

(12) UK Patent Application (19) GB (11) 2 425 449 (13) A

(43) Date of A Publication 01.11.2006

(21) Application No: 0508406.6

(22) Date of Filing: 26.04.2005

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(51) INT CL:
A01G 27/00 (2006.01) **A01G 27/02** (2006.01)

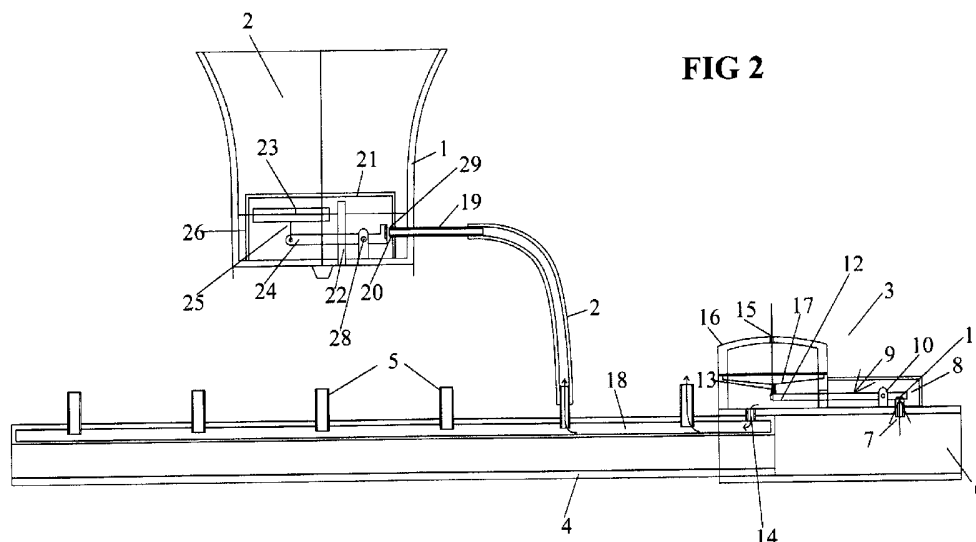
(52) UK CL (Edition X):
A1E EAE EAKA

(56) Documents Cited:
GB 2095083 A **JP 110192031 A**
US 6622430 B1 **US 6363658 B1**
US 6276090 B1 **US 20040035466 A1**

(58) Field of Search:
UK CL (Edition X) **A1E**
INT CL⁷ **A01G**
Other: **Online: WPI, EPODOC**

(54) Abstract Title: **Irrigation system**

(57) The system comprises a plant growth container 1, a reservoir 21, a container inlet, a float valve 23,24,25,29 and an outlet means. The float valve is adapted to close the container inlet when the water in the reservoir reaches a pre-determined level. An outlet means allows the passage of water from the reservoir to a receptacle containing growth medium. The system may further comprise a supply controller 3 having a controllable mains inlet valve and a pressure regulator comprising a diaphragm 17 which expands in response to an increase in water pressure in the controller to close the inlet valve.



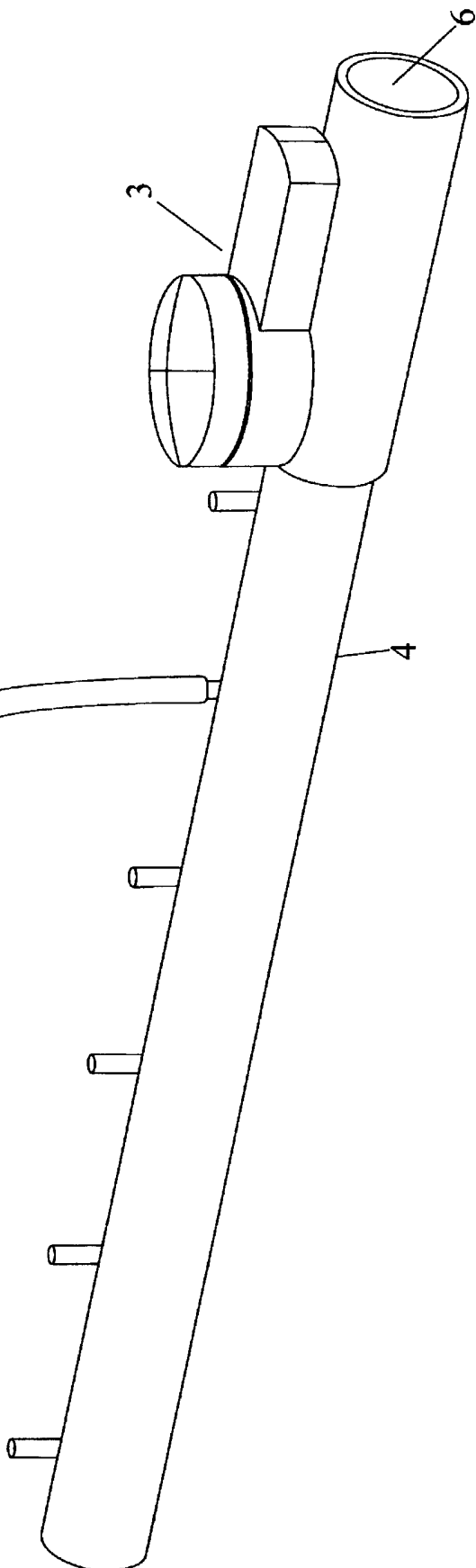
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FIG 1



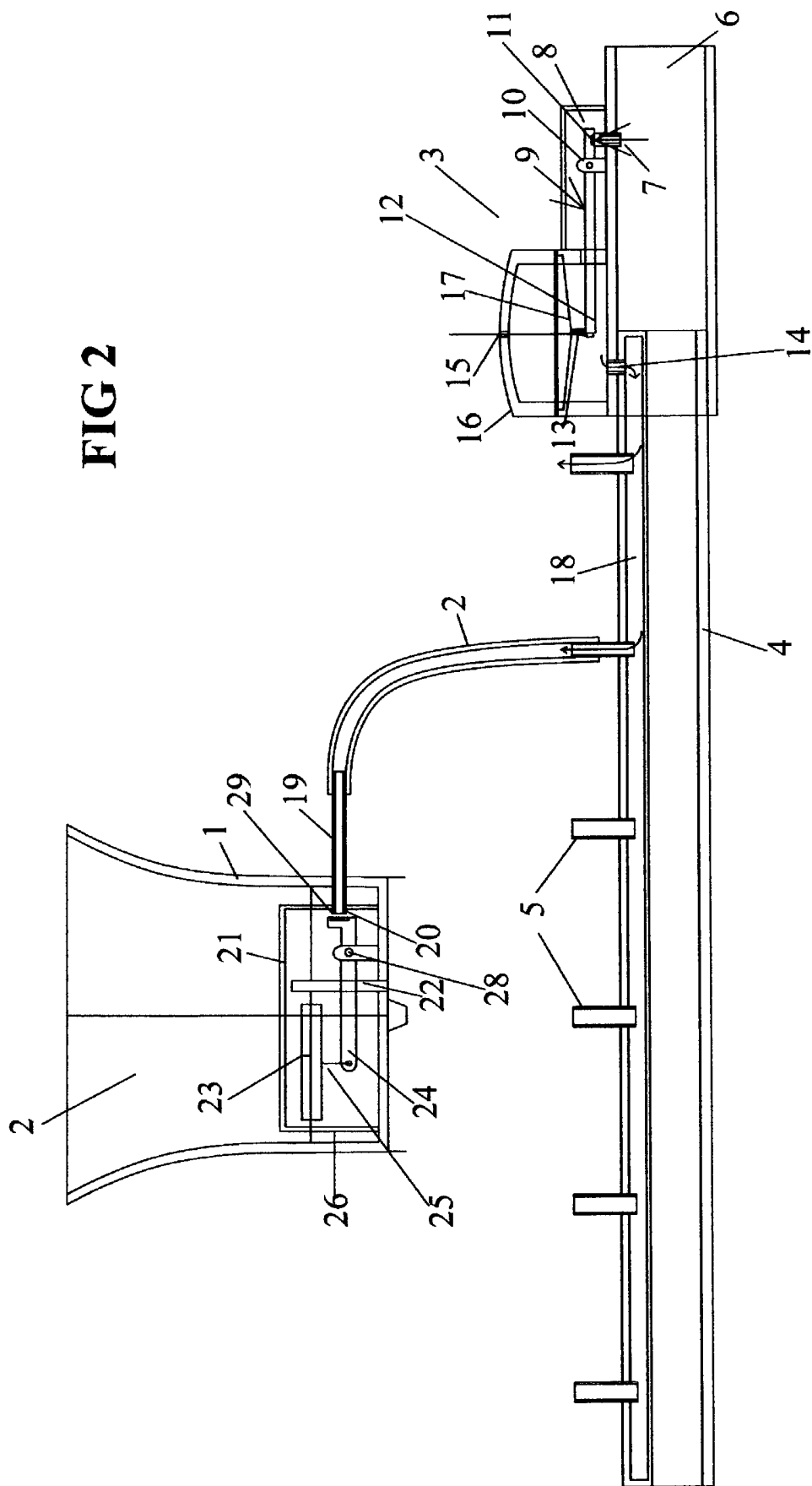


FIG 4

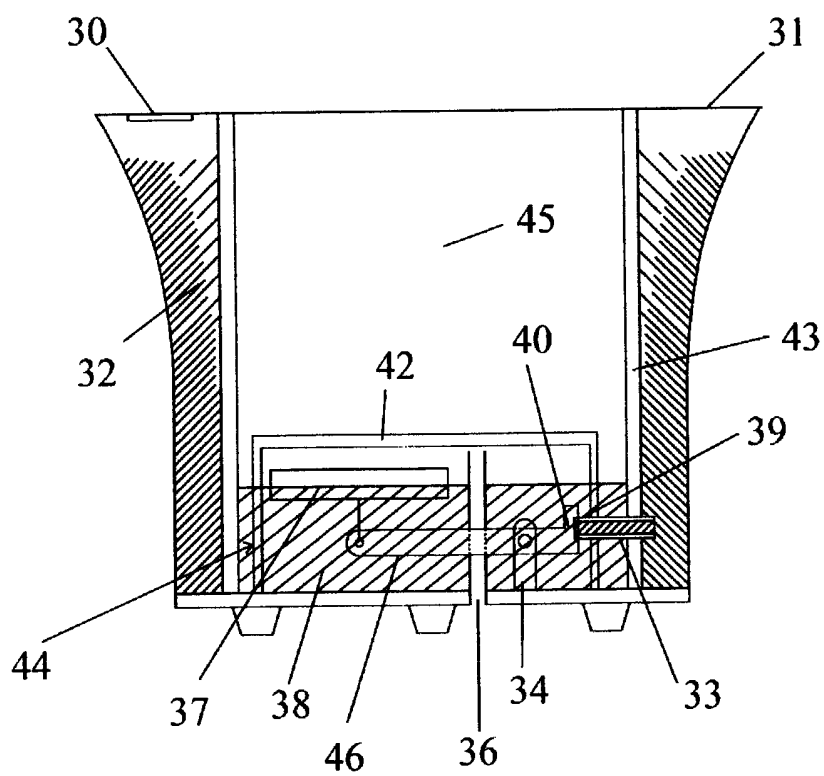


FIG 5

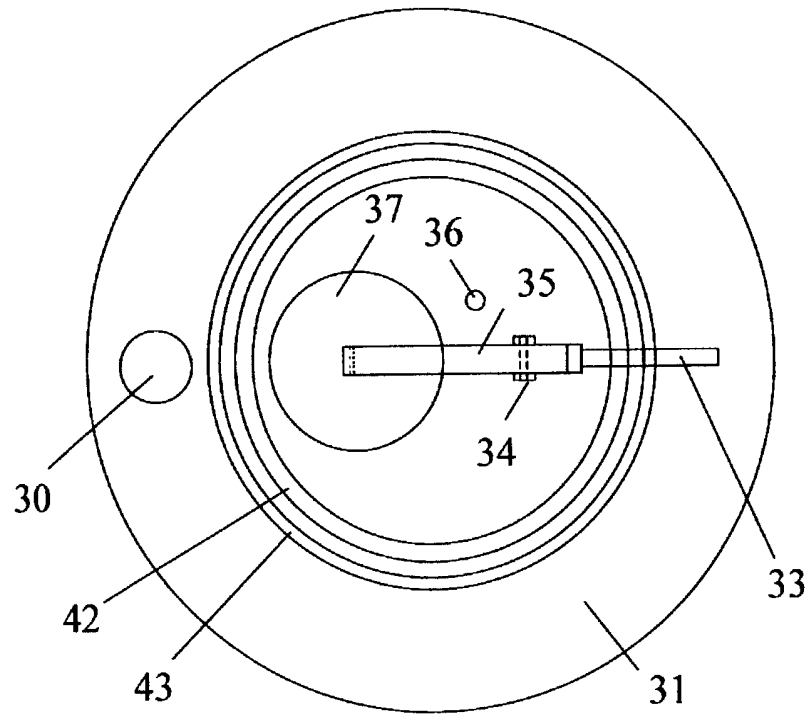


FIG 6

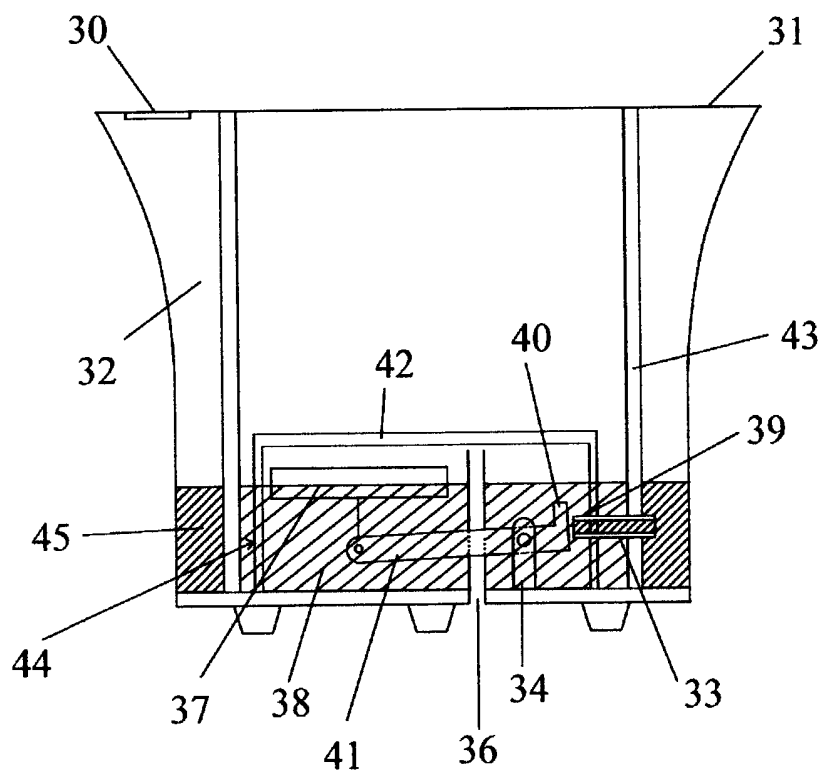


FIG 7

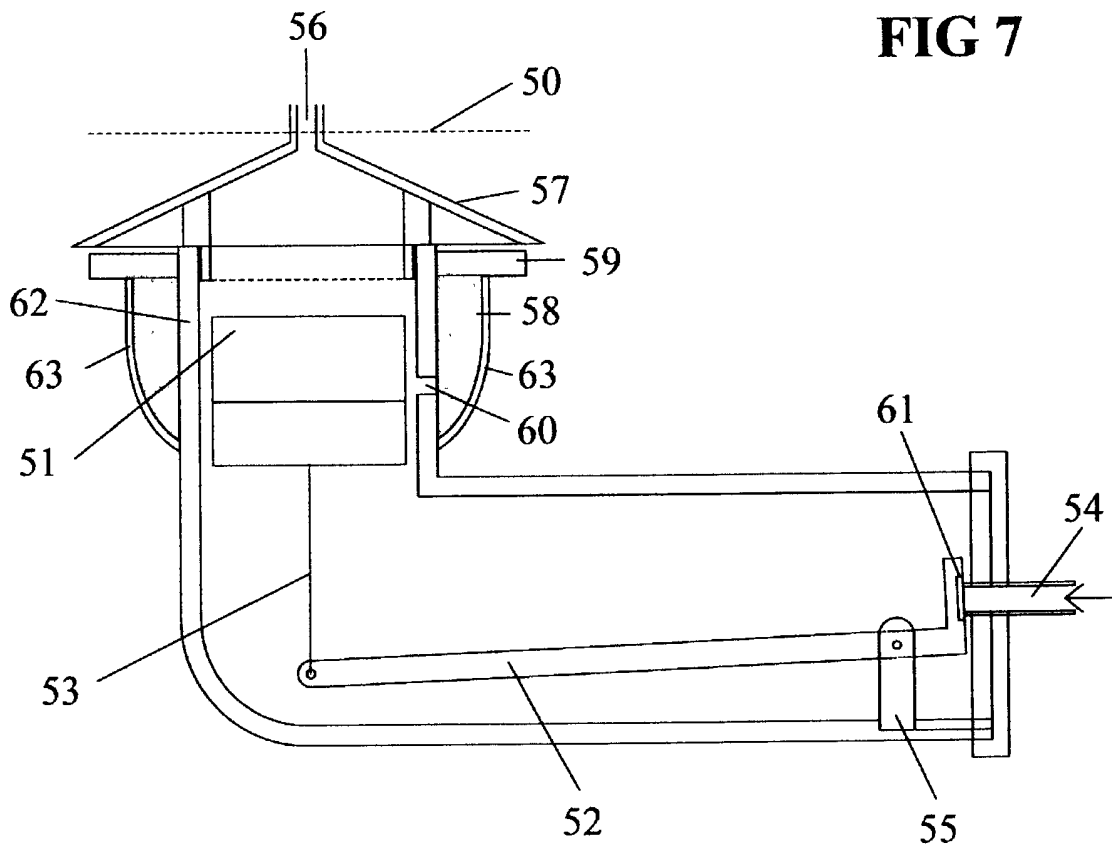
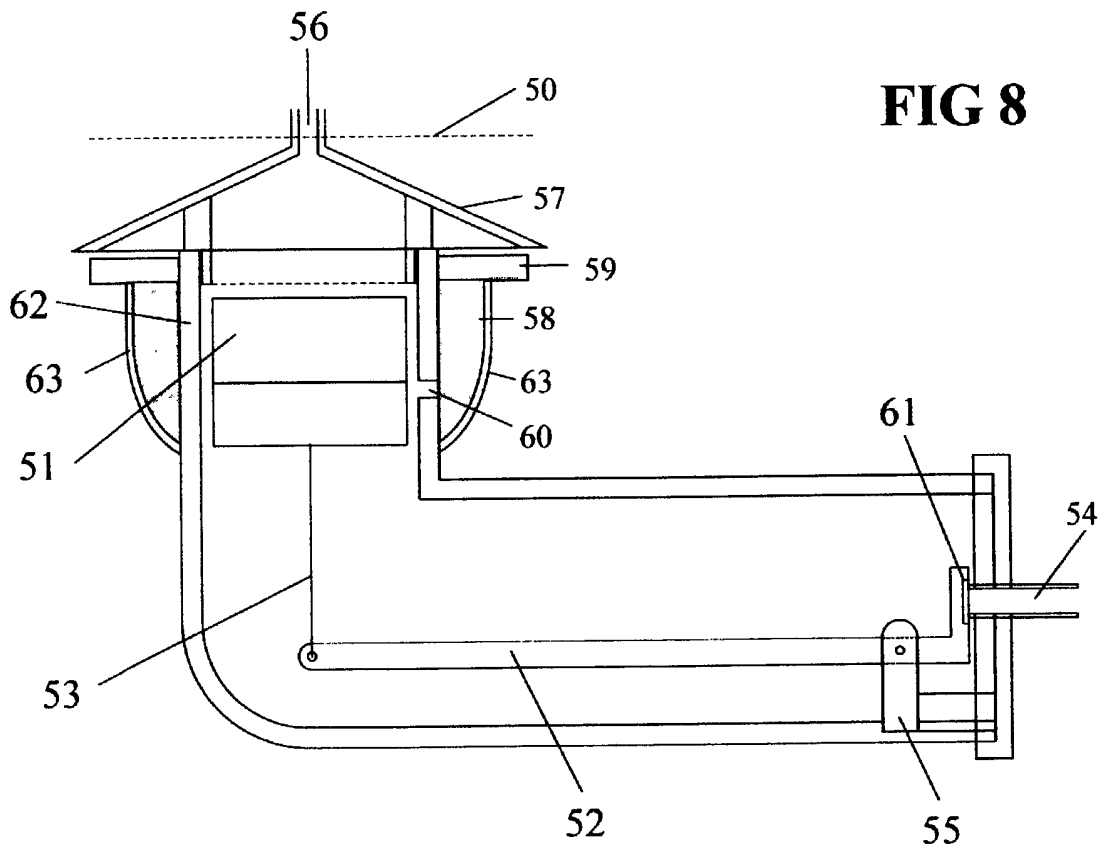


FIG 8



Irrigation System

This invention relates to a horticultural irrigation system particularly but not exclusively for potted plants or plants in other growth containers. The invention may also find use for irrigation of plants in growing beds or lawns.

5 Known irrigation systems such as sprinklers or diffusion systems which are connected directly to a mains water supply are able to provide a constant supply of water to a growth container. However such systems are not responsive to the amount of water within the container. For example water may continue to be provided to a container which has been flooded by a rainstorm or by over watering.

10 According to a first aspect of the present invention the horticultural irrigation system comprises a plant growth container comprising a receptacle for a plant growth medium, a reservoir, a container inlet for supply of water to the reservoir, a float valve adapted to close the container inlet when the water in the reservoir reaches a pre-determined level and outlet means for allowing passage of water from the reservoir to the
15 receptacle.

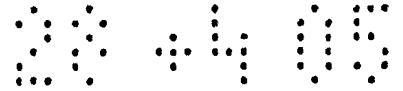
In a first preferred aspect of the present invention the side wall of the container incorporates a chamber for holding a supply of water, the inlet communicating between the chamber and the reservoir. This may serve as a stand-alone pot or container so that connection to a water supply is not required.

20 According to a second preferred aspect of the present invention a horticultural irrigation system comprises:

a supply controller comprising a controllable mains inlet valve adapted for connection in use to a mains water supply,

a pressure regulator adapted to close the mains inlet valve when water pressure in
25 the controller reaches a predetermined value,

one or more outlets each outlet being coupled to a dispenser inlet in a plant growth container, the plant growth container comprising a receptacle for a plant growth medium, a



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reservoir, a container inlet for supply of water from the supply controller to the reservoir, a float valve adapted to close the container inlet when the water in the reservoir reaches a predetermined level, and outlet means for allowing passage of water from the reservoir to the receptacle,

5 wherein the pressure regulator comprises an expandable member adapted to expand in response to an increase in water pressure in the controller and an actuator connected to the expandable member, the actuator being adapted to close the inlet valve when the pressure reaches a predetermined value.

10 Preferably the expandable member is a diaphragm. Alternatively, a bellows or piston arrangement may be used.

 Plant growth medium may be disposed in a container, for example a plant pot, tub or trough. Alternatively the plant growth medium may comprise a lawn or bed, for example a flower or vegetable bed which may be located outside or in a greenhouse, cloche
15 or cold frame.

 In the event that a receptacle is flooded, for example by a rain storm, the float valve in the container prevents any further supply of water to the growth medium until the level of water in the container has fallen below the predetermined value. In this way
20 excessive watering or drying out is prevented.

 In preferred embodiments the receptacle and float valve are integral with a container, for example located at the bottom of a plant pot, tub or trough so that water released from the valve can permeate the growth medium at the bottom of the container.

 The outlet means may comprise an aperture communicating with the receptacle.

25 In a preferred embodiment the outlet means comprises a porous or permeable body adapted to provide a slow release of water from the reservoir to the receptacle. The porous or permeable body may comprise a porous ceramic, fibrous or open celled foam

member or an array of small apertures or pores dimensioned to permit slow release of water from the reservoir to the growth medium.

Use of system in accordance with the preferred aspect of this invention confers several advantages. Several growth containers or beds may be located at different levels both above and below the level of the supply controller, the amount of water supplied to each container being controlled by the float valve. The pressure in the system may be controlled and adjusted by the linkage to the diaphragm or by adjusting the sensitivity of the diaphragm to water pressure. For example a restraining member may be used to reduce the flexible area of the diaphragm, reducing the sensitivity of the device to water pressure.

The predetermined pressure within the system may be selected so that the water is supplied to each container but that excessive pressures are avoided. Excessive pressure caused by direct connection to the mains supply is avoided. Application of full mains water pressure to the system is undesirable as this may lead to dislocation of the connecting pipes or leaks from the valves. In addition a high water pressure may make closure of the valves difficult, leading to a lack of sensitivity of the apparatus. Furthermore a more robust and expensive construction is necessary to reliably handle the higher water pressures of a mains water supply.

Several containers or dispensers, for example six or more may be connected to a single supply regulator.

In an alternative embodiment of the invention the plant growth medium comprises a bed, for example a flower border, vegetable bed or an indoor bed such as in a greenhouse, cloche or cold frame. The supply regulator may deliver water to several locations with a bed.

Figure 1 is a perspective view of system in accordance with this invention.

Figure 2 is a cross-sectional view through the system shown in Figure 1.

Figure 3 is a plan view of a second embodiment of the invention.

Figure 4 is a cross-section view of the system shown in Figure 3.

Figure 5 is a plan view through system shown in Figures 3 and 4 with the valve open.

Figure 6 is a cross-sectional view of the system shown in Figure 5, and

5 Figures 7 and 8 are cross-sectional views through a further alternative system in accordance with this invention.

The system shown in Figures 1 and 2 comprises a plant growth container (1) in the form of a plant pot connected by means of a flexible pipe (2) to a supply controller (3) having an outlet pipe (4). Several, for example six outlet pipes (5) may each be connected to a
10 respective tube (2) and container (1). A water inlet (6) having a connector (not shown) for connection to a mains water supply and inlet tube (7) has an outlet opening into chamber (8). A lever (9) is connected to pivot (10) which incorporates a valve seat (11) which co-operates with the inlet tube (7) to form a valve preventing flow of water from the water inlet (6) into the system. The remote end (12) of lever (9) is connected by a linkage (13) to
15 a diaphragm (17) located within a domed enclosure (16) having an air vent (15). Pressure of water within the chamber (8) urges the diaphragm (17) upwardly raising the remote end (12) of the lever (9) and closing the valve member (11) against the inlet tube (7).

The flexibility of the diaphragm (17) may be adjusted so that the valve is closed in response to a predetermined water pressure within the system. Alternatively the linkage
20 (13) may be adjusted in length to arrange the pre-determined water pressure.

Water in the chamber (8) passes out through an aperture (14) along the conduit (18) to the outlet tubes (5). Each outlet tube (5) is either connected to a container (1) or sealed to prevent leakage. The container (1) has an inlet tube (19) extending through the wall of the container and through an aperture in the wall (20) of a reservoir chamber (21). A float
25 valve comprising a float (23) which is connected by a linkage (25) to an end (24) of a lever

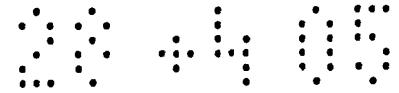
which is connected to pivot (28) is present within the reservoir chamber (21). A valve seat (29) co-operates with the end (19) of tube (18) to close the inlet to the reservoir chamber (21) preventing entry of water. The height of the float (23) may be adjusted so that the valve is closed when a pre-determined level of water is within the reservoir chamber (21).

5 The wall of the reservoir chamber (21) includes a porous or permeable portion permitting diffusion of water container into the base (26) of the container (1). Alternatively an aperture may be provided. For example the reservoir may be free standing or loosely secured to the underlying container base to allow passage of water from the reservoir chamber to the growing medium. Growing medium is placed in the portion (27) of the
10 container (1) and is moistened by the water in the lower part of the container (1). An overflow (22) provides an air vent and prevents overfilling of the reservoir chamber (21).

In use of the system, the diaphragm (17) is adjusted so that a sufficient pressure of water within the system is obtained to irrigate the containers (1) whether they are located on the same level as the supply controller or above or below it. The float valve in each container
15 permits sufficient water to pass to maintain a desired level within the reservoir chamber (21) providing a constant measured supply of water to the growing medium in the container (1). However, in the event that the container (1) is flooded, diffusion of water into the reservoir chamber (21) maintains the float valve in a closed position preventing further ingress of water.

20 Figures 3 to 6 illustrate an alternative embodiment of the invention wherein a free standing container (1) is supplied with water poured through an opening (30) in the upper surface (31) of the outer rim.

Water is stored in a doubled skinned outer chamber (32). An inlet tube (33) extends through the inner wall (43) and reservoir (44) to co-operate with a valve (40) of lever (46)
25 which is connected to form an inlet valve. A float (37) is connected to the lever (46) and provides a constant head float valve arrangement similar to that shown in Figure 2. Adjustment of the float (37) permits water to pass from the outer chamber (32) through inlet (33) to the reservoir chamber (42). The water (38) in the reservoir chamber (42) is allowed to diffuse though an aperture or permeable means (not shown) in the double



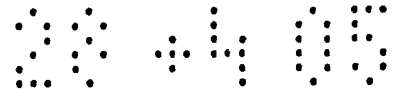
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skinned outer chamber (32) into the lower part (44) of the container (1) to moisten compost or other growth medium in the upper part (45) of the container (1).

Figures 3 and 4 show the valve (40) closed so that water in the outer chamber (32) cannot pass into the reservoir chamber (42). Figures 5 and 6 show the valve (40) open so that the water level in the outer chamber (33) falls as the level of the water (38) in the reservoir chamber (42) becomes depleted.

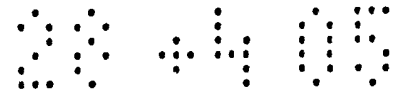
An overflow (36) prevents over-filling of the reservoir and also serves to equalise air pressure above the float (37).

Figures 7 and 8 show a further embodiment of the invention which may be located in a flower or vegetable bed or beneath the ground level (50) of a lawn. The system comprises a float (51) connected to lever (52) by a linkage (53). The lever (52) is mounted on a pivot (55) and has a valve seat surface (61) which is arranged to co-operate with the inlet tube (54) to form a constant head float valve as described in the previous embodiments. The water supply may be provided by a supply controller as shown in Figures 1 and 2 or the system may be directly connected to a water supply. An outlet (60) permits a steady flow of water from the chamber into a porous medium, for example a sponge or open cell foam (58) in an annular support (63) surrounding the upright portion (62) of the system. The foam extends radially outwardly at an upper portion (59) permitting an even distribution of water in the surrounding soil. A cover (57) and air vent (56) prevent soil from entering the float chamber. The linkage (53) is adjusted so that the water level when the valve is closed communicates with outlet (60), permitting a small but steady flow of water into the porous medium (58).



CLAIMS

1. A horticultural irrigation system comprising:
a plant growth container comprising a receptacle for a plant growth medium, a reservoir, a container inlet for supply of water to the reservoir, a float valve adapted to
5 close the container inlet when the water in the reservoir reaches a pre-determined level and an outlet means for allowing passage of water from the reservoir to the receptacle.
2. A horticultural irrigation system as claimed in claim 1 further comprising:
a supply controller comprising a controllable mains inlet valve adapted for connection in use to a mains water supply,
10 a pressure regulator adapted to close the mains inlet valve when water pressure in the controller reaches a predetermined value,
one or more outlets each outlet being coupled to a container inlet in a plant growth container, in which the container inlet supplies water from the supply controller to the reservoir,
15 wherein the pressure regulator comprises an expandable member adapted to expand in response to an increase in water pressure in the controller and an actuator connected to the expandable member, the actuator being adapted to close the inlet valve when the pressure reaches a predetermined value.
3. A horticultural irrigation system as claimed in claim 2 in which the plant growth
20 container is located above the level of the supply controller.
4. A horticultural irrigation system as claimed in claim 3 in which the expandable member is a diaphragm.
5. A horticultural irrigation system as claimed in any one of claims 1 to 4 in which the receptacle and float valve are integral with the container.
- 25 6. A horticultural irrigation system as claimed in any one of claims 1 to 5 in which the outlet means comprises an aperture communicating with the receptacle.



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7. A horticultural irrigation system as claimed in any one of claims 1 to 5 in which the outlet means comprises a porous or permeable body.

8. A horticultural irrigation system as claimed in claim 7 in which the porous or permeable body comprises at least one member selected from the group comprising porous ceramic, fibrous and open celled foam members.

5

Amendments to the claims have been filed as follows

1 A horticultural irrigation system comprising

a plant growth container comprising a receptacle for a plant growth medium, a reservoir, a container inlet for supply of water to the reservoir, a float valve adapted to
5 close the container inlet when the water in the reservoir reaches a pre-determined level and an outlet means for allowing passage of water from the reservoir to the receptacle, further comprising

a supply controller comprising a controllable mains inlet valve adapted for connection in use to a mains water supply,

10 a pressure regulator adapted to close the mains inlet valve when water pressure in the controller reaches a predetermined value,

one or more outlets each outlet being coupled to a container inlet in a plant growth container, in which the container inlet supplies water from the supply controller to the reservoir,

15 wherein the pressure regulator comprises an expandable member adapted to expand in response to an increase in water pressure in the controller and an actuator connected to the expandable member, the actuator being adapted to close the inlet valve when the pressure reaches a predetermined value.

2 A horticultural irrigation system as claimed in claim 1 in which the plant growth
20 container is located above the level of the supply controller

3. A horticultural irrigation system as claimed in claim 2 in which the expandable member is a diaphragm

4 A horticultural irrigation system as claimed in any one of claims 1 to 3 in which the receptacle and float valve are integral with the container.

25 5. A horticultural irrigation system as claimed in any one of claims 1 to 4 in which the outlet means comprises an aperture communicating with the receptacle

6 A horticultural irrigation system as claimed in any one of claims 1 to 4 in which the outlet means comprises a porous or permeable body.

7 A horticultural irrigation system as claimed in claim 6 in which the porous or permeable body comprises at least one member selected from the group comprising porous

5 ceramic, fibrous and open celled foam members



Application No: GB0508406.6

Examiner: Paul Jenkins

Claims searched: 1-8

Date of search: 21 July 2005

Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
X	1, 5 & 7-8	US 6622430 B1 (LAI) Whole document relevant see especially figure 3 & 4
X	1 & 5-6	US 2004/0035466 A1 (ORETTI) Whole document relevant
X	1, 5-8	US 6276090 B1 (LAI) Whole document relevant see especially figures 3 & 4
X	1, 5-8	JP 11192031 A (TANAKA) See WPI, PAJ and EPODOC abstracts and all the figures
X	1 & 5-8	GB 2095083 A (NGAU) See especially figures 1 and 2
X	1, 5-7	US 6363658 B1 (LAI) See especially figures 4 and 5

Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
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Search of GB, EP, WO & US patent documents classified in the following areas of the UKC^X :

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The following online and other databases have been used in the preparation of this search report

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