

SPECIFICATION

Invention Title: VERTICALLY HANGING VEGETATION APPARATUS

Field of the Invention

[01] The present invention relates to a vertically hanging vegetation apparatus, and more particularly, to a vertically hanging vegetation apparatus, which promotes growth of plants by an artificial light source arranged vertically.

Background Art

[02] Green vegetables, fruit vegetables and root vegetables out of food materials are very important elements in our food ingredients as much as it would not be an exaggeration to say that we eat them every day. Particularly, with expansion of dietary culture for health, there is a growing interest in eco-friendly green vegetables, fruit vegetables and root vegetables.

[03] We have the stereotype that people cultivate green vegetables, fruit vegetables and root vegetables on the bare ground or in greenhouses on a flatland, but, recently, with an increase of city people returning to farming or rural places, small and medium sized indoor plant farms are a growing trend.

[04] However, when people cultivate plants in the indoor plant farm, because there is a limitation in cultivating lots of plants in a small area, there is difficulty in that the people returning to farming can secure competitiveness through improvement of agricultural productivity.

[05] Moreover, the term, "microalgae", in the limelight as biofuel, is a general name for unicellular organisms having ability to photosynthesize with photosynthetic pigment. In general, microalgae, such as chlorella, isochrysis, chaetoceros and so on, may be used as live food in the artificial seed production process for marine creatures, such as shellfishes, and may be utilized for development of healthy food, sewage treatment, removal of CO₂, and biofuel due to various useful factors contained in the microalgae.

For utilization and study of the microalgae, microalgae have been cultured in quantity all over the world.

[06] In order to culture microalgae in quantity by conventional culture methods, it is required to secure a space for culture facilities. However, because the culture facilities and space cause enormous facility expenses and costs of land for the facilities, it becomes a factor in increasing production costs of seeds during the process of producing seeds of marine creatures. Moreover, in the case of development of healthy food, sewage treatment, removal of CO₂, and utilization and study of biofuel, there are many difficulties in securing a space for culture facilities.

Disclosure

Technical Problem

[07] Accordingly, the present invention has been made in view of the above-mentioned problems occurring in the prior art, and it is an object of the present invention to provide a vertically hanging vegetation apparatus, which includes one or more lighting means and a plurality of vertical cultivation means having one or more vegetation containers wherein the lighting means and the vertical cultivation means are vertically and continuously arranged to face each other at a predetermined interval, thereby allowing a user to cultivate and culture plants of various kinds even in a small space.

[08] It is another object of the present invention to provide a vertically hanging vegetation apparatus, which can promote photosynthesis and plant growth when plants are cultivated and cultured through cultivation in vinyl greenhouses or glass greenhouses effectively using rays of the sun during sunrise time and artificial light sources during sunset time or on cloudy days or rainy days, thereby enhancing cultivation, culture and management of plants.

[09] It is a further object of the present invention to provide a vertically hanging vegetation apparatus, which

can cultivate and culture plants in quantity by a cultivation facility in a small area because the vertical cultivation means are formed as long as possible within an allowable range of the cultivation facility, and in which the vertical cultivation means are able to ascend and descend in a vertical direction, thereby saving personnel expenses and increasing work efficiency.

Technical Solution

- [10] To accomplish the above object, according to the present invention, there is provided a vertically hanging vegetation apparatus including:
- [11] a first horizontal support arranged and seated on the ceiling of a randomly designated space or on a fabricated structure;
- [12] a winding rotor combined to the first horizontal support to wind or unwind an elevating wire;
- [13] a second horizontal support combined and connected to one end of the elevating wire;
- [14] a vertically hanging member which is fastened to the second horizontal support, is flexible, and includes a first surface part and a second surface part;
- [15] one or more support members coupled to the outer surface of the vertical hanging member;
- [16] vertical cultivation means which are detachably mounted on the support members, inserted into the support members or taken out of the support members, and each of which includes one or more vegetation containers having vegetation means therein for cultivating or culturing plants; and
- [17] a plurality of lighting means which are mounted vertically and has one or more artificial light source parts for emitting light at the vegetation containers to irradiate light to the plants of the vegetation containers.
- [18] The lighting means are arranged between a plurality of the vertical cultivation means.

- [19] In this instance, the artificial light source parts includes a PCB substrate on which one or more LEDs are arranged.
- [20] In another aspect of the present invention, there is provided a vertically hanging vegetation apparatus including: a first horizontal support arranged and seated on the ceiling of a randomly designated space or on a fabricated structure;
- [21] a winding rotor combined to the first horizontal support to wind or unwind an elevating wire;
- [22] a second horizontal support combined and connected to one end of the elevating wire;
- [23] a vertically hanging member which is fastened to the second horizontal support, is flexible, and includes a first surface part and a second surface part;
- [24] one or more support members coupled to the outer surface of the vertical hanging member;
- [25] one or more vegetation containers, which are detachably mounted on the support members, inserted into the support members or taken out of the support members, and includes cultivation means therein for cultivating or culturing plants; and
- [26] vertical cultivation means having one or more artificial light source parts fixed to the second surface part to irradiate light toward the vegetation containers,
- [27] wherein the first surface part of the vertical cultivation means and the second surface part of another vertical cultivation means are continuously arranged on the space to face each other at a predetermined interval.
- [28] Green vegetables, fruit vegetables and root vegetables are planted in the vegetation containers, or microalgae are cultured in the vegetation containers.
- [29] In all preferred embodiments of the present invention, the winding rotor is driven by a motor or by hand power.
- [30] The support members are formed at any one or both of the first surface part and the second surface part of the

vertically hanging member, and may be made of a transparent material.

- [31] In the meantime, the first surface part and the second surface part respectively have reflection layers for reflecting light of the sun or the artificial light source part.
- [32] The vegetation container may be selectively made of paper, woven fabric, or synthetic resin.
- [33] The vegetation container includes an injection part formed at an upper part thereof to supply water, nutrient solution or culture fluid to the cultivation means contained in the vegetation container, and a drain part formed at the bottom thereof to drain water, nutrient solution or culture fluid.
- [34] In this instance, the drain part includes a drain pipe part having a predetermined length, and the drain pipe part includes a valve unit formed to regulate drain of water, nutrient solution or culture fluid.
- [35] The vertically hanging vegetation apparatus is installed one or more independent carrier devices, and in this instance, the carrier device includes a moving unit at the bottom thereof to move in the space.
- [36] In the meantime, the vertically hanging vegetation apparatus further includes a sensor module for controlling cultivation environment, and the sensor module supplies cultivation environment data created in any place of the space to control means which analyzes sensing data, and controls the cultivation environment using control data provided by an analysis result of the sensing data.
- [37] The sensor module controls one or more of temperature, humidity, illumination intensity and an amount of CO₂.
- [38] The vertically hanging vegetation apparatus further includes: heating and cooling means for carrying out heating and cooling of the vertically hanging vegetation apparatus based on the analysis result from the sensor module; watering means for supplying water, nutrient

solution or culture fluid to the vertically hanging vegetation apparatus; and ventilation means for ventilating air of the vertically hanging vegetation apparatus.

[39] The first horizontal support may further include horizontally moving means capable of moving along a rail on the space.

Advantageous Effects

[40] As described above, the vertically hanging vegetation apparatus according to the embodiments of the present invention is easy in carrying, keeping and installation because the vertically hanging members are made of a flexible material, and can cultivate or culture lots of plants in a small area because a plurality of the vertical cultivation means and a plurality of the lighting means face each other at a predetermined interval and are continuously arranged in a space.

[41] Moreover, the vertically hanging vegetation apparatus can increase convenience and economic feasibility, because the vegetation containers in which plants are cultivated or cultured can be detachably mounted on the support members of the vertical cultivation means or inserted into the support members and taken out of the support member and the vertical cultivation means ascends and descends vertically using the elevating wire of the winding rotor. Additionally, because the vertically hanging vegetation apparatus is installed on one or more carrier devices independently, it can provide convenience, reduce production costs by remarkably reducing personnel expenses and working time through reduction of manpower, and produce lots of plants even in a small space because the vertical cultivation means can be made as long as possible.

Description of Drawings

[42] FIG. 1 is a front view of a vertically hanging vegetation apparatus according to a first preferred embodiment of the present invention.

- [43] FIG. 2 is an enlarged perspective view of part "A" of FIG. 1.
- [44] FIG. 3 is a front view showing a state where the vertically hanging vegetation apparatus is installed.
- [45] FIG. 4 is a front view of lighting means.
- [46] FIG. 5 is a perspective view showing essential parts of vertical cultivation means.
- [47] FIG. 6 is a view showing an example of a vegetation container.
- [48] FIG. 7 is a front view of a vertically hanging vegetation apparatus according to a second preferred embodiment of the present invention.
- [49] FIG. 8 is an enlarged perspective view of a part "B" of FIG. 7.
- [50] FIG. 9 is a front view showing a state where the vertically hanging vegetation apparatus according to the second preferred embodiment of the present invention is installed.
- [51] FIG. 10 is a perspective view showing essential parts of vertical cultivation means of the vertically hanging vegetation apparatus according to the second preferred embodiment of the present invention.
- [52] [Explanation of reference numerals in drawings]
- [53] 100: vertically hanging vegetation apparatus 110: first horizontal support 120: elevating wire
- [54] 130: winding rotor 131: second horizontal support 133: vertically hanging member
- [55] 150: first surface part 151: second surface part 153: support member 154: cultivation means
- [56] 155: vegetation container 160: vertical cultivation means 175: artificial light source part 180: lighting means
- [57] 190: reflection layer 200: motor 210: LED 300: injection part
- [58] 330: drain part 340: drain pipe part 350: valve unit 360: carrier device

[59] 400: horizontally moving means 500: sensor module 700:
moving unit

Best Mode

[60] Hereinafter, reference will be now made in detail to the preferred embodiment of the present invention with reference to the attached drawings.

[61] In order to help understand features of the present invention, a vertically hanging vegetation apparatus according to embodiments of the present invention will be described in detail. However, the present invention may be embodied in many different forms and should not be construed as being limited to the embodiments set forth herein. Rather, these embodiments are provided so that this disclosure will be thorough and complete, and will fully convey the scope of the invention to those skilled in the art.

[62] FIGS. 1 to 5 illustrate a vertically hanging vegetation apparatus according to a first preferred embodiment of the present invention.

[63] The vertically hanging vegetation apparatus 100 according to the first preferred embodiment includes: a first horizontal support 110; a winding rotor 130 which is combined to the first horizontal support 110 to wind or unwind an elevating wire 120; a second horizontal support 131 combined and connected to one end of the elevating wire 120; a vertically hanging member which is fastened to the second horizontal support, is in the form of a mat made of a flexible material, and includes a first surface part 150 and a second surface part 151; one or more support members 153 coupled to the outer surface of the vertical hanging member;

[64] vertical cultivation means which are detachably mounted on the support members 153, inserted into the support members 153 or taken out of the support members 153, and each of which includes one or more vegetation containers

155 having cultivation means 154 therein for cultivating or culturing plants; and a plurality of lighting means 180 which are mounted vertically and has one or more artificial light source parts 175 for emitting light at the vegetation containers to irradiate light to the plants of the vegetation containers 155, wherein the lighting means 180 are arranged between a plurality of the vertical cultivation means 160.

[65] The first horizontal support 110 is arranged and seated on the ceiling of a randomly designated space or on a fabricated structure.

[66] That is, the first horizontal support 110 may be arranged horizontally on a steel structure installed at an upper part of a cultivation space, such as a vinyl greenhouse or a glass greenhouse, or may be arranged horizontally on an upper part of a carrier device 360, which is a structure for conveyance manufactured separately.

[67] Furthermore, the first horizontal support 110 is made of a metallic material or a plastic material, and is formed in the shape of a bar or a pipe with a strong flexural strength.

[68] Additionally, the winding rotor 130, which winds or unwinds the elevating wire 120 at both longitudinal sides or at a specific position, is assembled to the first horizontal support 110, and the elevating wire 120 may be made of a metallic material or a synthetic resin material.

[69] In addition, the winding rotor 130 may be formed in the shape of a drum or a wheel, may be actuated by a motor 200 operated by electricity or actuated by hand power.

[70] Moreover, the second horizontal support 131 is connected with one end portion of the elevating wire 120 connected to the winding rotor 130 to be combined mutually, and the connection method or connection member for connecting the second horizontal support 131 are not restricted.

[71] Furthermore, the second horizontal support 131 is made of a metallic material or a synthetic resin material, and is

formed in the shape of a bar or a pipe with a strong flexural strength.

[72] Additionally, the vertically hanging member 133 is combined and hung on the second horizontal support 131. The vertically hanging member 133 is in the form of a mat made of a flexible material, and includes the first surface part 150 and the second surface part 151.

[73] A reinforcing member may be interposed between the first surface part 150 and the second surface part 151, and such a structure is to increase tensile force of the vertically hanging member 133.

[74] That is, the vertically hanging member 133 may be made of fabric woven with a lightweight and flexible material or of synthetic resin in order to minimize a burden of weight when the second horizontal support 131 is combined.

[75] In addition, one or more support members 153 are combined to the vertically hanging member 133.

[76] That is, the support members 153 disposed on the outer surface of the vertically hanging member 133 may be selectively combined to any one of the first surface part 150 and the second surface part 151 of the vertically hanging member 133, or may be combined to all of the first surface part 150 and the second surface part 151.

[77] Such support members 153 may be variably formed according to use purposes.

[78] Moreover, the support members 153 is formed in the shape of a pocket having a predetermined space therein, a hook or a loop, and may be in the form of a Velcro tape or in the form of a pair of fixed metal goods which can be firmly fixed or easily removed. Here, the support members 153 which is formed in the shape of a pocket having a predetermined space therein will be described.

[79] Furthermore, one or more vegetation containers 155 may be detachably mounted on the support members 153, inserted thereinto, or taken out of the support members 153.

- [80] Each of the vegetation containers 155 has the cultivation means 154 therein for cultivating or culturing plants. The vegetation means 154 contains materials suitable for growth of plants, such as soil, vegetation soil, glass wool, rock wool, sponge, water, nutrient solution, or culture fluid, therein.
- [81] Additionally, the vegetation container 155 may be selectively made of paper, woven fabric or synthetic resin, but the materials and shape of the vegetation container are not restricted, for instance, may be formed in the shape of a bag as shown in the drawing.
- [82] In addition, the vegetation container 155 has an injection part 300 formed at an upper part thereof to supply water, nutrient solution or culture fluid to the cultivation means 154 contained in the vegetation container 155, and a drain part 330 is formed at the bottom of the vegetation container 155 for draining water, nutrient solution or culture fluid.
- [83] Moreover, the drain part 330 of the vegetation container 155 has a drain pipe part 340 having a predetermined length, and a lower end portion of the drain pipe part 340 of the vegetation container 155, which is located above, is connected with the injection part 300 of another vegetation container 155, which is located below, such that water, nutrient solution or culture fluid put in the injection part 300 of the vegetation container 155 located above may fall down by gravity. A valve unit 350 may be formed on the drain pipe part 340 to regulate drain of water, nutrient solution or culture fluid.
- [84] The above is economical because the amount used of water, nutrient solution or culture fluid may be reduced.
- [85] Furthermore, the lighting means 180 includes one or more artificial light source parts 175 to irradiate light toward the vegetation containers 155.
- [86] That is, the lighting means 180 is means for fixing one or more artificial light source parts 175, and may be fixed

in the form of a wire or a sheet. Besides the above, various means for fixing one or more artificial light source parts 175 may be applied without any restriction, and the lighting means 180 may be in the form of a sheet as shown in the drawing, or may use a hanging device, such as a wire or a rope, or other hanging methods for vertically hanging without restriction.

[87] Additionally, the artificial light source parts 175 of the lighting means may irradiate light in one direction or in both directions.

[88] As described above, the artificial light source parts 175 of the lighting means 180 may be variably formed in one direction or in both directions, depending on whether the support members 153 formed on the vertically hanging member 133 are selectively combined to any one of the first surface part 150 and the second surface part 151 or are combined to both of the first surface part 150 and the second surface part 151.

[89] In the meantime, the artificial light source parts 175 of the lighting means 180 may use light sources of various kinds without restriction in kind if they can irradiate light sources necessary for the plants cultivated in the vegetation containers 155. For instance, various light sources, such as fluorescent lights, LEDs, halogen lamps, and so on, may be applied to the artificial light source parts 175.

[90] Preferably, the artificial light source part 175 may include a printed circuit board (PCB) on which a plurality of light-emitting diodes (LEDs) 210 are arranged.

[91] The LEDs 210 can promote photosynthesis of plants because they can regulate wavelength and the quantity of light necessary for the plants more effectively than other light sources. That is, the artificial light source parts 175 may have the form that a plurality of the LEDs 210 are attached to the PCB.

- [92] In this instance, the LEDs 210 included in the artificial light source part 175 may have white LEDs, blue LEDs and red LEDs.
- [93] In general, light sources of a plant cultivation device provides lights necessary for photosynthesis and growth of plants, and plants have different wavelengths of light according to their kinds and states of growth of the plants, and especially, in the case of photosynthesis of plants, the plants absorb blue color and red color but reflect green color in the light spectrum distribution.
- [94] Therefore, the vertically hanging vegetation apparatus 100 according to the preferred embodiment of the present invention makes the most of characteristics of plants to light, and may include the LEDs 210 emitting blue light and red light in order to properly supply color lights having the most wavelengths necessary for the plants.
- [95] Moreover, the first surface part 150 and the second surface part 151 are transparent, or has a reflection layer 190 for reflecting the light of the sun or the artificial light source part 175. If the surface layers of the first surface part 150 and the second surface part 151 are transparent, they can properly transmit light of the sun or the artificial light source part 175 and promote photosynthesis of plants located on another first surface part 150 and another second surface part 151. If there is the reflection layer 190 for reflecting light of the sun or the artificial light source part 175, the reflection layer 190 can reflect light to the plants for a long time through repeated continuous diffused reflection and refraction at various angles in various directions in order to promote the growth of the plants cultivated in the vegetation containers 155. Preferably, the reflection layer 190 may be applied without any restriction if it is made of one of materials for effectively reflecting light of the sun or the artificial light source part 175.

- [96] Furthermore, a plurality of the lighting means 180 are arranged between a plurality of the vertical cultivation means 160.
- [97] That is, in order to make lots of plants grow in a small area, a plurality of the lighting means 180 are arranged between the vertical cultivation means 160 spaced apart from each other at a predetermined interval. In this instance, the interval between the vertical cultivation means 160 and the lighting means 180 may be determined depending on characteristics of the plants.
- [98] Additionally, the vertically hanging vegetation apparatus 100 is installed on one or more carrier devices 360 which are arranged independently, and each carrier device 360 has moving units 700 at the bottom in order to move in the space.
- [99] When the vertically hanging vegetation apparatus 100 is installed on the carrier device 360 in order to cultivate plants, because the vertically hanging vegetation apparatus 100 can cultivate the plants while moving a space according to whether light of the sun is used or light of the artificial light source part 175 is used, it can promote growth of plants by increasing photosynthesis time of the plants and minimize personnel expenses by securing a working space and saving a harvest period of time when plants are planted, cultured and harvested, thereby promoting economic interests.
- [100] Moreover, the vertically hanging vegetation apparatus 100 further includes a sensor module 500 for controlling cultivation environment. The sensor module 500 supplies cultivation environment data created in any place of the space to control means (not shown) which analyzes sensing data, and controls the cultivation environment using control data provided by an analysis result of the sensing data. The sensor module 500 controls one or more of temperature, humidity, illumination intensity and an amount of CO₂. Based on the analysis result of the sensor module

500, the vertically hanging vegetation apparatus 100 further includes heating and cooling means (not shown) for carrying out heating and cooling, watering means (not shown) for supplying water, nutrient solution or culture fluid to the vertically hanging vegetation apparatus 100, and ventilation means (not shown) for ventilating air of the vertically hanging vegetation apparatus 100.

[101] That is, the sensor module 500 includes a temperature sensor, a humidity sensor, an illumination intensity sensor and a CO₂ sensor, and creates the optimized environment for plants cultivated or cultured in the place using such various sensors. For instance, the sensor module 500 transfers sensing data obtained through the sensors to a gateway, and the gateway supplies the corresponding data to a control device, so as to optimize the indoor environment of a greenhouse or a plant factory according to controls of the control device. In the above process, the control device supplies information to a manager's operation device to optimize the indoor environment of the plant factory according to the analysis result of the sensing data so as to order work. Alternatively, because the sensor module 500 includes a control unit capable of controlling wire and wireless local area network with the gateway, the sensor module 500 can create the optimized environment by controlling an air blast fan or a watering valve (water, nutrient solution or culture fluid), a heater or a humidity valve, and ON/OFF duty of the artificial light source part according to control commands of the control unit.

[102] In other words, the environment conditions optimized for growth of plants, such as temperature, humidity, illumination intensity and CO₂ content, may be varied according to kinds of plants. Therefore, based on information sensed by the temperature sensor, the humidity sensor, the illumination intensity sensor and the CO₂ sensor, the cultivation environment of the vertically

hanging vegetation apparatus 100 may be controlled effectively.

[103] Such control of the sensor module 500 using the wire and wireless network may be understood as internet of things which is technological environment to send and receive data through the Internet in real time by attaching sensors on a thing.

[104] Furthermore, the first horizontal support 110 may further include horizontally moving means 400 which is capable of moving along a rail.

[105] That is, the first horizontal support 110 can move in a state where it hangs on a space, and the horizontally moving means 400 used for the first horizontal support 110 may be a driving motor or other means to be driven by manpower, for instance, may be in the form of a wheel and a rail as shown in the drawing.

[106] Additionally, the horizontally moving means 400 may be combined to both sides of the first horizontal support 110 or other various positions.

Mode for Invention

[107] FIGS. 7 to 10 illustrate a vertically hanging vegetation apparatus according to a second preferred embodiment of the present invention.

[108] The vertically hanging vegetation apparatus 100 according to the second preferred embodiment includes: a first horizontal support 110; a winding rotor 130 which is combined to the first horizontal support 110 to wind or unwind an elevating wire 120; a second horizontal support 131 combined and connected to one end of the elevating wire 120; a vertically hanging member which is fastened to the second horizontal support, is in the form of a mat made of a flexible material, and includes a first surface part 150 and a second surface part 151; one or more support members coupled to the outer surface of the vertical hanging member; one or more vegetation containers 155, which are detachably mounted on the support members 153, inserted

into the support members or taken out of the support members 153 and includes cultivation means 154 therein for cultivating or culturing plants; and

[109] vertical cultivation means having one or more artificial light source parts fixed to the second surface part to irradiate light toward the vegetation containers, wherein the first surface part of the vertical cultivation means and the second surface part of another vertical cultivation means are continuously arranged on the space to face each other at a predetermined interval.

[110] One or more support members 153 are combined to the first surface part 150 of the vertically hanging member 133.

[111] Furthermore, the vegetation container 155 has an injection part 300 opened at the whole upper part or opened partially so as to supply water, nutrient solution, or culture fluid to the cultivation means 154 contained in the vegetation container 155.

[112] Additionally, green vegetables, fruit vegetables or root vegetables may be planted in the vegetation containers, or microalgae may be cultured in the vegetation containers, and in this instance, the green vegetables, the fruit vegetables, the root vegetables, and the microalgae are cultivated and cultured through photosynthesis, and materials of the cultivation means 154 may be properly selected and applied for cultivation of the green vegetables, the fruit vegetables, and the root vegetables, and culture of the microalgae.

[113] In other words, green vegetables, fruit vegetables or root vegetables are used as food ingredients, and microalgae are processed and used as biofuel or healthy food through a refining process according to their kinds.

[114] The first surface parts 150 of a plurality of the vertical cultivation means 160 and the second surface parts 151 of a plurality of the vertical cultivation means 160 are continuously and vertically arranged on the space to

face each other at a predetermined interval to promote growth of plants.

[115] In this instance, the interval between the first surface parts 150 of a plurality of the vertical cultivation means 160 and the second surface parts 151 of a plurality of the vertical cultivation means 160 may be determined according to characteristics of plants.

[116] While the present invention has been described with reference to the particular illustrative embodiments, it is to be appreciated that those skilled in the art can change or modify the embodiments in various ways without departing from the scope and spirit of the present invention as disclosed in the accompanying claims.

【CLAIMS】

【Claim 1】

A vertically hanging vegetation apparatus comprising:

a first horizontal support arranged and seated on the ceiling of a randomly designated space or on a fabricated structure;

a winding rotor combined to the first horizontal support to wind or unwind an elevating wire;

a second horizontal support combined and connected to one end of the elevating wire;

a vertically hanging member which is fastened to the second horizontal support, is flexible, and includes a first surface part and a second surface part;

one or more support members coupled to the outer surface of the vertical hanging member;

vertical cultivation means, which are detachably mounted on the support members, inserted into the support members or taken out of the support members, and, each of which includes one or more vegetation containers having vegetation means therein for cultivating or culturing plants; and

a plurality of lighting means which are mounted vertically and has one or more artificial light source parts for emitting light at the vegetation containers to irradiate light to the plants of the vegetation containers,

wherein the lighting means are arranged between a plurality of the vertical cultivation means.

【Claim 2】

The vertically hanging vegetation apparatus according to claim 1, wherein the support members are formed at any one or both of the first surface part and the second surface part of the vertically hanging member.

【Claim 3】

The vertically hanging vegetation apparatus according to claim 1, wherein the first surface part and the second surface part are transparent.

【Claim 4】

The vertically hanging vegetation apparatus according to claim 1, wherein the first surface part and the second surface part respectively have reflection layers for reflecting light of the sun or the artificial light source part.

【Claim 5】

The vertically hanging vegetation apparatus according to claim 1, wherein the vegetation container comprises an injection part formed at an upper part thereof to supply water, nutrient solution or culture fluid to the cultivation means contained in the vegetation container, and a drain part formed at the bottom thereof to drain water, nutrient solution or culture fluid.

【Claim 6】

The vertically hanging vegetation apparatus according to claim 5, wherein the drain part comprises a drain pipe part having a predetermined length.

【Claim 7】

The vertically hanging vegetation apparatus according to claim 6, wherein the drain pipe part comprises a valve unit formed to regulate drain of water, nutrient solution or culture fluid.

【Claim 8】

The vertically hanging vegetation apparatus according to claim 1, further comprising:

a sensor module for controlling cultivation environment,
wherein the sensor module supplies cultivation environment data created in any place of the space to control means which analyzes sensing data, and controls the cultivation environment using control data provided by an analysis result of the sensing data.

【Claim 9】

The vertically hanging vegetation apparatus according to claim 8, further comprising:

heating and cooling means for carrying out heating and cooling of the vertically hanging vegetation apparatus based on the analysis result from the sensor module;

watering means for supplying water, nutrient solution or culture fluid to the vertically hanging vegetation apparatus; and ventilation means for ventilating air of the vertically hanging vegetation apparatus.

【Claim 10】

A vertically hanging vegetation apparatus comprising:

a first horizontal support arranged and seated on the ceiling of a randomly designated space or on a fabricated structure;

a winding rotor combined to the first horizontal support to wind or unwind an elevating wire;

a second horizontal support combined and connected to one end of the elevating wire;

a vertically hanging member which is fastened to the second horizontal support, is flexible, and includes a first surface part and a second surface part;

one or more support members coupled to the outer surface of the vertical hanging member;

one or more vegetation containers, which are detachably mounted on the support members, inserted into the support members or taken out of the support members, and includes cultivation means therein for cultivating or culturing plants; and

vertical cultivation means having one or more artificial light source parts fixed to the second surface part to irradiate light toward the vegetation containers,

wherein the first surface part of the vertical cultivation means and the second surface part of another vertical cultivation means are continuously arranged on the space to face each other at a predetermined interval.

【Claim 11】

The vertically hanging vegetation apparatus according to claim 10, wherein the drain part comprises a drain pipe part having a predetermined length.

【Claim 12】

The vertically hanging vegetation apparatus according to claim 10, wherein the drain pipe part comprises a valve unit

formed to regulate drain of water, nutrient solution or culture fluid.

【Claim 13】

The vertically hanging vegetation apparatus according to claim 10, wherein green vegetables, fruit vegetables and root vegetables are planted in the vegetation containers.

【Claim 14】

The vertically hanging vegetation apparatus according to claim 10, wherein microalgae are cultured in the vegetation containers.