a plurality of modules configured to functionally execute the necessary steps of controllable and selective dispensing of water and nutrients to a plant, and specifically a plant in a plant container. These modules in the described embodiments include a primary reservoir containing a predetermined quantity of water and/or nutrients. The primary reservoir substantially provides the water and nutrients to at least one plant that is growing in soil that is contained in a plant container.

The primary reservoir comprises a plurality of sidewalls, an opening, a top wall, and a bottom wall. The primary reservoir further comprises a primary reservoir outlet configured to enable passage of the water and nutrients away from the primary reservoir. A lid hingedly regulates access to the opening of the primary reservoir. A seal member positions between the lid and the edges of the opening in the primary reservoir to inhibit insects and contaminants from engaging the liquid inside the primary reservoir.

The bottom wall of the primary reservoir comprises at least one reception aperture. The reception aperture is configured to receive to at least one anchor rod. The anchor rod provides the supportive foundation and enables selective positioning of the primary reservoir relative to the plant container. The anchor rods also allows the primary reservoir to be supported generally at a higher elevation than the plant container and soil contained therein.

The at least one anchor rod may include a reservoir end that forms a snug, sealed engagement with the reception aperture. The reservoir end may be threaded or beveled to register with a correlating reception aperture. The anchor rod further includes a mount end that engages the edge of the plant container or the soil.

In one embodiment, the primary reservoir may be repositioned from a first region of the plant container, and anchored to a different region by repositioning the anchor rods to different reception apertures. In this embodiment, the reservoir end of the anchor rod is selectively coupled to different reception apertures along the bottom wall. For example, the anchor rod may be detached from a central reception aperture and moved to a left side reception aperture. This allows the primary reservoir to be selectively positioned relative to the plant container; thereby selectively dispensing the water and nutrients at a desired region of the soil in the plant container.

In another exemplary repositioning, the primary reservoir may be repositioned from a first region of the plant container, and anchored to a different region by sliding the primary reservoir and the anchor rod along the container edge to position the tube above a desired region above the soil.

In some embodiments, a tube housing positions on the lid. The tube housing serves as a fixed bracket for secure placement of a tube that facilitates the transmission of the liquid. The tube housing may include a tube connection end. The tube connection end may include a male threaded hole. The tube extends from the tube housing to the region above the soil. The tube comprises a first end that attaches to the tube connection end, and a second end that enables dispensing of the liquid. The tube has an interior volume configured to contain a portion of a dual feeding wick, as described below.

The tube facilitates the conveyance of the liquid from the primary reservoir to the plant. The tube is flexible, yet is also segmented so that it can incrementally orient to a desired position. This allows for directional positioning of the tube to a desired position over the soil in the plant container. The tube is also collapsible for enhanced storage and portability.

In this manner, adjustable positioning is possible through: positioning of the anchor rod in selected reception apertures, sliding of the primary reservoir and the anchor rod along the edge of the plant container, and incrementally and fixedly reorienting the tube. These adjustment means work together to determine the region of soil in the plant container that receives the liquid.

In some embodiments, the apparatus may utilize capillary motion to transfer the water and nutrients from the primary

reservoir to the second end of the tube for dispensing on the plant. The apparatus utilizes a dual feeding wick to transfer the water from the primary reservoir to the plant. The dual feeding wick is defined by a reservoir portion that extends from the reservoir to the tube housing. From the tube housing, a tube portion of the dual feeding wick positions inside the tube, extending across the length of the tube and terminating at the second end of the tube.

The dual feeding wick operates on the principle that water is cohesive, and thus the molecules stick together. The other principle of water is adhesion, which pulls the water in a direction. Thus, the weight of the water dripping from the tube pulls the other water molecules, like a train.

It is the dual feeding wick that provides the medium for the water to controllably travel from the primary reservoir and through the tube. The size and material composition of the dual feeding wick may be altered to change the rate of dispensing. Those skilled in the art will recognize that the capillary motion enabled through the dual feeding wick ensures that the liquid supplied by apparatus does not over or under water the plant. In one embodiment, the dual feeding wick is a cotton material. In addition to the dual feeding wick, at least one primary valve may be used to regulate the water from the primary reservoir.

In some embodiments, a secondary reservoir may be used to supply apportion of the liquid to the primary reservoir. The secondary reservoir enables the apparatus to dispense liquid for a greater duration and to a greater number of plants. A secondary reservoir tube carries the liquid from the secondary reservoir to the primary reservoir. At least one secondary valve may be used to regulate the liquid from the secondary reservoir. The secondary valve may include an electronic valve, or a float valve having a valve chamber and a valve chamber orifice, and a float that work together to regulate dispensing of the liquid from the secondary reservoir to the primary reservoir.

The apparatus, in one embodiment, is configured to dispense water and nutrients to the plant and soil from any position relative to the plant container without disturbing the soil or plant.

The apparatus is further configured, in one embodiment, to selectively reposition the second end of the tube for dispensing through relocation of the anchor rod to a different reception aperture, by sliding the primary reservoir along the edge of the plant container, and through incremental and fixed reorientation of the tube.

The apparatus is further configured, in one embodiment, to help prevent root rot by perpetually dispensing water and nutrients, even when the plant is unattended for a duration.

In a further embodiment, the apparatus may be configured to prevent the soil from drying.

In a further embodiment, the apparatus may be configured to feed additional fertilizers and plant enhancement compositions to the plants in predetermined increments.

In a further embodiment, the apparatus may be configured to refill the primary reservoir easily so as to last hours or days.

In a further embodiment, the apparatus may be configured to deter mosquitoes from breeding in an open water source.

In a further embodiment, the apparatus may be configured to secure to the edge of a plant container in a nonintrusive manner and while creating a decorative effect.

In a further embodiment, the apparatus may be configured to easily detach from the plant container.

In a further embodiment, the water supplied by apparatus assures that plants will never be over or under watered.

5

Reference throughout this specification to features, advantages, or similar language does not imply that all of the features and advantages that may be realized with the present invention should be or are in any single embodiment of the invention. Rather, language referring to the features and advantages is understood to mean that a specific feature, advantage, or characteristic described in connection with an embodiment is included in at least one embodiment of the present invention. Thus, discussion of the features and advantages, and similar language, throughout this specification may, but do not necessarily, refer to the same embodiment.

Furthermore, the described features, advantages, and characteristics of the invention may be combined in any suitable manner in one or more embodiments. One skilled in the relevant art will recognize that the invention may be practiced without one or more of the specific features or advantages of a particular embodiment. In other instances, additional features and advantages may be recognized in certain embodiments that may not be present in all embodiments of the invention.

These features and advantages of the present invention will become more fully apparent from the following description and appended claims, or may be learned by the practice of the invention as set forth hereinafter.

#### BRIEF DESCRIPTION OF THE DRAWINGS

In order that the advantages of the invention will be readily understood, a more particular description of the invention briefly described above will be rendered by reference to specific embodiments that are illustrated in the appended drawings. Understanding that these drawings depict only typical embodiments of the invention and are not therefore to be considered to be limiting of its scope, the invention will be described and explained with additional specificity and detail through the use of the accompanying drawings, in which:

FIG. 1 is a perspective view illustrating one embodiment of a position adjustable self-watering apparatus operational on a plant container in accordance with the present invention;

FIG. 2 is a sectioned side view illustrating the position adjustable self-watering apparatus of FIG. 1 in accordance with the present invention;

FIG. 3 is a sectioned side view of a second embodiment of a position adjustable self-watering apparatus operational on a plant container in accordance with the present invention;

FIG. 4 is a side view of the position adjustable self-watering apparatus in FIG. 3 in accordance with the present invention;

FIG. 5 is a top view of the position adjustable self-watering apparatus in FIG. 3 in accordance with the present invention;

FIG. 6 is a bottom view of a bottom wall of the position adjustable self-watering apparatus in FIG. 3 in accordance with the present invention;

FIG. 7 is a perspective side view of a bottom wall of the position adjustable self-watering apparatus in FIG. 3 in accordance with the present invention;

FIG. 8A illustrates a perspective views of an anchor rod, where FIG. 8A is an anchor rod with a threaded reservoir end in accordance with the present invention;

FIG. 8B illustrates a perspective view of an anchor rod with a beveled reservoir end in accordance with the present invention;

6

FIG. 9 is a perspective view illustrating a third embodiment of a position adjustable self-watering apparatus having two tubes for controllably dispensing water and nutrients in accordance with the present invention;

FIG. 10 is a diagram view illustrating another embodiment of a position adjustable self-watering apparatus receiving water from a secondary reservoir in accordance with the present invention;

FIG. 11A illustrates a perspective view of a float valve in accordance with the present invention;

FIG. 11B illustrates a perspective view of an automated valve in accordance with the present invention;

FIG. 12 is a diagram view illustrating another embodiment of a position adjustable self-watering apparatus receiving water from a secondary reservoir in accordance with the present invention; and

FIG. 13 is a diagram view illustrating another embodiment of a position adjustable self-watering apparatus receiving water from a secondary reservoir in accordance with the present invention.

#### DETAILED DESCRIPTION

Reference throughout this specification to “one embodiment,” “an embodiment,” or similar language means that a particular feature, structure, or characteristic described in connection with the embodiment is included in at least one embodiment of the present invention. Thus, appearances of the phrases “in one embodiment,” “in an embodiment,” and similar language throughout this specification may, but do not necessarily, all refer to the same embodiment.

Furthermore, the described features, structures, or characteristics of the invention may be combined in any suitable manner in one or more embodiments. In the following description, numerous specific details are provided, such as examples of programming, software modules, user selections, network transactions, database queries, database structures, hardware modules, hardware circuits, hardware chips, etc., to provide a thorough understanding of embodiments of the invention. One skilled in the relevant art will recognize, however, that the invention may be practiced without one or more of the specific details, or with other methods, components, materials, and so forth. In other instances, well-known structures, materials, or operations are not shown or described in detail to avoid obscuring aspects of the invention.

The schematic flow chart diagrams included herein are generally set forth as logical flow chart diagrams. As such, the depicted order and labeled steps are indicative of one embodiment of the presented method. Other steps and methods may be conceived that are equivalent in function, logic, or effect to one or more steps, or portions thereof, of the illustrated method. Additionally, the format and symbols employed are provided to explain the logical steps of the method and are understood not to limit the scope of the method. Although various arrow types and line types may be employed in the flow chart diagrams, they are understood not to limit the scope of the corresponding method. Indeed, some arrows or other connectors may be used to indicate only the logical flow of the method. For instance, an arrow may indicate a waiting or monitoring period of unspecified duration between enumerated steps of the depicted method. Additionally, the order in which a particular method occurs may or may not strictly adhere to the order of the corresponding steps shown.

FIG. 1 depicts a position adjustable self-watering apparatus 100 for controllably dispensing water and nutrients to

at least one plant **204** through principles of capillary motion. The position adjustable self-watering apparatus **100**, hereafter, “apparatus **100**” is configured to functionally execute the necessary steps for controllable dispensing and positional adjustment while dispensing a liquid **212**, such as water and nutrients, to a plant **204**, and specifically a plant **204** in a plant container **200**. The apparatus **100** generally operates in the environment of a plant container **200** having a container edge **202** that can support the apparatus **100**. The plant container **200** may be shaped and dimensioned in any shape conducive for growing plants **204**, including cylindrical, rectangular, and cubicle.

In one embodiment, the plant container **200** includes at least one release aperture **210**, or weeping hole, which may be used at the base of the plant container **200** for releasing excess liquid. Though in some embodiments, the apparatus **100** may be used directly on the soil **206** without use of a plant container **200**. The apparatus **100** is portable and can transfer to different plant containers and regions of the soil **206** without disturbing the plant **204** or the soil **206**.

In various embodiments, the apparatus **100** and the container **200** may be formed as a single integrated piece. Alternatively, the container **200** and the reservoir **102** may be formed as a single integrated piece. The reservoir **102** may be integrated alongside the container **200**, disposed on top of the container **200**, and integrated towards the bottom of the container **200**. In various embodiments, the apparatus **100** (comprising everything shown except the container **200**, container edge **202**, plant **204**, and weeping hole **210**) may comprise a stand-alone unit, or may be placed on or in soil in the container **200**.

In various embodiments, the container **200** is molded as a single component with the reservoir **102** and/or apparatus **100**. The container **200** may comprise a pot, planter, garden box, or any other housing or container for receiving soil and growing plantlife.

FIG. **2** is a sectioned side view of the self-watering apparatus **100** shown in FIG. **1**. In some embodiments, the apparatus **100** may provide a primary reservoir **102** for storing and dispensing a predetermined quantity of the liquid **212**. The primary reservoir **102** substantially provides the water and nutrients in liquid form for feeding at least one plant **204** that is growing in soil **206** inside the plant container **200**. In one embodiment, the liquid **212** may include water fortified with minerals, and the nutrients may include fertilizer or a liquid nutritional supplement for plants **204**. In one alternative embodiment, the liquid **212** may also include a pesticide, insecticide, or wax that are dispensed.

The tube **112** may comprise a blow-molded polymeric flexible tube, as known to those of skill in the art.

As FIG. **2** illustrates, the primary reservoir **102** comprises a plurality of sidewalls **104**, an opening **140**, a top wall **138**, and a bottom wall **107**. In one possible embodiment, the sidewalls **104** form the primary reservoir **102** into a generally rectangular shape. Though other shapes are possible. In one alternative embodiment, one of the sidewalls **104** are concave to conform to a circular edge of a plant container **200**. The primary reservoir **102** further comprises a primary reservoir outlet **132** configured to enable passage of the liquid **212** from the primary reservoir **102** to the soil **206**.

In some embodiments, at least one primary reservoir valve may also be used to regulate flow of the liquid **212** as it moves from the primary reservoir **102**. The water level **208** in the primary reservoir substantially dictates the amount of liquid that move towards the soil **206**, either through capillary motion and/or the primary reservoir valve. When a float valve is used, for example, the float rises and lowers

based on the water level **208**. Similarly the capacity of the capillary motion is affected by the amount of liquid **212** in the primary reservoir since adhesion and cohesion are determinative for capillary motion.

In some embodiments, a lid **106** hingedly covers the opening **140** of the primary reservoir **102** for regulating access thereto. Though in some embodiments, the lid **106** covers a portion of the opening **140**, and the top wall **138** covers a portion of the opening **140**. A hinge and an axis of rotation **340** enable the pivoting motion of the lid **106**.

A tab **120** may extend from the lid **106** to provide a surface for gripping the lid and pivotally lifting and lowering the lid **106** on the opening **140** of the primary reservoir **102**. A seal member **122** may form between the lid **106** and the edges of the opening **140** in the primary reservoir **102**. The seal member **122** is configured to inhibit insects and contaminants from entering the water inside the primary reservoir **102**. In one embodiment, the seal member **122** is a rubber gasket.

The bottom wall **107** of the primary reservoir **102** comprises at least one reception aperture **126a-b**. The reception aperture **126a-b** is configured to receive to at least one anchor rod **108a-b**. The reception aperture **126a** may be threaded to rotatably engage the anchor rod **108a**. The reception aperture **126b** may also be beveled to form a friction fit with the anchor rod **108b**. The at least one anchor rod **108a-b** provides the supportive foundation and positioning capacity for the primary reservoir **102**, relative to the plant container **200**. The anchor rod **108a-b** also allows the primary reservoir **102** to be supported generally at a higher elevation than the plant container **200** and soil **206** contained therein.

The anchor rod **108a-b** may include a reservoir end **128a-b** that forms a snug, sealed engagement with the reception aperture **126a-b**. As discussed above, the reservoir end **128a-b** may be threaded or beveled to register with a correlating reception aperture **126a-b**. Though in some alternative embodiments, magnets, adhesives, and screws may be used to couple the reservoir end **128a-b** of the anchor rod **108a-b** to the reception aperture **126a-b**. The anchor rod **108a-b** further includes a mount end **130a-b** that engages the edge **202** of the plant container **200** and/or the soil **206** directly. In one embodiment, the mount end **130a-b** is pointed so that penetration in soil **206** is facilitated.

Though, when the primary reservoir **102** is supported by the plant container **200**, the container edge **202** wedges between the anchor rod **108a-b** and the primary reservoir **102**. The primary reservoir **102** may then slide **106** along the container edge **202** to adjust the position for dispensing the liquid **212** over a desired region of the soil **206**. In one exemplary use, the primary reservoir **102** may be repositioned from a first region of the plant container **200**, and anchored to a different region by sliding the primary reservoir **102** along the container edge **202** to a desired region above the soil **206** for dispensing the liquid.

In another embodiment, the primary reservoir **102** may be repositioned from a first region of the plant container **200**, and anchored to a different region by repositioning the anchor rods **108a-b** to different reception apertures **126a-b**. In this embodiment, the reservoir end **128a-b** of the anchor rod **108a-b** is selectively coupled to different reception apertures **126a-b** along the bottom wall **107**.

For example, the anchor rod **108a-b** may be detached from a central reception aperture **126a-b** and moved to a left side reception aperture **126a-b**. This allows the primary reservoir **102** to be selectively positioned relative to the plant container **200**. And the apparatus **100** can thereby

selectively dispense the water and nutrients to a desired region of the soil **206** in the plant container **200**. Thus by repositioning the anchor rod **108a-b** to different reception apertures **126a-b**, the exact point of dispensing the water and nutrient can be regulated.

A tube housing **110** serves as a fixed bracket for secure placement of a tube **112** that facilitates the transmission of the liquid **212**. In one embodiment, the tube housing **110** has a generally domed shape and fixedly rests on the lid **106**. The tube housing **110** may include a tube connection end **124**. The tube connection end **124** may include a male threaded hole. The tube **112** extends from the tube connection end **124** to the region above the soil **206**. The tube **112** comprises a first end **114** that attaches to the tube connection end **124**, and a second end **116** that enables dispensing of the liquid **212**.

The tube **112** has an interior volume **142** configured to contain a portion of a dual feeding wick **118**, described below. The tube **112** enables the conveyance of the liquid **212** from the tube housing **110** to the plant **204**. FIG. **1** illustrates that the tube **112** is flexible, yet is also segmented so that it can incrementally orient to a desired position. This allows for directional positioning of the tube **112** to a desired position over the soil **206** in the plant container **200**. In another embodiment, the tube **112** is collapsible for enhanced storage and portability.

The wick **118**, and wicking material used herein, may comprise and/or be formed from any material that will wick a liquid, including cotton.

The tube **112**, or positioning adjustable tube **112**, may be used to rapidly start or stop the wicking action. To stop the wicking action, the second end **116** of the tube **112** is turned to point upward and raised above the level of the reservoir **102**. The rapidly start the wicking action, the reservoir **102** need only be filled with water or a liquid because, in some embodiments, the lid **106** sits higher on the apparatus **100** than the connection point of the tube **112** to the lid assembly and the receiving male end of the lid assembly, as well as higher than the female end of the tube **112**. The overflow from the reservoir **102** will rapidly start the wicking action and pre-hydrate the soil (further shown below in relation to FIGS. **12** and **13**).

The tube **112** may connect to an exterior surface of the reservoir **102** using a clipping mechanism, or may be connected using a pipe clamp, or via any other means known to those of skill in the art. A springed lever may also be used to secure the apparatus **100** to the plant container **200**.

In this manner, the positioning means includes: repositioning of the anchor rod **108a-b** in selected reception apertures **126a-b**, sliding of the primary reservoir **102** along the edge **202** of the plant container **200**, and incrementally reorienting the tube **112** to a desired direction. These repositioning means work together to determine the region of soil **206** in the plant container **200** that receives the initial quantity of liquid **212**. Though the liquid will eventually soak into the soil **206** and saturate the entire plant container **200**.

In some embodiments, the apparatus **100** may utilize capillary motion to transfer the liquid **212** from the primary reservoir **102** to the second end **116** of the tube **112**. In essence, water is absorbed from the primary reservoir **102** through a capillary material and ultimately dispensed onto soil **206** in the plant container **200**, thereby moistening the soil **206**. Those skilled in the art will recognize that the apparatus **100** operates on the principle that water is cohesive, and thus water molecules stick together. The other principle of the apparatus **100** uses the fact that water is

adhesive. This adhesion between water molecules works to pull the water in a first direction. Thus, the weight of the water dripping from the tube **112** pulls the other water molecules, like a train, towards the first direction, which in this case moves from the primary reservoir **102** to the soil **206**.

FIG. **2** illustrates that the apparatus **100** utilizes a dual feeding wick **118** to transfer the liquid from the primary reservoir **102** to the soil **206**. The dual feeding wick **118** is defined by a wick reservoir portion **134** that extends from the primary reservoir **102** to the tube housing **110**. From the tube housing **110**, a wick tube portion **136** of the dual feeding wick **118** is configured to position inside the tube **112**, extending across the length of the tube **112** and terminating at the second end **116** of the tube **112**. In one possible embodiment, the wick tube portion **136** abuts the base of the plant container **200**, such that soil **206** or roots within the release apertures **210** of the plant container **200** lie adjacent to a portion of the dual feeding wick **118**.

The capillary motion enabled through the dual feeding wick **118** ensures that the liquid **212** supplied by the primary reservoir **102** does not over or under water the plant **204**. Thus, it is the dual feeding wick **118** that provides the medium for the water to controllably travel from the primary reservoir **102** and through the tube **112**. The size and material composition of the dual feeding wick **118** may be altered to change the rate of dispensing. In one embodiment, the dual feeding wick **118** is a cotton material.

In addition to the dual feeding wick **118**, at least one primary valve may be used to regulate, direct, and control the flow of the water from the primary reservoir **102**. The primary valve may include, without limitation, a ball float valve, an automated electrical valve, a butterfly valve, a globe valve, and a two port valve.

FIGS. **3** and **4** illustrate sectioned side views of a second embodiment of a position adjustable self-watering apparatus **300** operational on a plant container **200**. The apparatus **300** in this embodiment comprises a lid **306** having a tab **320**. The lid **306** in this embodiment only partially covers the opening in the primary reservoir **302**. Further, the lid **306** hingedly opens and closes over the opening through use of a hinge and an axis of rotation **340**.

Various embodiments of the present invention may comprise a plurality of tubes **312**, each comprising a wick **118** and/or wicking material. Multiple tubes **212** may extrude from the apparatus **300**. There may be anywhere, in various embodiments, from one to hundreds of tubes forming the apparatus **100**, **300**.

As illustrated in FIG. **5**, a seal member **322**, such as a rubber gasket, is shaped to match the perimeter shape of the lid **306** and opening **140**. The seal member **322** help to restrict insects from entering the primary reservoir **302**, and also prevents spillage or contamination of the liquid **212**. A top wall **308** covers the other portion of the opening. The sidewalls **304** form a generally rectangular shape and may be constructed from a molded plastic, a rigid polymer, metal, wood, fiberglass, and glass.

Turning now to FIG. **6**, a bottom wall **306** of the primary reservoir **302** comprises at least one reception aperture **326a-c**. The reception aperture **326a-c** is configured to receive to at least one anchor rod **308a-b**. The reception aperture **326a-c** may be threaded or beveled to form a friction fit with the anchor rod **308a-b**. In one embodiment shown in FIG. **7**, multiple reception apertures **326a-c** from a spaced-apart relationship to provide different positioning options for at least one anchor rod **308a-b**.



11

As illustrated in FIGS. 8A and 8B, the at least one anchor rod **308a-b** provides the supportive foundation and positioning capacity for the primary reservoir, relative to the plant container. The anchor rod **308a** may have a threaded mount end **330a** (FIG. 8A), or a beveled mount end **330b** (FIG. 8B). The anchor rod **308a-b** comprises a reservoir end **328a-b** that forms a snug, sealed engagement with the reception aperture **326a-b**. The anchor rod **308a-b** further comprises a mount end **330a-b** that engages the soil directly or the container edge **202**, so as to support the primary reservoir **302**.

A tube housing **310** is also used in this embodiment of the apparatus **300**. The tube housing **310** provides a base of support for a tube **312** that is flexible, yet incrementally fixed so as to enable directional orientation of the tube **312** for dispensing from a second end **316**. A tube connection end **324** in the tube housing **310** couples a first end **314** of the tube **312** thereto. The present embodiment also utilizes capillary motion through a dual feed wick **318** partially immersed in the primary reservoir **302**, and partially encased in the tube **312**.

FIG. 9 is a perspective view illustrating a third embodiment of a position adjustable self-watering apparatus **400** having a pair of tubes **412a-b** for controllably dispensing the liquid **212** from the primary reservoir. The pair of tubes **412** each mount on a respective tube housing **410a-b**, and operate substantially the same as the single tube embodiment discussed above. Similar to the prior embodiment, a single lid **406** having a single tab **420** is operable for accessing an opening in the primary reservoir.

FIG. 10 is a diagram view illustrating another embodiment of the position adjustable self-watering apparatus **500**. The primary reservoir **502** here, receives water from a secondary reservoir **552**. The secondary reservoir **552** may be used to supply a portion of the liquid **212** to the primary reservoir **502**. The secondary reservoir **552** increases the liquid volume capacity of the apparatus **500**. Thus, when the primary reservoir **502** is depleted, the secondary reservoir **552** may be called to supply liquid to the soil **206**. This increases the possible duration of dispensing liquid and also increases the amount of plants **204** that can receive the liquid **212**.

In one embodiment, a secondary reservoir tube **556** that is flexible, yet rigid serves to carry the liquid **212** from the secondary reservoir **552** to the primary reservoir **502**. The secondary reservoir tube **556** may be configured substantially the same as the tube described above. Nonetheless, despite the addition of a secondary reservoir **552**, the apparatus **500** operates substantially the same as discussed above. For example, a lid **506** supports a tube housing having a threaded tube connection end **524** that rotatably couples to a first end of a tube **512**. The tube may then carry a tube portion of a dual feeding wick to transport the liquid **212** through capillary motion.

In this embodiment of the apparatus **500**, the primary reservoir **502** may include at least one primary reservoir valve **550a-b** for regulating and initiating discharge of the water from the primary reservoir **502**. Similarly, at least one secondary valve **554a-c** may be used to regulate the water and nutrients from the secondary reservoir **552**. The secondary valve **554a-c** may include a butterfly valve **554a**, an electronic valve **554b**, or a float valve **554c** having a valve chamber and a valve chamber orifice, and various ball floats and/or elongated floats that work together to regulate dispensing of the liquid **212** from the secondary reservoir **552**.

FIGS. 11A and 11B illustrate perspective views of secondary reservoir valve **600a-b**, where FIG. 11A is a float

12

valve **600a**, and FIG. 11B is an automated electrical valve **600b** in accordance with the present invention. The float valve **600a**, or ballcock, operates in substantially the same manner as float valves known in the art.

In one embodiment, the influent water is allowed to pass through a valve inlet **608a-b** into a secondary reservoir tube **616a-b**, while avoiding overflow and backflow. As the water level **208** drops in the secondary reservoir, a float ball **610** drops, allowing the water to flow through a valve chamber **602a-b** through a valve chamber orifice **604a-b**. From here, the water enters the primary reservoir. As the water level **208** in the secondary reservoir increases, the float ball **610** rises, eventually sealing off the valve chamber orifice **604a-b**. In some embodiments, an elongated float **606** operatively connected to a float arm **612** falls and rises to open and shut the valve chamber orifice **604a-b**.

In another embodiment, a float valve screen **614** provides up and down travel of the float ball **610**. The screen **614** also allows air to escape before entering the valve chamber orifice **604a-b**. This creates an air gap that helps prevent the float ball **610** from sealing the valve chamber orifice **604a-b**, and consequently blocking the flow of influent water. Those skilled in the art will recognize that without the screen **614**, the influent water may not stop, thereby causing backflow. Similar valves may also be used at the primary reservoir.

Thus, in one possible embodiment, the position adjustable self-watering apparatus **100** is configured to carry a liquid **212**, such as water and/or nutrients, from the primary reservoir **02** to the second end **116** of the tube **112** through capillary motion. The apparatus **100** adjusts its portion relative to a plant container **200** to dispense the liquid **212** over a selected region of the soil **206**. In one positional adjustment, at least one anchor rod **108a-b** supports the primary reservoir **102** and selectively couples with at least one reception aperture **126a-b** in the bottom wall **107** of the primary reservoir **102** to move the primary reservoir **102** relative to the plant container **200**.

In yet another positional adjustment, the tube **112** is configured to incrementally and fixedly orient to a desired direction over a desired region of the soil **206** through a rigid, segmented configuration. In yet another positional adjustment, when the container edge wedges between the anchor rod and the sidewalls of the primary reservoir, the primary reservoir slides along the edge of the plant container to a desired region above the soil. The water is transmitted from the primary reservoir to the second end of the tube through capillary motion enabled by a dual feeding wick. At least one primary reservoir valve helps to regulate the flow of the liquid.

FIG. 12 is a diagram view illustrating another embodiment of a position adjustable self-watering apparatus receiving water from a secondary reservoir in accordance with the present invention; and FIG. 13 is a diagram view illustrating another embodiment of a position adjustable self-watering apparatus receiving water from a secondary reservoir in accordance with the present invention.

The water level rises as water is added to the reservoir **102** until it rises above the connection points of the tubes **112** and overflows, rapidly starting the wicking process. The apparatus **100**, **1200**, **1300** may comprise means for collecting rainwater, including various species of funnels, and refilling the reservoir **102** with this runoff. The funnel may be partially filled with a soluble fertilizer.

Alternatively, the apparatus **100**, **1200**, **1300** may comprises means for collecting rain/precipitation before it comes

## 13

in contact with the soil in the container 200, thus preventing excessive rain from washing nutrients out of the already moistened soil.

The present invention may be embodied in other specific forms without departing from its spirit or essential characteristics. The described embodiments are to be considered in all respects only as illustrative and not restrictive. The scope of the invention is, therefore, indicated by the appended claims rather than by the foregoing description. All changes which come within the meaning and range of equivalency of the claims are to be embraced within their scope.

What is claimed is:

1. An apparatus for position adjustable self-watering of a plant through capillary motion, the apparatus comprising:

- a primary reservoir, the primary reservoir configured to enable storage and dispensing of a liquid, the primary reservoir defined by a plurality of sidewalls, a bottom wall, a top wall, an opening, and a cavity;
- a lid, the lid configured to regulate access through the opening of the primary reservoir;
- a seal member, the seal member disposed to position between the primary reservoir and the lid, the seal member configured to restrict access to the cavity of the primary reservoir;
- a plurality of reception apertures, each of the reception apertures disposed to position at the bottom wall of the primary reservoir;
- a plurality of anchor rods, each of the anchor rods defined by a reservoir end and a mount end, the reservoir end configured to detachably attach to a respective one of the reception apertures, the mount end configured to enable mounting of the primary reservoir, whereby each of the anchor rods selectively engages a respective one of the reception apertures to reposition the primary reservoir relative to multiple mounted positions;
- a flexible tube, the tube configured to extend from a tube housing disposed on the primary reservoir, the tube defined by a first end, a second end, and an interior volume, the first end configured to join with the tube housing, the second end configured to dispense the liquid;
- a dual feeding wick, the dual feeding wick defined by a reservoir portion and a tube portion, the reservoir portion configured to engage the liquid in the primary reservoir, the tube portion disposed through the length of the interior volume of the tube, the dual feeding wick configured to enable capillary motion of the liquid from the primary reservoir to the second end of the tube; and
- at least one primary reservoir valve, the at least one primary reservoir valve configured to at least partially regulate flow of the liquid from the primary reservoir to the second end of the tube.

2. The apparatus of claim 1, wherein the reservoir is molded as a single integrated piece with a container for receiving soil.

3. The apparatus of claim 1, wherein the apparatus is configured to self-water a plant growing inside a plant container having a container edge.

4. The apparatus of claim 3, wherein each of the at least one reception aperture is threaded.

5. The apparatus of claim 4, wherein the reservoir end of each of the anchor rods is threaded.

6. The apparatus of claim 5, wherein the mount end of each of the anchor rods is pointed.

7. The apparatus of claim 6, wherein the mount end of each of the anchor rods is penetrates soil for mounting the primary reservoir.

## 14

8. The apparatus of claim 7, wherein the mount end of each of the anchor rods is and the plurality of sidewalls of the primary reservoir form a space for receiving the container edge for mounting the primary reservoir.

9. The apparatus of claim 1, wherein the lid hingedly opens and closes over the opening of the primary reservoir through a hinge and axis of rotation.

10. The apparatus of claim 1, wherein the lid comprises a tab, the tab configured to provide a surface for manipulating the lid.

11. The apparatus of claim 1, wherein the seal member is a rubber gasket.

12. The apparatus of claim 1, wherein the dual feeding wick is fabricated substantially from cotton.

13. The apparatus of claim 1, wherein the at least one primary reservoir valve includes at least one member selected from the group consisting of: a ball float valve, an automated electrical valve, a butterfly valve, a globe valve, and a two port valve.

14. The apparatus of claim 1, wherein the tube housing comprises a tube connection end, the tube connection end configured to couple to the first end of the tube.

15. The apparatus of claim 1, further including a secondary reservoir, the secondary reservoir configured to store a portion of the liquid.

16. The apparatus of claim 15, further including a secondary reservoir tube, the secondary reservoir tube configured to carry the liquid from the secondary reservoir to the primary reservoir.

17. The apparatus of claim 16, further including at least one secondary valve the at least one secondary valve configured to regulate the liquid dispensing from the secondary reservoir.

18. The apparatus of claim 17, wherein the at least one secondary valve includes at least one member selected from the group consisting of: a valve chamber, a valve chamber orifice, a float, a float arm, a float ball, and a float valve screen.

19. An apparatus for position adjustable self-watering of a plant through capillary motion, the apparatus comprising:

- a primary reservoir, the primary reservoir configured to enable storage and dispensing of a liquid, the primary reservoir defined by a plurality of sidewalls, a bottom wall, a top wall, an opening, and a cavity;
- a lid, the lid configured to regulate access through the opening of the primary reservoir;
- a seal member, the seal member disposed to position between the primary reservoir and the lid, the seal member configured to restrict access to the cavity of the primary reservoir;
- a plurality of reception apertures, each of the reception apertures disposed to position at the bottom wall of the primary reservoir;
- a plurality of anchor rods, each of the anchor rods defined by a reservoir end and a mount end, the reservoir end configured to detachably attach to a respective one of the reception apertures, the mount end configured to enable mounting of the primary reservoir, whereby each of the anchor rods selectively engages a respective one of the reception apertures to reposition the primary reservoir relative to multiple mounted positions;
- a tube, the tube configured to extend from a tube housing disposed on the primary reservoir, the tube defined by a first end, a second end, and an interior volume, the first end configured to join with the tube housing, the

15

- second end configured to dispense the liquid, the tube further configured to incrementally position the second end at an orientation;
- a dual feeding wick, the dual feeding wick defined by a reservoir portion and a tube portion, the reservoir portion configured to engage the liquid in the primary reservoir, the tube portion disposed through the length of the interior volume of the tube, the dual feeding wick configured to enable capillary motion of the liquid from the primary reservoir to the second end of the tube;
- at least one primary reservoir valve, the at least one primary reservoir valve configured to at least partially regulate flow of the liquid from the primary reservoir to the second end of the tube;
- a secondary reservoir, the secondary reservoir configured to store a portion of the liquid;
- a secondary reservoir tube, the secondary reservoir tube configured to carry the liquid from the secondary reservoir to the primary reservoir; and
- at least one secondary valve the at least one secondary valve configured to regulate the liquid dispensing from the secondary reservoir, the at least one secondary valve including at least one member selected from the group consisting of: a valve chamber, a valve chamber orifice, a float, a float arm, a float ball, and a float valve screen.
- 20.** An apparatus for position adjustable self-watering of a plant through capillary motion, the apparatus comprising:
- a primary reservoir, the primary reservoir configured to enable storage and dispensing of a liquid, the primary reservoir defined by a plurality of sidewalls, a bottom wall, a top wall, an opening, and a cavity;
- a lid, the lid configured to regulate access through the opening of the primary reservoir;
- a seal member, the seal member disposed to position between the primary reservoir and the lid, the seal member configured to restrict access to the cavity of the primary reservoir;

16

- a plurality of reception apertures, each of the reception apertures disposed to position at the bottom wall of the primary reservoir;
- a plurality of anchor rods, each of the anchor rods defined by a reservoir end and a mount end, the reservoir end configured to detachably attach to a respective one of the reception apertures, the mount end configured to enable mounting of the primary reservoir, whereby each of the anchor rods selectively engages a respective one of the reception apertures to reposition the primary reservoir relative to multiple mounted positions;
- a pair of tubes, the pair of tubes configured to extend from a pair of tube housings disposed on the primary reservoir, each of the tubes in the pair of tubes defined by a first end, a second end, and an interior volume, the first end configured to join with the pair of tube housing, the second end configured to dispense the liquid, the pair of tubes further configured to incrementally position the second end at an orientation;
- a dual feeding wick, the dual feeding wick defined by a reservoir portion and a tube portion, the reservoir portion configured to engage the liquid in the primary reservoir, the tube portion disposed through the length of the interior volume of the pair of tubes, the dual feeding wick configured to enable capillary motion of the liquid from the primary reservoir to the second end of the pair of tubes;
- at least one primary reservoir valve, the at least one primary reservoir valve configured to at least partially regulate flow of the liquid from the primary reservoir to the second end of the tube;
- a secondary reservoir, the secondary reservoir configured to store a portion of the liquid;
- a secondary reservoir tube, the secondary reservoir tube configured to carry the liquid from the secondary reservoir to the primary reservoir; and
- at least one secondary valve the at least one secondary valve configured to regulate the liquid dispensing from the secondary reservoir.

\* \* \* \* \*