

AN AUTOMATIC PLANTING ASSEMBLY FOR PERIODICAL MULTIPLE SEEDLINGS CULTIVATION

FIELD OF THE INVENTION

- 5 This invention is in the field of seedlings germinating and planting assembly, and in particular, related to automatic system to germinate seedlings and seedlings planting which is environmental friendly, and efficiently plant growth.

BACKGROUND OF THE INVENTION

- 10 In view of the continuous advancement and development of science and technology, such development causes a great impact on all walks of life, in particular, in the field of plant cultivation, through technological innovation; the process of plant cultivation can be achieved by way of intelligent devices, which subdues the traditional methods of cultivation. Under such intelligent method of cultivation, plants are no longer restricted by environmental factors, their growth cycle has also been altered, and the efficiency of seedling germinating has been
- 15 greatly improved. As a result of such improvement, the system for the planting of the cultivated seedling has also been improved to nearly perfection.

- Currently available plant cultivation equipment in general has low efficiency and is restricted by the environment, and must be cultivated according to the growth cycle of plants. In addition, there is only one single way of cultivation method which requires more manual operations,
- 20 and is not able to realize intelligent controlled way of cultivation, thus the yields and output of cultivation are greatly restricted.

- In soil-less culture, plants are cultivated using a liquid solution of water and nutrients. Due to environmental pollution and climatic conditions, some farming methods to plant organic plants are becoming lesser healthy, and it is important to expedite the growth of plants, and its growth
- 25 can be effectively monitored and controlled.

- US Patent No. 5,119,588 discloses plant material being embedded in a plug of particulate medium having soil-like properties. The plug and plant material are then placed in a bag which is preferably made of a material which allows the passage of light and gases necessary for plant growth and development from the ambient environment to the interior of the bag. The
- 30 bag preferably also passes water vapor at a slow rate from the interior of the bag to the ambient environment for humidity control inside the bag.

US20040020110A1 discloses an apparatus for transplanting plants from containers with small cavities to containers with large cavities, comprising: first transport means for supplying and removing containers with small cavities; second transport means for supplying and removing containers with large cavities; a moving and gripping device with a first movable gripper for gripping the plants in the container with the small cavities, transporting the plant to the containers with the large cavities and locating the plants in the large cavities, characterized in that the moving and gripping device comprises at least a second gripper, wherein the first and the at least second gripper are located on the same carrier, which carrier is movable between a position above the first transport means and a position above the second transport means.

10 The apparatus does not provide transplanting from one level to another level.

European Patent EP2944187A1 discloses a plant cultivation apparatus comprising: cultivation trays that hold plants; a plurality of cultivation shelves that store said cultivation trays; transport means for transferring said cultivation trays; and spraying means for spraying a spray liquid on leaf surfaces of the plants held on said cultivation trays, wherein said spraying means is arranged on a transfer path or at a transfer destination of each of said cultivation trays transferred by said transport means, and includes a separator that forms a partitioned-off space above said cultivation tray, and a spray nozzle that sprays a spray liquid toward interior of the space formed by said separator.

Japanese Patent Application Laid-open No. 2000-209970 discloses a plant cultivation apparatus having a plurality of cultivation trays that hold plants, a plurality of cultivation shelves that store the cultivation trays, and transport means for transferring the cultivation trays, wherein an irrigation mechanism is provided for automatically delivering a cultivation liquid containing nutrients or the like to the cultivation trays.

SUMMARY OF THE PRESENT INVENTION

It is therefore a main object of the present invention is to provide an automatic planting system for periodical multiple seedlings cultivation, which can overcome the shortcomings of currently available method and equipment, such as low efficiency in the course of application and the equipment is subject to environmental constraints. The drawbacks include failing to allow cultivation according to the growth cycle of plants. In addition, the cultivation method is one way cultivation which needs a lot of manual operations, and intelligent controlled of the cultivation of plants cannot be realized, and thus the stability of yield is restrictive.

The objective of the present invention can be achieved by way of the following technical solutions: an automatic planting system with periodical multiple seedlings cultivation, including a main frame structure connected with a main water pipe, and within the main frame structure,

located a plurality of planting boxes; a water storage tank is provided at the bottom of the interior of the main frame structure and having one lateral side being connected with a drainage pipe; one side of the drainage pipe is connected with a water treatment device, and the outer wall of the water treatment device is connected a water inlet pipe. An elevating device is each installed on the left and right side of the outer side of the main frame structure, and one side of the outer wall of the planting box is connected with a liquid capillary. The bottom of the outer wall of the planting box is provided with a limiting block, and a roller is provided to the outer wall of the limiting block, and the bottom of the roller is installed with a guide rail, a water outlet is provided at the bottom of the planting box, and below the water outlet is provided with a water discharge trough. The inner wall of the main frame structure is provided with an AI lighting module, and the front end of the main frame structure is provided with an independent AI control module.

An object of the present invention is to provide an automatic planting system for periodical multiple seedlings cultivation, characterized in that the planting box includes a handle on the surface of the planting box, a floating plate limiting block, an inner chamber, drainage holes, a groove, a baffling groove, a floating plate, a planting hole and a base, and the inner wall of the planting box is provided with a floating plate limiting block, and the inner chamber is installed on the inner side of the floating plate limiting block, and the inner wall of the inner chamber is provided with two drainage holes, one of the two drainage holes is for the water outlet and the other is for water drainage. On one lateral wall of the inner chamber there is provided with a recess, and the surface of the inner chamber is provided with the baffling grooves, the upper surface of the planting box is provided with the floating plate, and the surface of the floating plate is provided with the planting holes. The bottom of the planting box is the base.

Yet another object of the present invention is to provide an automatic planting system for periodical multiple seedlings cultivation characterized in that the external of the inner chamber matches the internal structure of the planting box, and the planting holes are evenly and equidistantly distributed with respect to the surface of the floating plate.

Still a further object of the present invention is to provide automatic planting system for periodical multiple seedlings cultivation characterized in that UVC germicidal lightings and a filter core are arranged inside the water treatment device, and the filter core is installed on one side of the UVC germicidal lighting.

Yet still a further object of the present invention is to provide automatic planting system for periodical multiple seedlings cultivation characterized in that the water treatment device and the UVC germicidal lightings are connected, and the UVC germicidal lightings are

symmetrically distributed about the horizontal center line of the water treatment device which is connected to the filter core.

Still another object of the present invention is to provide automatic planting system for periodical multiple seedlings cultivation characterized in that the surface of the elevating device includes a support plate, a rotating wheel and a push rod, the upper and lower side of the inside of the elevating device are equipped with a rotating wheel, and the push rod is mounted to the interior of the elevating device lifting .

Still yet a further object of the present invention is to provide automatic planting system for periodical multiple seedlings cultivation characterized in that the rotating wheel and the elevating device cooperate with each other to form a rotating structure, and the supporting plate is evenly arranged on the surface of the elevating device.

Yet another object of the present invention is to provide automatic planting system for periodical multiple seedlings cultivation characterized in that the AI lighting module includes a silica gel covering surface, an LED plant growth lighting, an aluminum substrate, and an aluminum heat sink, and the inner wall of the aluminium heat sink is provided with an LED plant growth lighting, and the surface of the outer wall of the aluminum substrate is bonded with the silica gel covering surface.

Yet another object of the present invention is to provide automatic planting system for periodical multiple seedlings cultivation characterized in that the LED plant lightings are uniformly arranged along the horizontal direction of the AI lighting module, and the external shape of the silica gel covering surface is rectangular in shape.

Yet another further object of the present invention is to provide automatic planting system for periodical multiple seedlings cultivation characterized in that the planting system includes the following:

an independent AI control module (4), a central control module; an user terminal, and a monitor module, wherein

(a) the independent AI control module (4) is provided with transponders for temperature, humidity, CO₂ and water level, EC value, and the signals that collected by the transponders are timely wirelessly sent to the central control module, and the central control panel is provided with a control panel which can independently control the lighting and irrigation system of the production line, and also can timely access current utility usage data, and able to simplify evaluation of obstacles of the equipment, and to send the obstacles when the obstacles are sensed to the central control center module via wireless; (b) wherein the central control module

collects the signals and data from the transponders, and analyse the signal and the data to adjust humidity, temperature and CO₂ concentration so as to timely control and monitor the growth of plants; (c) wherein the user terminal includes the mobile phone or portable computer which can link to the central control module via wireless and the user can check the plant growth from the display of the pc or mobile display, and at the same time, via the terminal to monitor or to adjust the operation status of the adjusting system so as to satisfy the growth requirements of varies kinds of plants, and (d) a monitoring module, a drone is used to collect the data of the plant growth and analyse the data so as to monitor and control the status of growth of the plants.

10 The present invention relates to an automatic planting assembly for periodical multiple seedlings cultivation and the planting assembly, wherein the planting box is installed on the elevating device and under the LED intelligent lighting module. Plants are grown in different stages, through the independent intelligent control module to dynamically adjust a variety of color combinations to meet the needs of different spectrum and light intensity for plants in
15 different growth periods, so as to achieve better plant appearance, color saturation, higher nutritional value, and to increase yield and the storage time is longer, and the AI lighting module is transmitted to different positions through the plant elevating device, and is transferred to the elevating device during the final harvest, and the final harvesting is carried out through the elevating device. A nutrient solution module and a nutrient solution recovery
20 processing module are assembled in the elevating device. The AI control module is located in the front of the elevating module. The central control module can collect and control data of the independent intelligent control module. The central control module and monitoring module can monitor the plant growth environment in the plant box in real time.

In accordance with the present invention, the number of planting holes on the floating plate
25 can be designed according to the size of the seedlings; the bottom of the planting box has a fixed water level limiting device and water outlet holes, suitable for deep water cultivation; if a substrate is needed for cultivation, just remove the floating plate and the inner chamber, and replace them with a flower pot of suitable size, and place the flower pot at the bottom of the planting box. The inner chamber of the planting box contains a baffling groove which is
30 suitable for shallow water cultivation, and the baffling grooves can increase the internal circulation time of the nutrient solution in the planting box, and also increase the oxygen content of the nutrient solution, so that the roots of the plant can fully absorb the nutrient elements in the nutrient solution and promote root development.

In accordance with the present invention, the planting system is equipped with a water
35 treatment device, and the water discharged through the drain hole flows back to the water

storage tank through the water treatment device. The water treatment device has a UVC germicidal light and a filter element, which can effectively remove mosses in the nutrient solution by filtration so as to prevent bacteria from growing; the special designed planting system can install the water supply and drainage system on the same side of the main frame structure, which is more conducive to maintenance and monitoring.

In accordance with the present invention which has the elevating device, which uses a double-track chain to lift, and is equipped with a multiple sets of pallets to support the placement of the planting box. By comparing the present elevating device with the traditional lifting platform, the traditional lifting module can only collect one layer of planting box, whereas the elevating device of the present invention can receive multi-layer planting boxes at the same time, thus greatly improves the automation efficiency of the system.

In accordance with the present invention, the system is equipped with an AI lighting module, using aluminum structure for heat dissipation and aluminum substrate, using high-transmitting silica gel for waterproofing, and using the high-performance LED plant growth lights with multiple wavelengths as the lighting source can dynamically adjust a variety of color combinations to meet the needs of different spectrum and light intensity for plants in different growth periods, so as to achieve better plant appearance, color saturation, higher nutritional value, higher yield, and preservation for a longer period of time.

In accordance with the present invention, the main frame structure is provided with a symmetrically fixed limiting block on the outer wall of the bottom end of the planting box, which has two functions. One of the functions is to restrict the planting box to a guide rail and transmit the box to a fixed position or receive the planting box by a lifting module. Another function is that the limiting block leaves a space for an intelligent robot control car, which can use agv programming to control the horizontal fixed point movement of the planting box or send it to the receiving position of the elevating device.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevation view of the main frame structure of the planting assembly in accordance with the present invention, wherein a water treatment device is located one lateral side of the elevating device.

FIG. 2 is the front elevation view of the elevating device within the main frame structure of the planting assembly in accordance with the present invention.

FIG. 3 is the front elevation view of the planting box within the main frame structure in accordance with the present invention.

FIG. 4 is a side elevation view of the rollers and railing of the main frame of the planting system in accordance with the present invention.

FIG. 5 is a perspective view of the AI lighting module in accordance with the present invention.

FIG. 6 is a perspective view of the planting box in accordance with the present invention.

5 FIG. 7 is a perspective view of the inner chamber in accordance with the present invention.

FIG. 8 is a perspective view of the floating plate in accordance with the present invention.

FIG. 9 is a schematic view showing the controlling of the sensors for humidifiers, CO2 sensors, EC sensors in accordance with the present invention.

10 FIG. 10 is a schematic view of the water treatment device in accordance with the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT OF THE INVENTION

The technical details disclosed in the preferred embodiments of the present invention will be clearly and completely described below in conjunction with the accompanying drawings in the
15 present invention. It is obvious that the described embodiments are only a part of the present invention, and are not to construe as a limitation to the present invention.

In the disclosure, unless otherwise specified, "a plurality of" means two or more; the terms "upper", "lower", "left", "right", "inner", "outer" , "front", "back", "rear", etc. indicate the orientation or positional relationship based on the orientation or positional relationship shown
20 in the accompanying drawings, and are only for the convenience of describing the preferred embodiments of the present invention and is not indicated or implied that specific orientation, or must be configured in that specific orientation, and therefore cannot be understood as a limitation of the present invention. In addition, the terms "first", "second", "third", etc. are only used for descriptive purposes, and cannot be understood as a limitation.

25 In the disclosure of the present invention, it should be noted that the terms "connected" and "linked" should be understood in a broad sense unless otherwise clearly specified and limited. For example, the terms may refer to a fixed connection, detachable connection, or integrally connection; or a mechanical connection or an electrical connection; and it can be meant directly connected or indirectly connected through an intermediate medium. To those of
30 ordinary skill in the art, the specific meaning of the above-mentioned terms used in the disclosure of the present invention can be understood in construe the present invention.

Referring to FIGs. 1-10, there are drawings used to describe the preferred embodiment of an automatic planting assembly for periodic multiple seedlings cultivation in accordance with the present invention. As shown, the planting assembly (100) has a main frame structure (1), a main water pipe (2) connected to the top of the main frame structure (1), and a planting box (3) being installed inside the main frame structure (1), a water storage tank (5) installed at the bottom of the main frame structure (1), and a drainage pipe (16) connected to one side of the water storage tank (5), and a water treatment device (6) having connected to the drainage pipe (16) at one lateral side of the water treatment device (6), a water inlet pipe (15) connected to the outer wall of the water treatment device (6), the left and right side of the outer side of the main frame structure (1) each equipped with an elevating module (7), and one side of the outer wall of the planting box (3) connected with a liquid capillary tubing (8), and the outer wall of the bottom of the planting box (3) provided with a limiting block (9), and a roller (10) being installed on the outside of the limiting block (9), a guide rail (11) being located at the bottom of the roller (10), a water outlet (12) being formed at the bottom of the planting box (3), and a drainage groove (13) provided below the water outlet (12), an AI lighting module (14) installed at the inner wall of the main frame structure (1), and an independent AI control module (4) being mounted at the front end of the main frame structure (1).

FIG. 1 is a side elevation showing the main frame structure (1) of the planting assembly (100) in accordance with the present invention, wherein the water treatment device (6) is located one lateral side of the elevating module (7). The drainage pipe (16) from the main frame structure (1) enters the water treatment device (6) at the top thereof, and the water inlet pipe (15) enters the water treatment system device (6) at the side thereof. Both the water drainage pipe (16) and the water inlet pipe (15) are linked to the main frame structure (1) within the planting system (100) in accordance with the present invention.

FIG. 2 is the front elevation view of the elevating module (7) within the main frame structure (1) of the planting assembly (100) in accordance with the present invention. As shown, the surface of the elevating module (7) is provided with a plurality of support plates (701), a plurality of rotating wheels (702), and a push rod (703), and at the two lateral sides of the elevating module (7) are provided with the rotating wheel (702) which is located at the top and bottom section of each of the lateral sides thereof. The elevating module (7) moves upward by means of a double-track chain, and the plurality of supporting plates (701) are provided to support the placement of the planting boxes (3).

Further, the rotating wheels (702) and the lifting module 7 cooperate with each other to form a rotating structure, and the plurality of support plates (701) are evenly arranged on the surface of the elevating module (7). As compared with the traditional lifting platform, only a single

layer of planting boxes can be supported, the elevating module (7) of the present invention can simultaneously hold more than one layer of planting boxes (3), and accordingly the planting system (100) provides higher automation efficiency. The water storage tank (5) within the water treatment system (6) is located beside the lower part of the elevating module (7) in accordance with the present invention.

FIG. 3 is the front elevation view of the planting box (3) within the main frame structure (1) in accordance with the present invention, and FIG. 4 is a side elevation view of the planting box (3) showing the position of the rollers (10) and the guide rail (11) of the main frame structure (1) of the planting system (100) in accordance with the present invention.

FIG. 5 is a perspective view of the AI lighting module (14) in accordance with the present invention. The AI lighting module (14) includes a silicone cover (1401), an LED plant growth light (1402), an aluminum substrate (1403), and an aluminum heat sink (1404). The aluminum heat sink (1404) has the aluminum substrate (1403), and the inner wall of the aluminum substrate (1403) is embedded with LED plant growth light (1402), and the surface of the outer wall of the aluminum substrate (1403) is bonded with the silica gel covering surface (1401). The AI lighting module (14) employs the aluminum substrate (1403) and the aluminum heat sink (1404) and employs high light-transmitting silica gel for waterproofing.

In accordance with the present invention, the LED plant growth light (1402) is uniformly arranged along the horizontal direction of the AI light module (14), and the shape of the silica gel covering surface (1401) is rectangular. The high-performance LED plant growth light (1402) with multiple wavelengths is used as the lighting source, which can be dynamically adjusted to provide a plurality of color combinations to meet the needs of different spectrum and light intensity for plants in different growth periods, so as to achieve better plant appearance, color saturation, higher nutritional value, higher yield, and longer storage time.

FIG. 6 is a perspective view of the planting box (3) in accordance with the present invention; FIG. 7 is a perspective view of the inner chamber (303) in accordance with the present invention, and FIG. 8 is a perspective view of the floating plate (307) in accordance with the present invention. In accordance with the present invention, the surface of the planting box (3) includes a handle (301), a floating plate limiting block (302), the inner chamber (303) being made of plastic, at least one drainage hole (304) at the corner of the inner chamber (303), a recess (305), a plurality of baffling grooves (306), a floating plate (307), and planting holes (308) (FIG.8) and a base (309), and the inner wall of the planting box (3) is provided with the floating plate limiting block (302), the inner side of the floating plate limiting block (302) is provided to the inner wall of the inner chamber (303).

In accordance with the preferred embodiment of the present invention, and the inner wall of the inner chamber (303) is provided with two drainage holes (304), one for water entering the planting box (3) and the other for drainage of water out from the planting box (3). The outer wall of the inner chamber (303) is provided with the recess (305) (FIG. 7), and the surface of the inner chamber (303) is provided with the baffling grooves (306). The upper surface of the planting box (3) is provided with the floating plate (307), and there are a plurality of planting holes (308) located on the surface of the floating plate (307). The bottom of the planting box (3) is the base (309). The baffling grooves (306) is suitable for shallow water cultivation of crops, and the baffling groove (306) can increase the nutrient solution to the cultivated crops in the planting box (3) as the flow of the nutrient solution along the baffling grooves (306) is slow and all the cultivated crops are able to absorb the nutrients. The internal circulation time of the nutrient solution along the baffling grooves (306) increases the oxygen contents of the nutrient solution, allowing the roots of the cultivated plants to fully absorb the nutrient elements in the nutrient solution, and at the same time promote the strong development of the plant roots.

Further, the dimension of the structure of the inner chamber (303) is designed such that the inner chamber (303) can be fitted to the inner dimension of the planting box (3), and the planting holes (308) are evenly and equidistantly distributed with respect to the surface of the floating plate (307); and the planting holes (308) on the floating plate (307) are designed based on the size of the seedlings. The bottom of the planting box (3) has a fixed water level limit device and a water outlet (12), which is suitable for deep water cultivation and for substrate or soil cultivation.

FIG. 10 is a schematic view of the water treatment device (6) in accordance with the present invention.

As shown in the figure, the interior of the water treatment device (6) has an UVC germicidal lighting (601) and a filter core (602). The filter core (602) is positioned substantially at the center of the device (6), and one side of the filter core (602), the UVC germicidal lighting (601) is positioned. The discharged water through the drainage hole (604) flows back to the water storage tank (4) through the water treatment device (6). The water treatment device (6) has the UVC germicidal lighting (601) and the filter element (602), which can effectively filter the moss in the water and nutrient solution to prevent the growth of bacteria therein. In accordance with the present invention, the special design can mount the water supply and drainage system on the same side of the main frame structure (1), which is more conducive to maintenance and monitoring.

Alternatively, the water treatment device (6) and the UVC germicidal lighting (601) are connected, and the UVC germicidal light (601) are symmetrically distributed about the horizontal center line of the water treatment device (6), and the water treatment device (6) and the filter core (602) are connected.

- 5 In the preferred embodiment of the present invention, the high-performance LED plant growth light (1402) with multiple wavelengths is used as the lighting source, which can dynamically adjust a variety of color combinations to meet the needs of different spectrum and light intensity for plants in different growth periods, so as to achieve better plant appearance and color saturation, higher nutritional value, higher yield, and longer storage time.
- 10 Further, the planting assembly (100) for automatic seedling germinating compatible with multiple cultivation method includes:

(a) the independent AI controlled module (4) is provided with a plurality of transponders for temperature, humidity, CO₂ and water level, electrical conductivity (EC), and the signals that collected by the transponders are timely wirelessly sent to the central control module, and the
15 central control panel is provided with a control panel which can independently control the lighting and irrigation system of the production line, and also can timely access current usage data, and able to simply evaluate obstacles of the equipment, and to resolve the obstacles when the obstacles are delivered to the central control center module via wireless; (b) the central control module collects the signals and data from the transponders, and analyse the
20 signal and the data to adjust humidity, temperature and CO₂ concentration so as to timely control and monitor the growth of plants; (c) the user terminal includes the mobile phone or portable computer which can link to the central control module via wireless and the user can check the plant growth from the display of the pc or mobile display, and at the same time, via the terminal to monitor or to adjust the operation status of the adjusting system so as to satisfy
25 the growth requirements of various kinds of plants, and (d) a monitoring module, a drone is used to collect the data of the plant growth and analyse the data so as to monitor and control the status of growth of the plants.

FIG. 9 illustrates schematically the module being equipped with temperature, humidity, CO₂, water level alarm and other EC value sensors, which can wirelessly send the signals collected
30 by the sensors to the central control module in real time in accordance with the present invention.

In summary, in employing of the automatic planting assembly (100) for periodic multiple cultivation, the limiting block (9) is used to limit the planting box (3) on the guide rail (11), and then through the sliding relationship between the rollers (10) and the guide rail (11), the

planting box (3) moves horizontally to the receiving position of the tray (701) of the elevating module (7), and the pushing rod (703) pushes another new planting box (3) or a second planting box (3) into the main frame structure (1), and at the same time, the pushing rod (703) pushes out the plants on the planting box (3) that can be harvested at the other lateral side of the main frame structure (1). The pushing rod (703) pushes the planting box (3) horizontally to a fixed point. Each time a new planting box of the plants is being pushed in, the plants on the planting box (3) at each level are ready to be harvested at the other end of the elevating module (7). In addition, an automated guided vehicle (agv) programming method is used to control the horizontal fixed-point movement of the planting box (3) or transfer the planting box (3) to the elevating module (7), and a double-track chain is used for the elevating module (7) to lift and to simultaneously collect the planting box (3) at various level, and the high-performance LED plant growth lighting (1402) with multiple wavelengths as illumination light source is used, and the color of lighting can be adjusted so as to meet the supply of light in different growth periods, and the nutrient solution is diverted through the main water pipe (2) to the liquid outlet capillary (8), and an uncompensated flow stabilizer is used to limit the water flow, and then circulate through the baffling grooves (306) so as to increase the fluidity of the water or nutrient solution, and finally flow out through the water outlet hole (12).

The solution in the planting box (3) can be automatically drained away and the planting box (3) can be replenished with fresh nutrient liquid by means of the sensor. The water discharged through the water outlet hole (12) flows back to the water storage tank (5) through the water treatment device (6). By employing the control panel of the independent AI control module (4), independently control the lighting and irrigation system of the production line, and read and calculate operation power usage data in real time, also simply diagnosing equipment obstacles, and wirelessly send to the central control center module when the equipment obstacles are read, and the central control center module will perform system analysis on the data. Then, the the centrol center module will adjust the data, and then transmit the data to the user terminal. The user terminal collects and analyzes the plant growth data obtained by drone, that is, the drone performs fixed-point aerial photography to monitor the growth of plants.

Various modifications of the invention, in addition to those described herein, will be apparent to those skilled in the art from the foregoing description. Such modifications are also intended to fall within the scope of the appended claims. Each reference cited in the present application is incorporated herein by reference in its entirety.

Although there has been shown and described the preferred embodiment of the present invention, it will be readily apparent to those skilled in the art that modifications may be made

thereto which do not exceed the scope of the appended claims. Therefore, the scope of the invention is only to be limited by the following claims.

CLAIMS

1. An automatic planting system for periodical multiple seedlings cultivation having a main frame structure (1) characterized in that
the main frame structure (1) is provided with an inner cavity, an inner wall and an upper
5 portion, wherein the upper portion is linked to a main water pipe (2) and the inner cavity
is for a plurality of planting box (3) growing with plants, the base of the inner cavity is
provided with a storage tank (5) having one lateral side being linked to a discharging
pipe (16), wherein surface at the side of the discharging pipe (16) is connected to a
water treatment device (6) having mounted with a water inlet pipe (15) at the external
10 wall thereof, the external of the main frame structure (1) has a left and right side which
is individually installed with an elevating module (7), and the planting box (3) is
provided with a lateral wall linked to a liquid capillary (8), the external wall of the base
of the inner cavity is provided with a limiting block (9) having an external side being
mounted with a roller (10), below the roller (10) is provided with a guide rail (11), the
15 planting box (3) has a bottom section which is provided with a water outlet (12) and
the beneath the water outlet (12), a water discharging trough (13) is mounted, wherein
the inner wall of the main frame structure (1) is provided with an AI light module (14),
and the front end of the main frame structure (1) is provided with an independent AI
control module (4), thereby the plants on the planting box (3) obtains nutrients from
20 the bottom of the box (3) within the main frame structure (1) from one elevating module
(7) and the planting box (3) are positioned within the main frame structure (1) until the
planting box (7) is discharged to the other elevating module (7) for harvesting.

2. The automatic planting system for periodical multiple seedlings cultivation as set forth
25 in Claim 1, characterized in that the planting box (3) is provided with a handle (301), a
floating plate limiting block (302), an inner chamber (303), at least one discharging
hole (304), a recess (305), a plurality of baffling grooves (306), a floating plate (307),
a plurality of planting hole (308), a base seat (309), and the inner wall of the planting
box (3) is provided with a limiting block (302), and the inner side of the limiting block
30 (302) is mounted with the inner chamber (303) having two water discharging holes
(304) , one of the discharging hole (304) being used for water supplying and the other
used for discharging of water, and the external wall of the inner chamber (303) is
provide with the recess (305) and the surface of the inner chamber (303) is provided
with a plurality of baffling grooves (306) and the surface of the planting pox (3) is
35 provided with the floating plate (307) , and the surface of the floating plate (307) is

provided with a plurality of the planting holes (308) and the bottom section of the planting box (3) is provided at the base seat (309).

- 5 3. The automatic planting system for periodical multiple seedlings cultivation as set forth in Claim 2, characterized in that the external dimension of the inner chamber (303) is corresponding to the inner structural dimension of the planting box (3) and the planting holes (308) on the floating plate (307) are of evenly distributed.
- 10 4. The automatic planting system for periodical multiple seeding cultivation as set forth in Claim 1, characterized in that the interior of the water treatment device (6) is provided with a UVC bactericidal light (601) and a filtration core (602) mounted at one side of the UVC bactericidal light (601).
- 15 5. The automatic planting system for periodical multiple seedling cultivation as set forth in Claim 4, characterized in that the water treatment device (6) and the UVC bactericidal light (601) are interlinked, and within the water treatment device (6), the filter core (602) is position at the central thereof, and the UVC bactericidal lights (601) are positioned with the horizontal axis thereof pointing to the lateral side of the filtering core (602).

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- 25 6. The automatic planting system for periodical multiple seedlings cultivation as set forth in Claim 1, characterized in that the surface of the elevating module (7) is provided with a tray (701), a rotating wheel (702) and a pushing rod (703), the upper and lower side of the interior of the elevating module (7) is mounted with the rotating wheel, and the interior of the elevating module (7) is provided with the pushing rod (703).
- 30 7. The automatic planting system for periodical multiple seedlings cultivation as set forth in Claim 6, characterized in that the rotating wheel (702) and the elevating module (7) interact with each other to form into a rotating structure and the tray (701) is mounted onto the surface of the elevating block (703).
- 35 8. The automatic planting system for periodical multiple seedlings cultivation as set forth in Claim 8, characterized in that the AI light module (14) comprises a silicone cover (1401), a LED plant growth lighting (1402), an aluminium substrate (1403) and an aluminium heat sink (1404), and the aluminium substrate (1403) is located within the aluminium heat sink (1404), and the internal wall of the aluminium substrate (1403) is

engaged with the LED plant growth lighting (1402) and the surface of the external wall of the aluminium substrate (1403) is adhered with the silicone cover (1401).

- 5 9. The automatic planting system for periodical multiple seedlings cultivation as set forth in Claim 8, characterized in that the LED plant growth lighting (1402) in the AI light module (14) along the horizontal direction thereof, and the external shape of the silicone covering face (1401) is a rectangular shape.
- 10 10. The automatic planting system for periodical multiple seedlings cultivation as set forth in Claim 1, wherein the planting slot (4) comprises the floating plate (6), a planting box, and a plurality of baffle plate (11) mounted within the planting slot (4), and the baffle plates (11) increases the flowing time of nutrients to the plants.
- 15 11. The automatic planting system for periodical multiple seedlings cultivations as set forth in Claim 1, further comprising a LED lighting module to provide lighting of variety intensity and spectrum at different timing of growth of the plant.
- 20 12. The automatic planting system for periodical multiple seedlings cultivation as set forth in Claim 1, further comprising a water supplying or nutrient solution supplying module, wherein water and/or nutrient solution is being transported to liquid outlet capillary through a main water pipe.
- 25 13. The automatic planting system for periodical multiple seedlings cultivation as set forth in Claim 8, wherein the control module is equipped with a control panel and is controlled independently the lighting and irrigation system, and the control module can send instructions if the device is experienced any obstacle.
- 30 14. The automatic planting system for periodical multiple seedlings cultivation as set forth in Claim 8, further comprising a central control module to collect signals and data detected by the sensors in the independent intelligent control module, wherein the central control module can proceed to adjust humidity, temperature and carbon dioxide concentration through analysis, and regulate and to monitor the growth environment in real time of the seedling.
- 35 15. The automatic planting system for periodical multiple seedlings cultivation as set forth in Claim 8, further comprising a user terminal, which is connected to the central control module through wireless means.

16. The automatic planting system for periodical multiple seedlings cultivation as set forth in Claim 11, wherein the user terminal includes a mobile phone, a laptop computer or a PC.
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17. The automatic planting system for periodical multiple seedlings cultivation as set forth in Claim 12, wherein the user checks the growth of plants on the mobile terminal and the PC terminal, and also monitors or adjusts through the terminal any operating status to meet the growth needs of plants.
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18. The automatic planting system for periodical multiple seedlings cultivation as set forth in Claim 12, further comprising a monitoring module wherein the user terminal collects and analyses plant growth data.
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19. The automatic planting system for periodical multiple seedlings cultivation as set forth in Claim 12, wherein the plant growth data can be obtained by using a drone to perform a fixed-point aerial photography to monitor the growth of plants.