

[54] PLANT TRAY IRRIGATION SYSTEM

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[51] Int. Cl. A01g 9/02

[58] Field of Search 47/1.2, 14, 16, 34.12, 47/38-39

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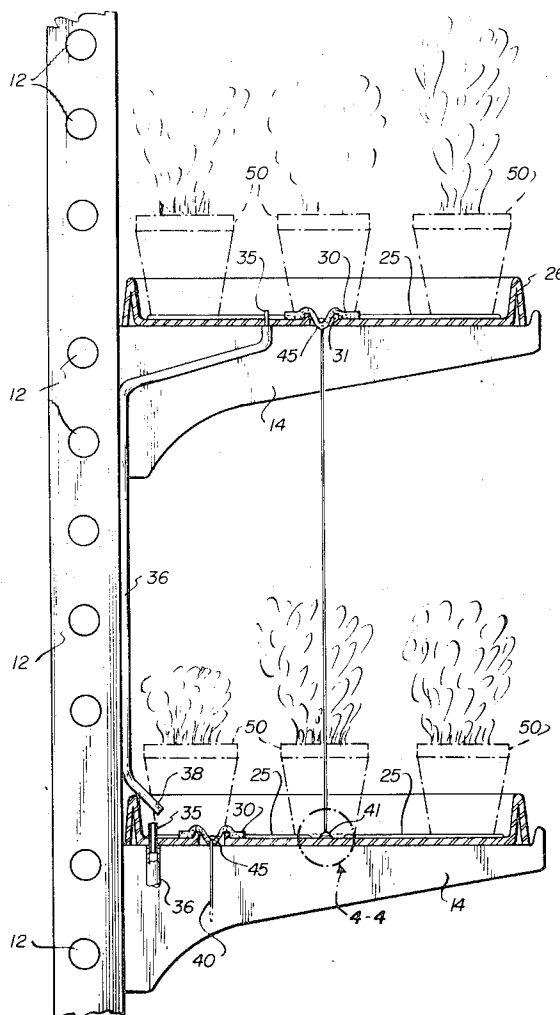
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[57] ABSTRACT

A plant tray irrigation system is disclosed in which a plurality of trays are spaced atop each other. A pumping system from a reservoir tray at the bottom of the unit delivers water on a timed basis to the top tray. Each tray is provided with an overflow having a peripheral rim determining the depth of water in the tray for the overflow, and in addition a drain having a ridge, its perimeter insuring a small amount of water in the base of the tray, and a drain guide wick which is positioned centrally of the drain ridge and dimpled to provide for capillary action to drain and dry the tray when the irrigation is concluded. A drain guide in the form of a string or elastic vertically oriented member which is secured at the base of the dimple of the drain guide wick, and anchored to the tray below guides the drainage in a steady stream to inhibit dripping and splashing. In one embodiment, the drain guide wick and overflow are provided at an offset in the tray so that the tray can be positioned piggyback fashion atop a light tray for supplying growth-type light to the plants positioned on the tray beneath.

9 Claims, 9 Drawing Figures



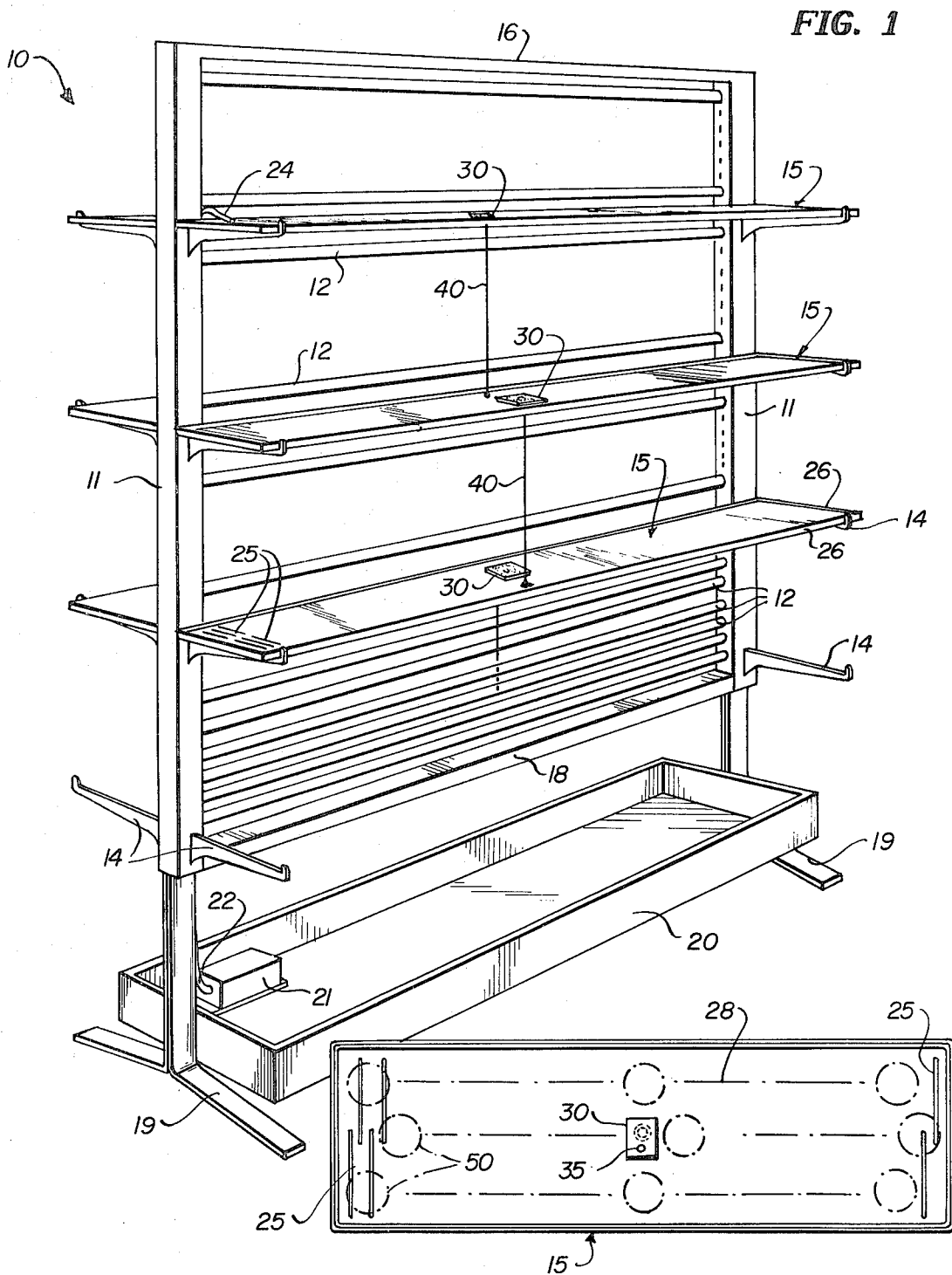


FIG. 2

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FIG. 3

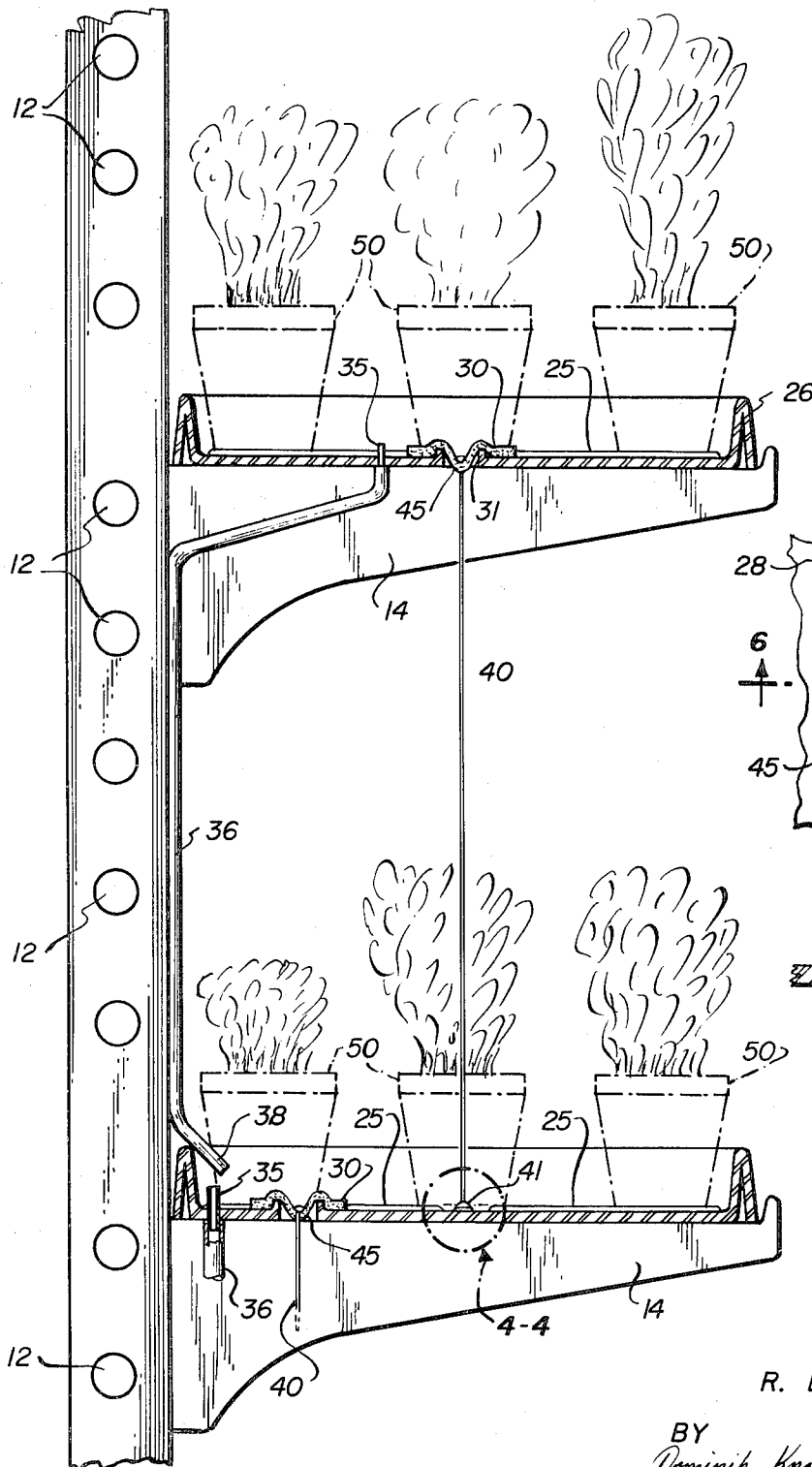


FIG. 4

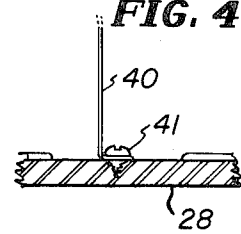


FIG. 5

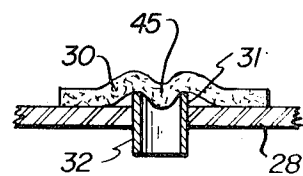
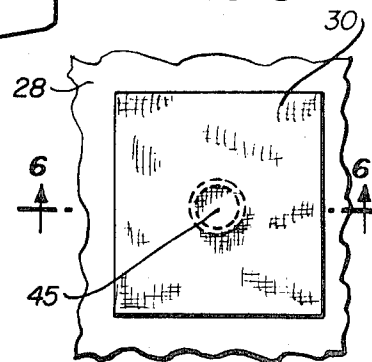


FIG. 6

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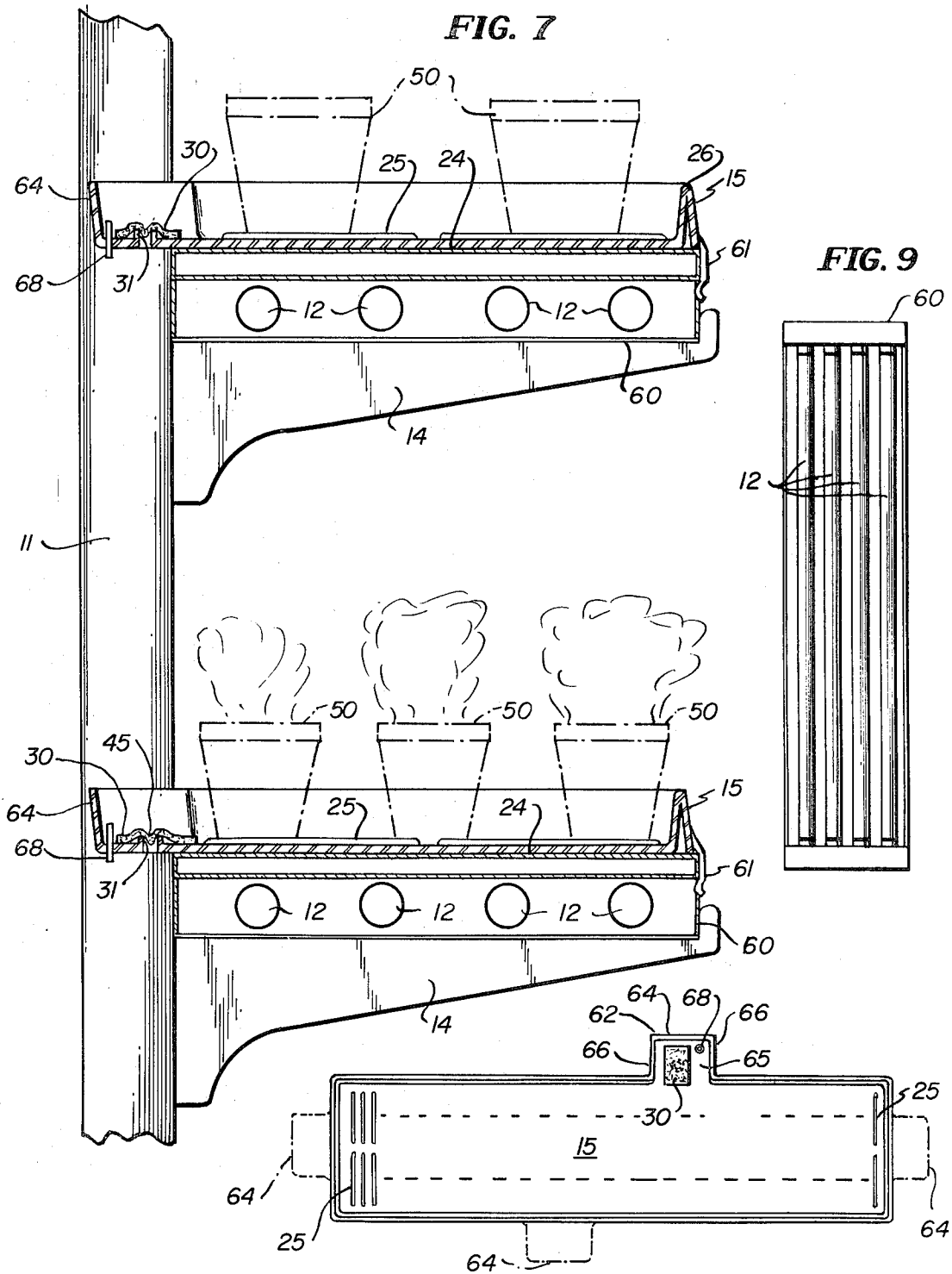


FIG. 8

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PLANT TRAY IRRIGATION SYSTEM

FIELD OF INVENTION

The present invention relates to artificial growth systems in which growth type lighting in elongate tubes is provided. The invention is directed to an irrigation system which can flood the base of potted plants in each tray for a predetermined period of time, and thereafter drain the trays to dryness. Splash inhibiting features are employed along with an optional offset of the irrigation elements to permit a light tray positioned beneath each plant supporting tray.

BACKGROUND OF INVENTION

The prior art is generally exemplified in Louis Ware U.S. Pat. No. 3,529,379 which discloses movable trays and a lighting system positioned centrally.

The prior art as disclosed in the subject Ware U.S. Pat. No. 3,529,379 is quite efficient, but involves moving trays which introduce an additional expense to the unit. In many merchandising applications where plants are positioned for display in stores and other heavily trafficked areas, a less expensive display unit with fixed trays is desirable, but must be provided with automatic watering facilities to insure minimization of loss. Naturally to minimize the cost, moving parts must be sacrificed in favor of fixed parts, but without a corresponding sacrifice of thorough irrigation.

SUMMARY

An irrigation system is provided exemplary of the present invention where a plurality of plant supporting trays are provided in a generally vertical parallel orientation. Each tray includes an overflow, and a drain guide wick which is positioned within a drain port having a peripheral ridge which predetermines the depth of water normally in the tray during the irrigation cycle. A drain guide wick of a porous capillary type material is spread over the drain port and atop its ridges and in to and on top of the flat tray to attract moisture which is in the tray and guide the same down through a dimple provided at the central portion of the drain guide wick to permit the water to cascade down to the tray below. Optionally but desirably a drain guide is secured in fluid flow relationship with the drain guide wick, preferably at the central portion of the dimple of the drain guide wick, and secured to a drain guide anchor at the tray below. The material of the drain guide may be a generally transparent nylon filament, and will attract water dropping through the drain port and confine the same on to the drain guide thereby reducing a tendency to drop, splatter, and splash on the plants positioned on the tray below. In an alternative embodiment, the drain port, overflow, and drain guide wick are positioned at an offset relationship to the tray, so that a light tray can be positioned beneath each tray, and serve to illuminate and provide the growth energy light sources for the plants contained on the tray below.

The principal object of the present invention is to provide an irrigation system for a plurality of trays without moving parts, and with means for insuring a timed flooding of the tray, and a drying of the tray thereafter to avoid leaving the plants contained on the tray in water soaked relationship. In short, the plants in pots which are on each tray must alternatively be watered, and then permitted to dry.

Another object of the invention is to provide an irrigation system for a plurality of trays which is sufficiently flexible to be positioned at most any location within the tray.

Still a further object of the present invention is to provide an irrigation system for plant trays which is self-draining, and self-flushing to the end that clogging of the principal flooding control and draining element is reduced, and in addition providing an overflow in the event of clogging so that permanent damage will not be done to the entire system by overflowing.

Still another object of the present invention is to provide for a plant tray irrigation system which is inexpensive, simple to maintain, and relatively trouble free in operation.

DESCRIPTION OF DRAWINGS

Further objects and advantages of the present invention will become apparent as the following description proceeds, taken in conjunction with the accompanying illustrative drawings in which:

FIG. 1 is a frontal perspective view of a partially assembled display rack in which the irrigation system of the present invention finds utility.

FIG. 2 is a plan view of a typical tray as employed in the display rack illustrated in FIG. 1.

FIG. 3 is a transverse sectional view enlarged taken through a midpoint of the display rack illustrated in FIG. 1.

FIG. 4 is an enlarged transverse sectional view taken at the lower portion of the drain guide showing its attachment to the tray bottom, the same being enlarged as illustrated in phantom lines at the lower portion of FIG. 3.

FIG. 5 is a plan view in enlarged detail illustrating the positioning of the wick on top of the tray bottom.

FIG. 6 is a transverse sectional enlarged view of the wick and tray bottom showing the relationship of the same with the irrigation tube taken generally along section line 6-6 of FIG. 5.

FIG. 7 is an enlarged transverse sectional view of an alternative embodiment display rack taken from the same general section as that shown in FIG. 3.

FIG. 8 is a plan view of the alternative embodiment tray illustrating in phantom lines alternative embodiments thereon.

FIG. 9 is a plan view of a light shelf, reduced in size from the light shelf shown in FIG. 7 but at the approximate same scale as the tray shown in FIG. 8 taken from the underneath portion of the light shelf as oriented in FIG. 7.

DESCRIPTION OF ILLUSTRATIVE EMBODIMENT

Referring now to FIG. 1, it will be seen that the irrigation system of the present invention finds its principal utility in a display rack 10 of the character shown in FIG. 1. The display rack 10 includes a pair of opposed vertically oriented end posts 11, and means for supporting a plurality of grow light tubes 12 between the end posts oriented horizontally. A plurality of tray brackets 14 are adjustably secured to the end posts 11, and extend outwardly in cantilever fashion to support a plurality of trays 15. A tie bar 16 is provided at the top to join the two end posts 11, and a corresponding tie bar 18 is employed at the lower portion of the display rack 10 to join the end posts 11. Utilities such as electrical wiring to support the energy function for the

grow light tubes 12, timing wires, timers, and the like may also be housed in the tie bars 16, 18 which join the respective end posts 11. The entire unit is supported by a pair of opposed feet 19 insertable into the end posts 11.

A water reservoir 20 in the form of a tub is provided beneath the display rack 10 and generally takes the dimension defined by the planar area projected downwardly from the pairs of trays 15, and somewhat shorter in length than the distance between the two display rack feet 19. Contained within the water reservoir 20 is a submerged pump 21 which picks up the water contained in the water reservoir 20 and pumps the same through a pipe 22. As will be observed at the upper portion of FIG. 1, the pipe 22 is continuous and has a pipe outlet 24 which takes the water which is pumped by the submersible pump 21 from the reservoir 20 and discharges the same on the top tray 15 which is the initial stage of the irrigation system employed in the display rack 10.

Referring now to FIGS. 2 and 3 in particular, it will be seen that the tray 15 has four tray walls 26 surrounding the same and defining an area upon which flower pots 50 may be rested. These flower pots 50 set atop a plurality of tray ribs 25 provided in the tray bottom 28. The precise configuration of the tray ribs 25 is of lesser importance than the functional result achieved by the tray ribs 25, namely, providing a drainage area beneath each flower pot 50 so that on the off portion of the cycle the underneath portion of each flower pot 50 may dry completely.

Referring now more specifically to FIG. 3, it will be seen that each tray bottom 28 is provided with a wick 30 which is in hydraulic communication with the water resting in the bottom of the tray 15 on the bottom 28 and spaced from the flower pots 50 by the ribs 25. The wick 30 is formed in a generally rectangular configuration as shown in FIG. 5 and cut from a porous type plastic material which is selected for its good capillary action for soaking up and delivering the water in the bottom of the tray 28 to the shelf or tray therebeneath when the water level for irrigation is predetermined by the irrigation ridge 31. Optionally, particularly as illustrated in FIG. 6, an irrigation tube 32 may be provided beneath the wick 30 to serve the twofold purpose of providing the irrigation ridge 31 at its upper portion, and confining the water which is delivered downwardly by means of the open mouth at the bottom of the irrigation tube 32.

An overflow 35, as will be noted in FIG. 3, is provided in the form of an upstanding tube which extends above the tray bottom 28 a distance somewhat in excess of the height of the irrigation ridge 31. As illustrated in FIG. 3, the overflow outlet 35 is connected with an overflow tube 36 with an overflow outlet at its lower portion, positioned immediately above the tray 15 beneath the tray in which the overflow 35 is fixed. The purpose of the overflow is to insure that in the unlikely event that one of the wicks 30 becomes clogged, and fluid cannot pass through the irrigation tube 32, that the overflow water will drain down into the tray therebeneath and not flood the clogged tray 15 wherein the overflow 35 is positioned. Optionally, the wick 30 may be extended to surround the overflow 35, and therefore the overflow 35 serves as an anchor for positioning the wick 30 in combination with the ridge 31.

Particularly as noted in FIG. 3, it will be seen that a drain guide 40 is employed which is secured to the base of the dimple 45 provided in the central portion of the wick 30. The dimple 45, as shown in FIG. 6, is not secured to a drain guide 40, but nonetheless assists in directing the water which is picked up from the tray bottom 28 by the wick 30 into the irrigation tube 35 and thereafter to the tray below. By providing a drain guide 40, in hydraulic communication with the lower portion of the dimple 45, water will pass directly down the drain guide 40 and not splash on the tray below, thereby insuring irrigation by flooding the bottom of the flower pots and not splashing on preselected ones of the flower pots to the exclusion of another. The drain guide 40 may be formed of thread, nylon filament, or indeed of elastic material. The drain guide 40 is secured, as illustrated in FIG. 4, by an anchor on the tray 28 which is shown in the form of a screw fastener. Other anchors are contemplated, the purpose primarily being to insure a generally vertical orientation of the drain guide 40.

An alternative embodiment of the irrigation system disclosed and described above in connection with FIGS. 1 through 6 is shown in FIGS. 7, 8 and 9. For convenience and illustrating the community of relationship between the various elements, the same reference numerals will be used in describing the alternative embodiment where the parts are substantially the same. Referring now to FIG. 7, it will be seen that the flower pots 50 set atop ridges 25 on the tray bottom 28. The trays 15 have tray walls 26 running around the entire perimeter as particularly illustrated in FIG. 8. A light shelf 60 is positioned beneath each tray 15, and contains a plurality of the grow light tubes 12 oriented in planar relationship to the flower pots 50 therebeneath, to the end that the light is directed from above the plants contained in the flower pots 50 as contradistinguished from the side light source referred to in the embodiment described in connection with FIGS. 1 through 6. Because the light tray 60, as illustrated in FIG. 9, is generally rectangular and has a flat upper surface, it can be used as a basic shelf and is so used as the light shelves 60 are positioned atop the tray brackets 14. A light shelf clip 61 connects the light shelf 60 with the tray 15 in a removable relationship so that the trays can be taken off with all the flower pots 50 intact if this is desired, or otherwise removed for cleaning, replacement, and the like.

A cascade well 62 is provided preferably at the rear portion of each tray 15 as illustrated in FIG. 8. The cascade well 62 is made up by a cascade end wall 64 which is offsettingly opposed to the tray wall 26, and the cascade bottom 65 is in open communication with an extension of the tray bottom 28. The cascade side walls 66 render the cascade well 62 in hydraulic communication with the interior portion of the tray 15 and the water contained therein by means of the tray walls 26. While the cascade well 62 has been shown in FIG. 8 primarily as at the rear portion of the tray 15, it will be appreciated from the phantom lines shown about each of the side wells of the tray 15 illustrated in FIG. 8 that alternative locations for the cascade well 62 are contemplated. The desirability of locating the cascade well 62 at the rear portion is illustrated on the left-hand side of FIG. 7 where it will be seen that the cascade wells are hidden and in vertical juxtaposed relationship at the

central portion of the display bracket and in the area between the end posts 11.

Further as will be noted in FIG. 7, the cascade well 62 includes a wick 30, an irrigation ridge 31, and a dimple 45 which function similarly to the wick 30 and dimple 45 in combination with the irrigation ridge 31 as illustrated in FIGS. 1 through 6.

In operation, as set forth above, the submerged pump 21 is activated, normally with its cycle determined by a timer, both as to duration, as well as spaced periods of irrigation. The water from the reservoir 20 then proceeds upwardly through the irrigation pipe 22 to the outlet of the irrigation water 24 and thence on to the top trays 15. As the water wets the entire tray bottom 28 of the upper tray 15, the same will migrate toward the wick 30 at the central portion of the upper tray 15. The water is then soaked up by the wick 30, carried up above the irrigation ridge 31, down through the dimple 45, and along the drain guide 40 to the tray 15 below. In the event of clogging, as set forth above, an overflow 35 is provided and may be in varying forms. After the trays have all received a complement of water to a level determined by the irrigation ridge 31, the timer will turn off the submerged pump 21, and the plants in the flower pots 50 sitting atop the ridges 25 will have had an opportunity through the capillary action of the water through the hole in the bottom of the flower pot or other porous material at the bottom of the flower pot to become moist. To continue flooding the flower pots 50 would cause rot and a drowning of the plants. To this end, the wick 30 is provided at a position at a low point on the tray 15, and the water drains to this location and is soaked up by the wick 30 and delivered to the tray therebeneath in the drying process.

In a typical embodiment, the watering cycle will vary from 10 to 20 minutes, and be watered two or three times per day. A 5- to 20-gallon water charge in the reservoir 20 is sufficient. When nutrients are desirably delivered to the plants in the pots 50, the same may be added to the reservoir 20.

In review it will be seen that two embodiments of an irrigation system employed in the display rack have been disclosed. In each instance the means is provided to prevent overflow in the event of clogging, and to further soak up the water after the irrigation cycle is concluded and lead the same downwardly into a reservoir. The operation is such that the plants are watered from the bottom up, and yet not permitted to persist in standing water. In one embodiment a light shelf is shown with the light source generally oriented in a horizontal plane above the pots 50, and in the other embodiment the light members are oriented in a vertical plane. The cascading arrangement of the cascade wells as disclosed in the embodiment with the light shelves provide for continuity in flow, and an unobstructed lower portion of the support trays in combination with the light shelf.

Although particular embodiments of the invention have been shown and described in full here, there is no intention to thereby limit the invention to the details of such embodiments. On the contrary, the intention is to cover all modifications, alternatives, embodiments, usages and equivalents of a plant tray irrigation system as fall within the spirit and scope of the invention, specification and the appended claims.

What is claimed is:

1. A plant tray irrigation system comprising, in combination,

a plurality of trays formed to retain a plurality of potted plants and having a bottom and peripheral side walls surrounding the bottom to retain moisture flooded therein,

means stacking said trays one beneath the other in spaced apart relationship,

ridges in the bottom of each tray to permit water flow beneath potted plants,

a reservoir beneath the bottom one of said stacked trays,

a drain port provided in each tray for draining flooded moisture contained therein to the tray therebeneath and a reservoir below,

said drain port having a peripheral ridge to predetermine the selected level of moisture in the trays while irrigating,

wick means covering and in fluid communication with each said drain port,

and pump means in fluid communication with the reservoir and top tray for circulating the water from the reservoir to the top tray for cascade-like irrigation of all trays.

2. In the plant tray irrigation system of claim 1, wherein said wick means comprises of a capillary material formed to overlie the entire drain port and extend in fluid communication with water in the tray thereabove,

a dimple provided in the central portion of said wick and protruding downwardly through the drain port ridge to drain moisture from the tray to descend to the tray or reservoir therebeneath,

whereby, after pumping has ceased, the trays are dried by means of the dimpled wicks on each tray leading the moisture retained on the trays through the drain port and ultimately down to the reservoir.

3. In the plant tray irrigation system of claim 2 above, a drain guide secured at the base of each dimpled wick at the base of the dimple,

and means on the tray therebeneath for anchoring said drain guide to the tray therebeneath.

4. In a plant tray irrigation system of the character defined in claim 3 above,

said drain guide being formed of a linear-like material such as thread or nylon filament, and stretched in generally vertical orientation from the base of the dimpled wick on the tray above to the anchor means on the tray below.

5. In the plant tray irrigation system of claim 4 above, said drain guide being formed of a taut elastic material to assist in the maintenance of the dimpled center of each dimpled wick.

6. In the plant tray irrigation system of claim 2 above, an overflow port formed in the base of each tray bottom and having a ridge about its periphery extending a height above each tray in excess of the height of the ridge about the drain port.

7. In the plant tray irrigation system of claim 3 above, said plant tray being generally rectangular in configuration with a long axis at least twice the width of the unit,

an offset portion along one long edge of said tray containing the wick, drain port, and dimpled portion of the wick,

each tray positioned therebeneath having a corresponding offset portion to receive the water cascading from one tray down to the next, and means secured to and depending from the side walls of said trays for securing a light source beneath the bottom of each of the trays, whereby the irrigation system proceeds in a dimensionally offset relationship to the trays and light source therebeneath thus providing for full lighting of each tray in plane projection uninhibited by the irrigation system elements.

8. In the plant tray irrigation system of claim 1 above, an overflow port formed in the base of each tray bottom and having a ridge about its periphery extending a height above each tray in excess of the height of the ridge about the drain port.

9. In the plant tray irrigation system of claim 1 above,

said plant tray being generally rectangular in configuration with a long axis at least twice the width of the unit, an offset portion along one long edge of said tray containing the drain port, each tray positioned therebeneath having a corresponding offset portion to receive the water cascading from one tray down to the next, and means secured to and depending from each tray for securing a light source beneath the bottom of each of the trays, whereby the irrigation system proceeds in a dimensionally offset relationship to the trays and light source therebeneath thus providing for full lighting of each tray in plane projection uninhibited by the irrigation system elements.

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