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(54) Title: A COLLAPSIBLE VERTICAL HYDROPONICS ASSEMBLY

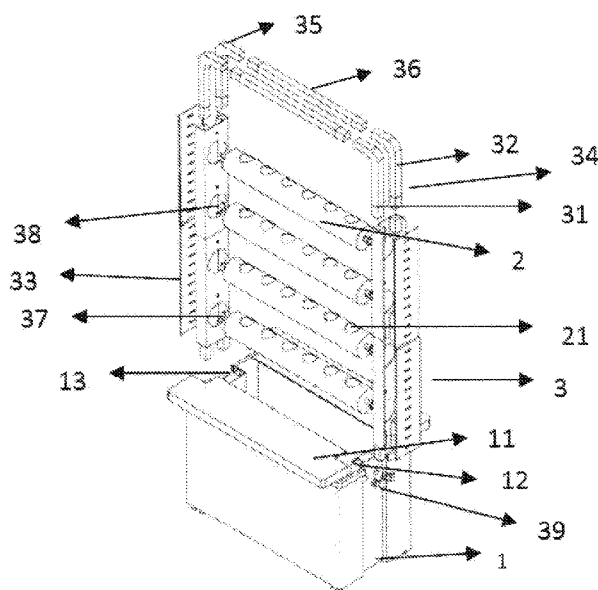


Figure 1

(57) Abstract: A hydroponic growing system comprising of a plurality of tubular elements (2) capable of holding plane and/or plant pots, a box (1), and a collapsible mechanism (3) for holding the plurality of tubular elements (2) such that in the collapsed state the collapsible (3) mechanism and tubular elements are compactly placed in the box (1). The collapsible mechanism is a combination of vertical bars (31, 32) and holding elements preferably in the form of hooks (37) which hold the plurality of tubular elements (2) in horizontal orientation such that in collapsed state the collapsible mechanism (3) along with the tubular elements (2) is capable of being placed inside the box (1). In upright state the collapsible mechanism (3) stands erected over the above surface (11) of the box with tubular elements (2) in horizontal orientation stacked vertically above each other at substantial distance from each other.

OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA,
SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN,
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A COLLAPSIBLE VERTICAL HYDROPONICS ASSEMBLY**Field of invention**

This invention relates to compact stackable portable vertical
5 hydroponic rack system which can be easily stacked into a
compact box for transporting from one place to another.

Background of invention

Hydroponics has been known in the art for long for growing
plants in soil less conditions. In this method plants are
10 grown in a mineral nutrient solution in water, without soil.
Methods for soil less conditions for plant culture have been
known and have been actively used since 18th century.

However recently hydroponics is being used for aesthetically
growing plants due to paucity of space in urban dwelling
15 areas. With the advent of high rise buildings hydroponics has
become a preferred choice for green landscaping within and
outside living areas.

However classic tank shaped designs and or structures of
hydroponics demanded more space, therefore vertical structures
20 of hydroponics employing multilevel structures were developed
and are known in the art.

US 4255896 discloses a hydroponic plant growing apparatus
wherein a nutrient enriched liquid is flowed within a series
of ducts adapted to mount a plurality of planting cups, each
25 of which supports a sterile media and a plant seedling. The
planting cup includes an aperture bottom surface which permits
capillary action of the nutrient liquid into the support media
as well as allows the root system of each plant to extend into

the duct yet isolates the sterile media from direct flow contact with the nutrient liquid. The individual plant cups eliminate contamination of the nutrient liquid, facilitate easy removal and replacement of individual plants on the apparatus, and form an effective seal with the ducts yielding a substantially hermetically sealed apparatus which is not susceptible to rain contamination, evaporation, or algae growth. The Hydroponic as disclosed herein employ a plurality of tubular elements for holding the plants.

This assembly does uses less space and resources. However a major drawback is that it is difficult to transport the structure without disassembling the whole assembly if once assembled at a place.

US 9532518 disclose a hydroponic growing system that comprises a plurality of parallel horizontal pipes, a vertical drain pipe, and a plurality of nutrient-delivering tubes. The horizontal pipes are adapted to support crops that receive nutrients from the nutrient-delivering tubes and grow in high density. The horizontal pipes have opposite first and second ends, as well as a plurality of openings along a length, and a plurality of pipe segments extending angularly from an outer surface. The vertical drain pipe has a plurality of angular pipe extensions along a length, which mate with one of the first and second ends of the horizontal pipes. The nutrient-delivering tubes have openings along a length and extend from the vertical drain pipe, branching through the pipe segments extending from the horizontal pipes.

This assembly uses less space and is ideal for rooftops or balconies, however is not compact and difficult to transport especially at heights.

US Patent publication US2012/0079765 discloses is a hydroponic growing system with increased accessibility. The hydroponic growing system comprises a chamber having support posts extending vertically from the top of the chamber to the bottom of the chamber, such that the support posts are attached with the top of the chamber and the bottom of the chamber. A plurality of racks having two ends is mounted perpendicular to the support posts. The plurality of racks extend toward the two sides of the chamber without contacting the two sides of the chamber, such that a space exists between each end of each rack and each side of the chamber. The space allows a user to easily access components of the hydroponic growing system for cleaning and repairs. The hydroponic growing system also comprises a plurality of irrigation pipes and a plurality of removable trays for growing plants.

This hydroponic though compact is still difficult to transport especially at heights.

US 20110296757 disclose a hydroponics apparatus for growing plants. The apparatus includes a frame attached to a base; the frame includes a frame member having an angled portion at an angle with respect to the base. Pluralities of substantially parallel tubes are attached to the angled portion of the frame member, so that the tubes are terraced with respect to each other. Connectors connect the tubes at the ends thereof, thereby forming a single serpentine path for fluid flow. A reservoir is connected to an end of the lowermost tube, for collecting fluid flowing from the tubes. A pump is provided for pumping the fluid into the tubes. In various embodiments, the angled portion of the frame member is at an angle of approximately 45° elevation with respect to the base, and the tubes have netpots for holding the plants. However transport

of such structures from one place to other and transporting them on heights such as balconies or rooftops of high rise buildings still remained a major problem.

In order to overcome these drawbacks a compact collapsible vertical hydroponics rack assembly has been developed and is being disclosed.

Summary of invention

This invention relates to compact stackable portable hydroponic rack system which can be easily stacked into a compact box for transporting from one place to another.

The hydroponics assembly of present invention is a combination of vertical bars forming a collapsible mechanism which holds a plurality of tubular elements. The tubular elements can move through the entire vertical length of the bars through holding elements which are capable of moving on or between the bars. The collapsible mechanism is such that in collapsed state the mechanism along with the tubular elements rests inside the box and therefore can be easily transported from one place to another and also can be easily transported to height manually or through lifts. In collapsed state the tubular elements are stacked above each other.

In a preferred embodiment of the present invention the box (1) is rectangular in shape.

In an embodiment of present invention the box (1) has an upper surface in the form of a movable lid(11) capable of sliding over the upper edges of the box(1).

In another embodiment of the present invention the lid (11) is a single unit capable of sliding in one direction such that in

closed state the lid forms the upper surface (11) of the box, in open state the lid slides to one direction such that the cavity of the box(1) is open for receiving the collapsible mechanism(3).

5 In yet another embodiment of the present invention the lid (11) of the box is a two part unit such that the two parts divide the upper surface through the central axis of the upper side of the box. The two part lid is capable of sliding in opposite directions, such that in closed state two parts of
10 the lid form upper surface (11) of the box, however in open state the two parts of the lid slide into opposite directions such that the cavity of the box is open for receiving the collapsible mechanism(3).

In an embodiment of present invention the box(1) has slots(12)
15 through side walls on two opposite sides of the box(1) for receiving the bars(31,32) in collapsed state. The slots (12) are formed through the side wall such that the upper end of the slot (12) forms an aperture (13) on the upper surface (11) of the box. The slots (12) are capable of holding the bars
20 (31, 32) of the assembly when the collapsible mechanism (3) is in collapsed state.

In an embodiment of this invention the tubular elements (2) are held between the side bars through holding elements (37).

In yet another embodiment of invention, the tubular elements
25 (2) are held in between the bar pairs(34) by hooks(37).

In yet another preferred embodiment of present invention the hooks (37) are capable of rotating on their own axis.

In yet another embodiment of present invention the hooks (37) are preferably T shaped or L shaped.

In yet another preferred embodiment of present invention the hooks (37) are capable of moving on /or between the vertical bar (31, 32) and/or bar pair (34).

5 In yet another of preferred embodiment of present invention the hooks (37) in their horizontal orientation hold the attached tubular elements (2) at a position between the vertical bar pair (34).

10 In yet another embodiment of present invention, the hooks (37) in their vertical orientation are capable of moving through the vertical length of the bar pair (34) in the in the in-between space of the parallel bars (31,32) of each bar pair(34).

15 In yet another preferred embodiment of present invention when the collapsible mechanism(3) is in collapsed state, the tubular elements(2) are stacked over each other by the hooks(37) twisted in vertical orientation between the vertical bar pairs(34).

20 In yet another preferred embodiment of present invention when the collapsible mechanism (3) is in upright state, the tubular elements (2) are stacked over each other by the hooks(37) twisted in horizontal orientation between the vertical bar pairs(34).

25 In another embodiment of present invention in collapsed state the bars along with the tubular elements (2) are capable of being placed inside the rectangular box (1) and each vertical bar pair(34) are placed in their respective slots(12) on each side of the box(1).

In yet another embodiment of present invention, the box (1) is rectangular in shape and has slots (12) for holding parallel

bar pair (34) at each of its two opposite sides, such that the opening of the slots states apertures (13) on the upper surface of the box. The upper surface (11) is a two part lid which slides in opposite directions to open the cavity of the box. The side walls of the box have hook shaped supporting elements (39) for supporting the bars over the upper surface of the box when the collapsible mechanism is in upright state.

In yet another embodiment of the present invention the collapsible mechanism can hold a plurality of tubular elements (2) which have a plurality of openings for holding plants and/or plant pots (21).

In yet another embodiment of present invention the collapsible mechanism (3) comprises of two vertical bars (31, 32), capable of moving through apertures (13) available through the upper surface and slots (12) available through side walls, of the box. The bars are held parallel to each other on two opposite sides of the box such that in upright state the bar pair(34) on each side of the box are parallel to and face each other ,the bar pair on each side of the box hold the tubular elements between them in horizontal orientation through hooks (37)which are capable of rotating on their own axis such that the hooks(37) ,which in their horizontal orientation hold the attached tubular elements at a position between the vertical bar pair(34),and in their vertical orientation are capable of moving through the vertical length in the in between space of the parallel bars of each bar pair(34).

In yet another embodiment of present invention the vertical bar pairs (34) are joined by removable joinder bar(35) and a horizontal bar(36) to state an inverted U shaped frame over the box when held in upright position over the box.

In yet another embodiment of present invention the bar pairs are covered on both sides by an opaque, transparent and or translucent covering (33) which has circular apertures (38) which capable of receiving the tubular elements for providing an
5 aesthetic sense to the hydroponics assembly.

Brief Description of the Drawings

Other objects, features, and advantages of the invention will be apparent from the following description when read with
10 reference to the accompanying drawings. In the drawings, wherein reference numerals denote corresponding parts throughout the several views:

Figure 1 illustrates an exemplary embodiment of the present invention wherein the collapsible mechanism is in upright
15 state

Figure 2 illustrates the back view of a preferred embodiment of present invention wherein the collapsible mechanism is in upright state

Figure 3 illustrates the side view of a preferred embodiment
20 of present invention wherein the collapsible mechanism is in upright state

Figure 4 illustrates the side of a preferred embodiment of present invention wherein the collapsible mechanism is in collapsed form and stacked inside the box.

25 Description

The invention relates in particular to a vertical hydroponics growing system. The invention has been conceptualized keeping

in mind the need of a compact hydroponic system which is easy to transport, takes less space, and can be easily transported at heights.

The hydroponic growing system comprises of tubular elements(2) capable of holding plants and or plant pots, a box(1), and a collapsible mechanism (34) for holding plurality of said tubular elements(2) such that in the collapsed state the collapsible mechanism and tubular elements are compactly placed in the box(1). Alternatively, the tubular elements (2) may be such that they can hold plant pots. The tubular elements (2) may be hollow and have a plurality of openings (21) for holding the plant pots or plants.

The collapsible mechanism (3) is a combination of vertical bars (31,32) and holding elements(37) which hold a plurality of tubular elements(2) in horizontal orientation such that in collapsed state the collapsible mechanism(34) along with the tubular elements(2) is capable of being placed inside the box(1). In upright state the collapsible mechanism (34) stands erected over the above surface (11) of the box with tubular elements (2) in horizontal orientation stacked vertically above each other at substantial distance from each other.

The tubular elements (2) are held through the collapsible mechanism (3). The collapsible mechanism (3) is capable of being placed in the box (1) in collapsed state. In collapsed state the tubular elements (2) are stacked over each other with no space between them so that they can be compactly placed inside the box (1) and can be transported with ease. In upright state the tubular elements (2) are vertically held at positions on the bar pairs such that there is substantial space between them which can support plants and /or plant pot.

The collapsible mechanism (3) comprises of vertical bars (31,32) on two opposite sides of the box such that both bars are held parallel to each other at a substantial distance from each other when the mechanism is in upright state. The bars
5 (31,32) hold the tubular elements (2) between them preferably in horizontal orientation.

The tubular elements (2) are held through holding elements (37) on the bars (31, 32). The holding elements (37) are capable of moving along the vertical length of the bars (31, 32) and therefore are capable of moving the tubular elements
10 (2) through the vertical length of the bars (31, 32). In collapsed state the bars rest along the side wall of the box (1). In upright state the bars are held over the above surface (11) of the box (1).

15 In a preferred embodiment of present invention the collapsible mechanism (3) comprises of a pair of two parallel vertical bars(31,32) held at substantial distance from each other which form a bar pair (34) on two opposite sides of the box such that both bar pairs(34) are held parallel to each other when
20 the mechanism is in upright state. The bar pairs (34) hold the tubular elements (2) between them preferably in horizontal orientation.

In collapsed state the bars (31,32) rests along the side wall of the box(1). In upright state the bar pairs (34) are held
25 over the above surface of the box through supporting elements (39). The supporting elements (39) are fixed on the side wall of the box preferably protruding outwards just below the upper edge of the box (1). The box (1) of present invention can be polygonal in shape. The vertical bar pairs(34) may be joined

by removable bars to form polygonal shapes capable of being placed in the box(1).

The invention is further described below non-limiting embodiments. These embodiments are meant only for illustration
5 and do not limit the scope of the invention.

In a preferred embodiment of the present invention the box (1) is rectangular in shape.

In an embodiment of present invention the box (1) has an upper surface in the form of a movable lid(11) capable of sliding
10 over the upper edges of the box(1).

In another embodiment of the present invention the lid (11) is a single unit capable of sliding in one direction such that in closed state the lid forms the upper surface (11) of the box, in open state the lid slides to one direction such that the
15 cavity of the box(1) is open for receiving the collapsible mechanism(3).

In yet another embodiment of the present invention the lid (11) of the box is a two part unit such that the two parts divide the upper surface through the central axis of the upper
20 side of the box. The two part lid is capable of sliding in opposite directions, such that in closed state two parts of the lid form upper surface (11) of the box, however in open state the two parts of the lid slide into opposite directions such that the cavity of the box is open for receiving the
25 collapsible mechanism(3).

In an embodiment of present invention the box(1) has slots(12) through side walls on two opposite sides of the box(1) for receiving the bars(31,32) in collapsed state. The slots (12) are formed through the side wall such that the upper end of

the slot (12) forms an aperture (13) on the upper surface (11) of the box. The slots (12) are capable of holding the bars (31, 32) of the assembly when the collapsible mechanism (3) is in collapsed state.

- 5 In an embodiment of this invention the tubular elements (2) are held between the side bars through holding elements (37).

In yet another embodiment of invention, the tubular elements (2) are held in between the bar pairs(34) by hooks(37).

- 10 In yet another preferred embodiment of present invention the hooks (37) are capable of rotating on their own axis.

In yet another embodiment of present invention the hooks (37) are preferably T shaped or L shaped.

- 15 In yet another preferred embodiment of present invention the hooks (37) are capable of moving on /or between the vertical bar (31, 32) and/or bar pair (34).

In yet another of preferred embodiment of present invention the hooks (37) in their horizontal orientation hold the attached tubular elements (2) at a position between the vertical bar pair (34).

- 20 In yet another embodiment of present invention, the hooks (37) in their vertical orientation are capable of moving through the vertical length of the bar pair (34) in the in the in-between space of the parallel bars (31,32) of each bar pair(34).

- 25 In yet another preferred embodiment of present invention when the collapsible mechanism(3) is in collapsed state, the tubular elements(2) are stacked over each other by the

hooks(37) twisted in vertical orientation between the vertical bar pairs(34).

In yet another preferred embodiment of present invention when the collapsible mechanism (3) is in upright state, the tubular
5 elements (2) are stacked over each other by the hooks(37) twisted in horizontal orientation between the vertical bar pairs(34).

In another embodiment of present invention in collapsed state the bars along with the tubular elements (2) are capable of
10 being placed inside the rectangular box (1) and each vertical bar pair(34) are placed in their respective slots(12) on each side of the box(1).

In yet another embodiment of present invention, the box (1) is rectangular in shape and has slots (12) for holding parallel
15 bar pair (34) at each of its two opposite sides, such that the opening of the slots states apertures (13) on the upper surface of the box. The upper surface (11) is a two part lid which slides in opposite directions to open the cavity of the box. The side walls of the box have hook shaped supporting
20 elements (39) for supporting the bars over the upper surface of the box when the collapsible mechanism is in upright state.

In yet another embodiment of the present invention the collapsible mechanism can hold a plurality of tubular elements (2) which have a plurality of openings for holding plants
25 and/or plant pots (21).

In yet another embodiment of present invention the collapsible mechanism (3) comprises of two vertical bars (31, 32), capable of moving though apertures (13) available through the upper surface and slots (12) available through side walls, of the

box. The bars are held parallel to each other on two opposite sides of the box such that in upright state the bar pair(34) on each side of the box are parallel to and face each other ,the bar pair on each side of the box hold the tubular elements between them in horizontal orientation though hooks (37)which are capable of rotating on their own axis such that the hooks(37) ,which in their horizontal orientation hold the attached tubular elements at a position between the vertical bar pair(34),and in their vertical orientation are capable of moving through the vertical length in the in between space of the parallel bars of each bar pair(34).

In yet another embodiment of present invention the vertical bar pairs (34) are joined by removable joinder bar(35) and a horizontal bar(36) to state an inverted U shaped frame over the box when held in upright position over the box.

In yet another embodiment of present invention the bar pairs are covered on both sides by an opaque, transparent and or translucent covering (33) which has circular apertures (38) which capable of receiving the tubular elements for proving an aesthetic sense to the hydroponics assembly.

Claims:

1. A hydroponic growing system comprising of a plurality of tubular elements(2) capable of holding plant and /or plant pots, a box(1), and a collapsible mechanism(3) holding the plurality of tubular elements through a plurality of holding elements characterizes in that, in the collapsed state the collapsible mechanism (3) along with the tubular elements(2) are compactly placed in the box(1).
2. The system as claimed in claim 1, wherein the box(1) is a rectangular box, capable of holding the collapsible mechanism(3), said box(1) having slots(12) through side walls on two opposite sides of the said box(1) such that the upper end of the slot(12) forms an aperture on the upper surface(1) through the side walls of the box and said box having a movable upper surface(11) capable of sliding over the upper edges of the box.
3. The system as claimed in claim 1 and 2, wherein the collapsible mechanism(3) comprises of two vertical bars(31,32), capable of moving through apertures available through the upper surface(11) and slots(12) available through side walls of the box(1), are held parallel to each other at substantial distance from each other, on two opposite sides of the box(1) to form a bar pair(34) on each side of the box (1) such that in upright state the bar pair(34) on each side of the box are parallel to and face each other, the bar pair(34) on each side of the box hold the tubular elements(2) between them in horizontal orientation through hooks(37) which are capable of

rotating on their own axis such that the hooks , in their horizontal orientation hold the attached tubular elements(2) at a position between the vertical bar pair(34), in their vertical orientation are capable of moving through the vertical length in the in between space of the parallel bars(31,32) of each bar pair(34).

4. The system as claimed in claim 3, wherein in the collapsed state the tubular elements (2) are stacked over each other by the hooks (37) held in vertical orientation between the vertical bar pairs(34) and are capable of being placed inside the rectangular box(1) and each vertical bar pair(34) are placed in their respective slots(12) on each side of the box(1).

5. The system as claimed in claim 3, wherein in upright state the vertical bar pair(34) are held upright over the edges of upper surface of the box and the plurality of tubular elements(2) in horizontal orientation are held vertically one above the other maintaining substantial space between them.

6. The system as claimed in claim 3, wherein the hooks (37) are preferably T shaped or L shaped.

7. The system as claimed in claim 3, wherein the vertical bar pairs(34) are joined by removable bars to state polygonal shapes capable of being placed in the box.

8. The system as claimed in claim 3, wherein the vertical bar pairs(34) are joined by removable joinder bar(35) and

a horizontal bar(36) to state an inverted U shaped frame over the box when held in upright position over the box.

5 9. The system as claimed in claim 3, wherein the side walls preferably have a supporting element (39) capable of holding the vertical bars in upright position over the upper surface of the box.

10 10. The system as claimed in claim 2, wherein the upper surface (11) of the box is a two part lid capable of sliding in opposite direction, such that in closed position two parts of the lid form upper surface of the box (11), in open position the two parts of the lid slide into opposite direction such that the cavity of the box
15 is open through the central axis of the upper side of the box.

20 11. The system as claimed in claim 2, wherein the upper surface (11) of the box is a lid made of single unit capable of sliding in one direction such that in closed state the lid forms the upper surface of the box, in open position the lid slides to one direction such that the cavity of the box is open.

25 12. The system as claimed in claim 1, wherein the tubular elements (2) are hollow and have a plurality of openings(21) for holding the plants.

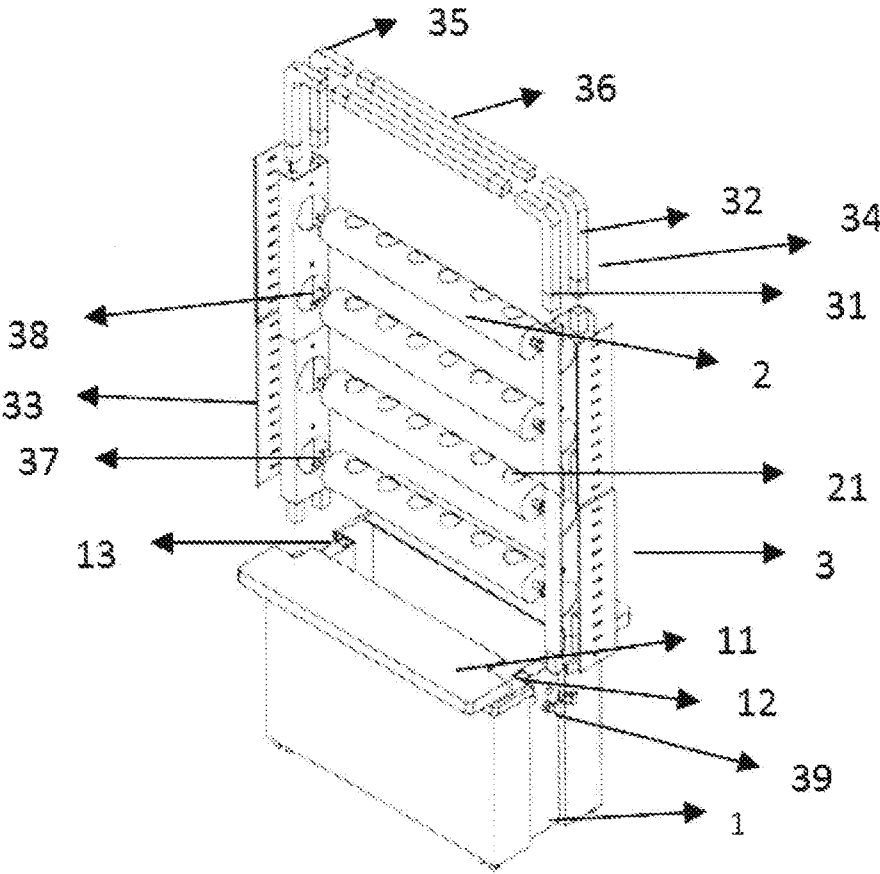


Figure 1

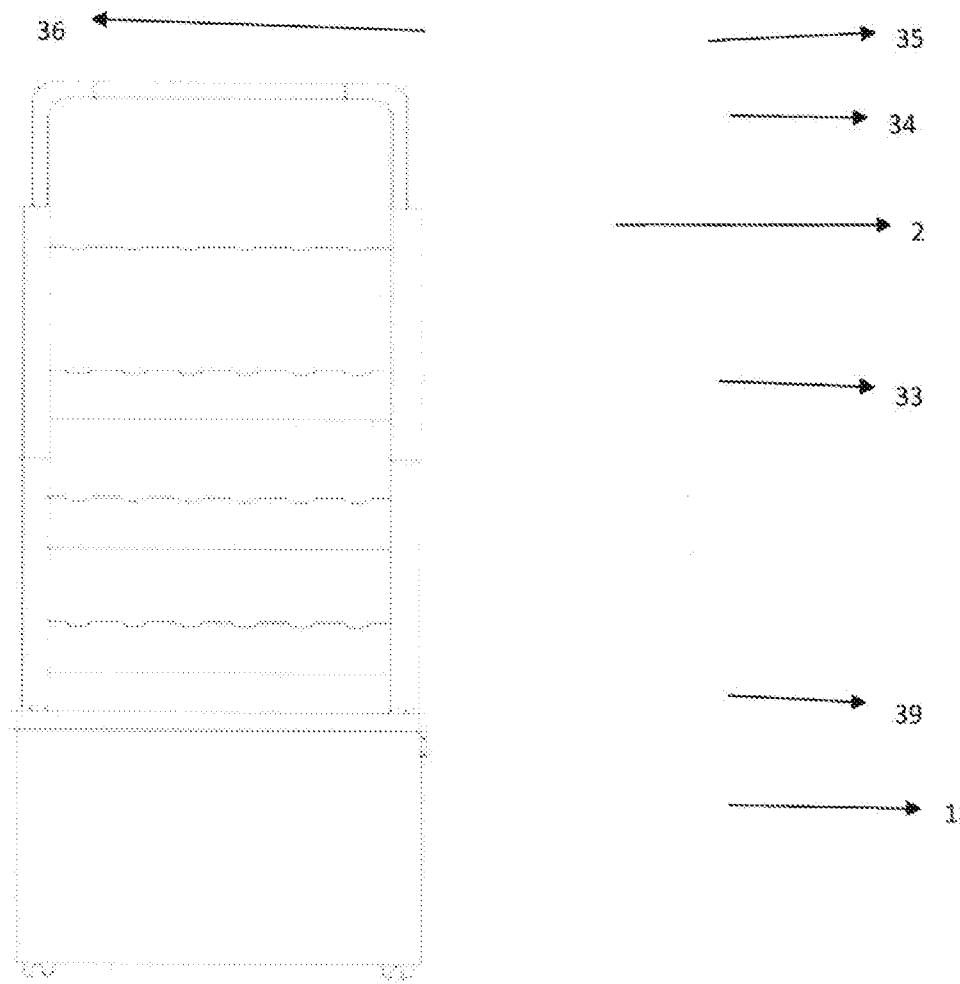


Figure 2

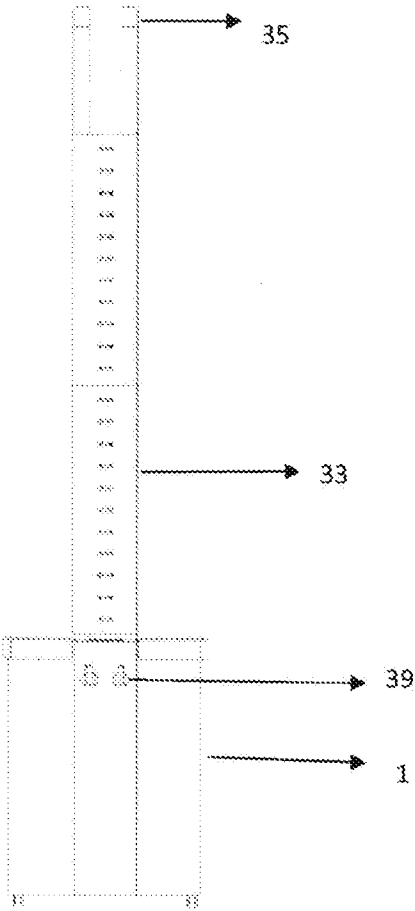


Figure 3

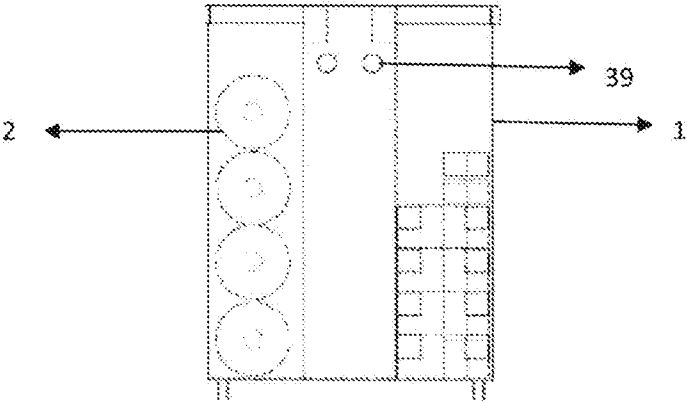


Figure 4

INTERNATIONAL SEARCH REPORT

International application No.
PCT/MY2018/000021

A. CLASSIFICATION OF SUBJECT MATTER

A01G 31/06 (2006.01)

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

PATENW, Google Patents, Espacenet: IPC/CPC A01G31/02/LOW, Y02P60/216/LOW and keywords hydroponics, system, kit, assembly, modular, collapsible, telescopic, extendable, retract, compact, portable, transport, improved, box, crate, container, storage, plant, basket, pot, and like terms Google Patents, Google: keywords as above. Applicant/Inventor name search in the above databases and Internal databases provided by IP Australia.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
	Documents are listed in the continuation of Box C	



Further documents are listed in the continuation of Box C



See patent family annex

* "A"	Special categories of cited documents: document defining the general state of the art which is not considered to be of particular relevance	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
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"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
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Date of the actual completion of the international search
6 August 2018

Date of mailing of the international search report
06 August 2018

Name and mailing address of the ISA/AU

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INTERNATIONAL SEARCH REPORT		International application No.
C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		PCT/MY2018/000021
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2016/0066525 A1 (DUQUESNAY et al.) 10 March 2016 Whole document	1-12
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X	Opcom Farm – GrowBox/GrowWall Intro [retrieved from the internet on 1/8/2018] <URL: https://www.youtube.com/watch?v=r55LYkHjEY > published on 16/11/2016 Whole document	1 and 12
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