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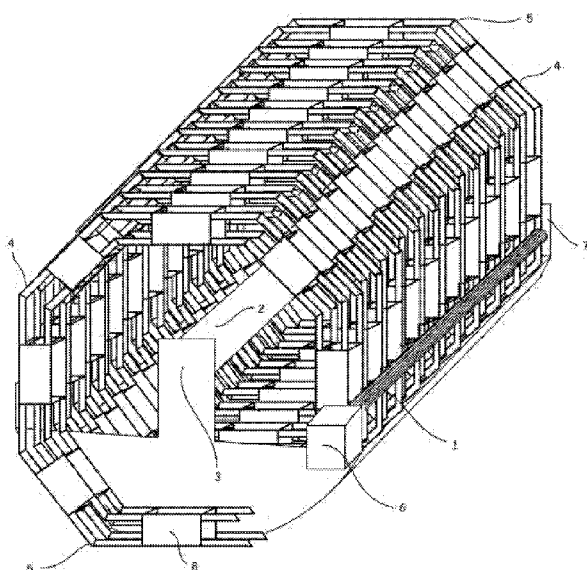
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(54) Title: HYDROPONIC APPARATUS

Figure 1



(57) Abstract: An apparatus for cultivating plants and vegetables. The invention includes individual units (29) that contain growing media to grow a plant (s) or vegetable (s) (34) in. The units spiral around a central light source (2). As the spiralling units get to the lower most point of the spiral they will be partially submerged into nutrient rich water in order for the growing media to absorb the nutrient rich water which then feeds the plant (s) or vegetable (s). The nutrient rich water is contained in a tray (22). The nutrient rich water is kept to the same level by a pump and an outlet pipe (24) at the desired level. The spiralling units are supported on two geared rollers (1) which are powered by a servo (6). The units have a rack of teeth (4) on the outside edge and fit onto the geared rollers. As the geared rollers rotate which then turns the spiralling units.

HYDROPONIC APPARATUS

Technical field

The invention is in the field of crop cultivation through the method of hydroponics. Currently there are several modes of cultivating crops using hydroponics as the method. These are: static solution culture, continuous flow solution culture, passive sub irrigation, flood and drain sub irrigation, run to waste and deep water culture. The invention is a completely new method. This invention relates to the method and apparatus for growing plants and vegetables in a controlled setting using and precisely controlling combinations of lighting, water, nutrients and carbon dioxide to produce ideal growing conditions to produce maximum possible growth and crop production

Background art

Common soil farming is fast becoming unsustainable because of population growth and a lack of fertile soil in the world to grow crops on. Much of the land in the world is not suitable for growing fruit and vegetables. Hydroponics is a much more sustainable way of producing food, however at the moment this method can still take up a lot of land. Many of the current forms of industrial hydroponics still rely on the sun as there source of light and so they can only grow one layer of crops at a time. If they tried growing one layer of plants on top of another they would block the sun light from getting to the layer underneath the top layer. The global population has risen substantially in recent decades. Between 1980 and 2000 it rose from 4.4billion to 6.1billion and food production increased 50%. By 2050 the population is expected to reach 9billion. That being said, food production also needs to increase to supply the new demand. With this invention food production will be more efficient, environmentally friendly and quicker than is has been in the past.

Disclosure of invention

The invention consists of many trapezoid prism shaped units, a nutrients tray, a drive servo, two long geared rollers and separating cylinders. The units connect together by hooks and arms. At the front of one unit are two hooks that connect to two arms on the back of the unit ahead of the said unit. Each unit contains growing media in which to grow a crop(s) or plant(s) in. When systems of units are connected together they form a spiral with plants or crops facing the centre. In the centre of the spiral is a light source for the crops to grow towards and get there energy from. On the outside (also the bottom edge) of each unit are teeth that fit onto the geared rollers. The outside edge is the longest edge on any unit. The outside edge would ideally be curved to make a smoother transition over the geared roller when the geared roller encounters the joining of units. Straight edged units will not cause a problem and will work in the same way as curved units. Each unit can grow one or more plants or vegetables in them. Growing more than one plant or vegetable in one unit would be done to save space when growing small plants or vegetables. The growing media can also be of any size as long as it is not larger than the unit it is contained within. When systems of units are connected to form the spiral, the spiral is rested on the two geared rollers that are attached to the nutrients tray below. In between the two geared rollers is a nutrients tray that is filled with a nutrient and water solution. The nutrients in the tray is set to a specific level by having an outlet tube at the desired height. Nutrients in pumped into the tray at timed intervals

to keep the tray full. When the units spiral around the light, as they reach their lowest position in the spiral they are dipped into the nutrients and nutrients is then absorbed by the growing media. The nutrient solution is taken in by the plant(s) or crop(s) because the roots grow into the growing media allowing them to take all the nutrients that had been absorbed in the growing media. The growing media should take in enough nutrients to feed the plant(s) or crop(s) before it gets dipped into the nutrients again on its next spiral. As a plant or crop gets wider than a single unit, separating cylinders are put onto the geared rollers to force a gap between the spirals. The apparatus saves space through keeping the units as close as possible throughout the system by only using the separating cylinders as the plant(s) or vegetable(s) gets wider as the said plant(s) or vegetable(s) goes through the system. A grub screw is used to stop the separating cylinder from moving. The grub screw will go from the outside of the cylinder towards the centre and will tighten onto the geared roller. The geared rollers rotate slowly and are powered by a motor or servo. As the geared rollers rotate they drive the units spiralling around. A constant supply of units must be fed to the beginning of the system to keep it going. Systems of units can be as long as are necessary or shorter systems can be stacked on top of each other and more units can be used to join the systems together. As the units come to an end on the top system they will join on to the beginning of the system below by hooking together the last of the top system unit to the beginning of the system below.

Brief description of drawings

Figure 1 is a perspective view of the apparatus.

Figure 2 is a front view of the apparatus.

Figure 3 is a drawing of two units connected together.

Figure 4 is a drawing showing how systems of units can be stacked on top of each other to save space.

Figure 5 is a drawing showing how the geared roller connected to the bearing.

Figure 6 is a drawing of a plant or crop growing out of a unit.

With reference to the drawings, a hydroponic growing system is described. The system includes plant or vegetable support units, a light system of which the units spiral around, a nutrients tray that the spiralling units will partially be submerged under, a long geared roller with larger cylinders attached to create gaps between the units spiralling around the light source and also to guide the units along the gears at either side of the larger cylinders, and a computer controlled servo to rotate the long geared roller which in turn will give control at which the speed of the spiralling units will go.

With reference to figure 1. 2 represent the light source that the plants and vegetables spiral around. The light source is supported by 3, 3 is part of the nutrient trays front and back walls. 6 houses a servo that drives the geared roller 1. 4 is the rack on the outside edge of the unit. The outside edge is always the longest. A rack 4 is a toothed edge that goes along the geared roller 1. As the geared roller 1 turns, it moves the rack 4 along and round the light source 2. 7 holds the geared roller in place opposite the servo 6 and works with the servo 6. 8 is an empty unit with no growing media. 5 shows the joining of two units.

With reference to figure 2, 22 is the back wall of the nutrients tray. As you can see the light support 3 is also part of the back wall. 25 is the inlet pipe, nutrients in pumped through this pipe at timed intervals to keep the nutrients level constant. When the nutrients in the tray reaches the desired level it will reach the overflow pipe 24 which will take excess nutrients back to the pump to be reused. 7 holds the geared roller opposite the servo (see Figure 5). 20 is a unit at the end of the system. The next stage for the last unit is for the plant or crop to be taken off the unit so the unit can be reused back at the beginning of the system. 21 is the end of the geared roller and is connected to 7 through a bearing (see Figure 5). 4 is the rack on the edge of the unit. The rack is a toothed edge that sits on the geared roller. 23 is the front of a unit. The front of a unit has two hooks (shown in figure 3).

With reference to figure 3, figure 3 is a perspective view of 2 units connected together. Units are connected together through a hook 9 and arm 15 system. At the back of each unit there are two arms 15. At the front of each unit are two hooks 9 that attach onto the back on the unit ahead of the said units arms 15. On the top 13 of each unit are two bars 17. The bars 17 stop the growing media 10 from falling out of the unit when the unit is upside down as it is in Figure 3. The unit is upside down when it is at the highest point of the spiral. As the plant or vegetable is grown in the growing media 10, this adds to the force pulling the growing media down when it is upside down so the two bars 17 are there to stop the growing media from moving. Similarly there are two bars 14 on either side of the unit. The side bars 14 are there to stop the growing media from moving forwards and backwards. There are two pairs of side bars situated at the front and back of the unit. The growing media must be the right dimensions to fit into the unit to stop any movement. The side bars 14 and the bottom bars 17 are attached to the sides of the unit 29. The sides of each unit have cross supports 30 to strengthen the unit. On the bottom edge of the unit are teeth 4 (also called the rack) that fit onto the geared roller. 13 is the top of the unit. 18 and 19 are part of the sides and they have two inward facing arms 11 and 12 on the ends. 11 is an arm at the front of the unit and 12 is at the back of the unit. When the units are connected together 11 and 12 rest on each other. 16 is a part of the side that extends the rack and connects to the two arms 15 that the hooks 9 hook onto.

With reference to figure 4, Figure 4 shows how systems of spirals can be connected together. System one is the top system in the Figure, system two is the middle system in the figure and system three is the bottom system in the figure. Units in this figure are represented as rectangles. 26 is the first unit at the back of the system. It is the newest unit to be added to the system. 27 is a unit that has left the first spiral system but not yet entered the second spiral system. As all three systems move the unit in-between system one and two 27 will eventually join system two and start spiralling around the said system. The unit leaving system two 28 has just finished on system two and eventually will join system three as all the spiralling units move along. Each system has a light support 3 and a light source 2 in the centre of the spirals. 7 is a drive system. The drive system will consist of a servo that connects directly to the geared roller 1. The servo will drive the geared roller 1 around which will then drive the units to spiral around and along the system. 6 holds the geared roller in place at the opposite end to the drive system 7. 6 consists of a bearing attached to a metal plate (See figure 5). at the bottom of each system is a nutrients tray 22. The units spiral in and out of the nutrients tray partially submerging the units into the nutrient solution contained within the tray 22. As the

plant or crop gets larger there might be a need to enlarge the gap between the sides of each unit. This is done by inserting a separating cylinder 31 onto the geared roller. The separating cylinder 31 locks onto the geared roller 1 through a grub screw that is tightened onto the geared roller 1.

With reference to figure 5 a diagram showing how the geared roller fits into the bearing is described. At the end of the geared roller 1 is a smaller cylindrical end 33 that fits into the centre of the bearing hole. The bearing hole and cylindrical end 33 are the same size to make sure they fit tightly together with no movement other than the rotation of the said bearing. The bearing 32 is mounted on a metal plate 6. The metal plate 6 will also have a hole cut into it the same size as the bearing 32 to stop any movement of the bearing out of the metal plate 6. The metal plate is then attached to the nutrients tray.

With reference to figure 6, a drawing showing a plant growing out of a unit is shown. The drawing shows the direction of which the plant 34 grows out of a unit. Along the bottom of the unit is the rack 4 that will sit on the geared roller. The plant 34 is grown in growing media 10. The growing media 10 is big enough to support a plant(s) or crop(s) roots until it is harvested as the growing media cannot be changed from the time it enters a spiral system.

Best mode for carrying out the invention

The best mode for carrying out the invention would be in a controlled environment. Lighting would be controlled to provide ideal growing conditions for different plants and crops at different stages of their growth. Nutrient solution would also be controlled for ideal growing conditions at different stages of a plant or crops growth. Carbon dioxide and humidity levels would be controlled to create an ideal atmosphere that promotes growth for different plants and crops.

Industrial applicability

The invention is intended for industrial use to grow plants and crops on a mass scale. The invention will be able to supply many more fruits and vegetables using less space than conventional farming and current forms of hydroponics. The invention will also be powered by means of renewable energy as this is the most cost effective way of powering the invention. The invention will be able to produce many more fruits and vegetables than current forms of hydroponics and will use less space.

The apparatus is designed such as to save space. Hydroponic farming currently uses almost as much space as conventional soil farming. This is because they rely on sunlight for the plants to grow. The apparatus described in the invention uses an artificial light source so plants and vegetables can be grown almost anywhere providing all the other environmental conditions are right. The artificial light source can be changed to suit each individual plant or vegetable. For example different parts of the light spectrum are best for different types of plants. Blue spectrum light is great for leafy plants, such as Lettuce, Radish, or Collard. It also helps to keep the plant nice and compact. lights producing an orange-red spectrum are best for flowering plants, such as paper whites and iris. The orange-red light stimulates plants hormones, which makes for more flowering in the plant. As the light is in the centre of each system of spiralling units, they systems can be stacked on top of each other without blocking

any light as they do not rely on light coming from above. Plants and vegetables can also be grown quicker because artificial light can be on all day and night unlike the sun, because of this the plants and vegetables grown using this system have more time in the artificial light to grow rather than plants and vegetables grown under the sun where they stop growing when the sun sets.

All the lights used in the systems and all the servos used to rotate the systems will be powered by renewable energy such as solar panels and wind turbines. These forms of power supply would be easily attached to the roof of the building that houses the hydroponics apparatus. As power from the grid increases in price, it would not be cost effective to be used here from a business point of view so solar panels, wind turbines and other forms of renewable energy would be the primary choice.

I CLAIM:

1. The apparatus for growing plants and vegetables using hydroponics as the growing method
2. The said apparatus in claim one has a separate unit for growing each individual plant or vegetable or groups of plants or vegetables
3. The said units in claim two, when connected with other units will spiral around a central light source
4. The use of separating cylinders to save space and keep spirals as close as possible
5. The apparatus can be stacked on top of each other and can link two or more systems together by joining units from each system together.
6. The outside edge (also the bottom) of a unit may be straight or curved to create a smoother joining edge between each unit when connected together
7. One or more plants or vegetables can be grown in a single unit

Figure 1

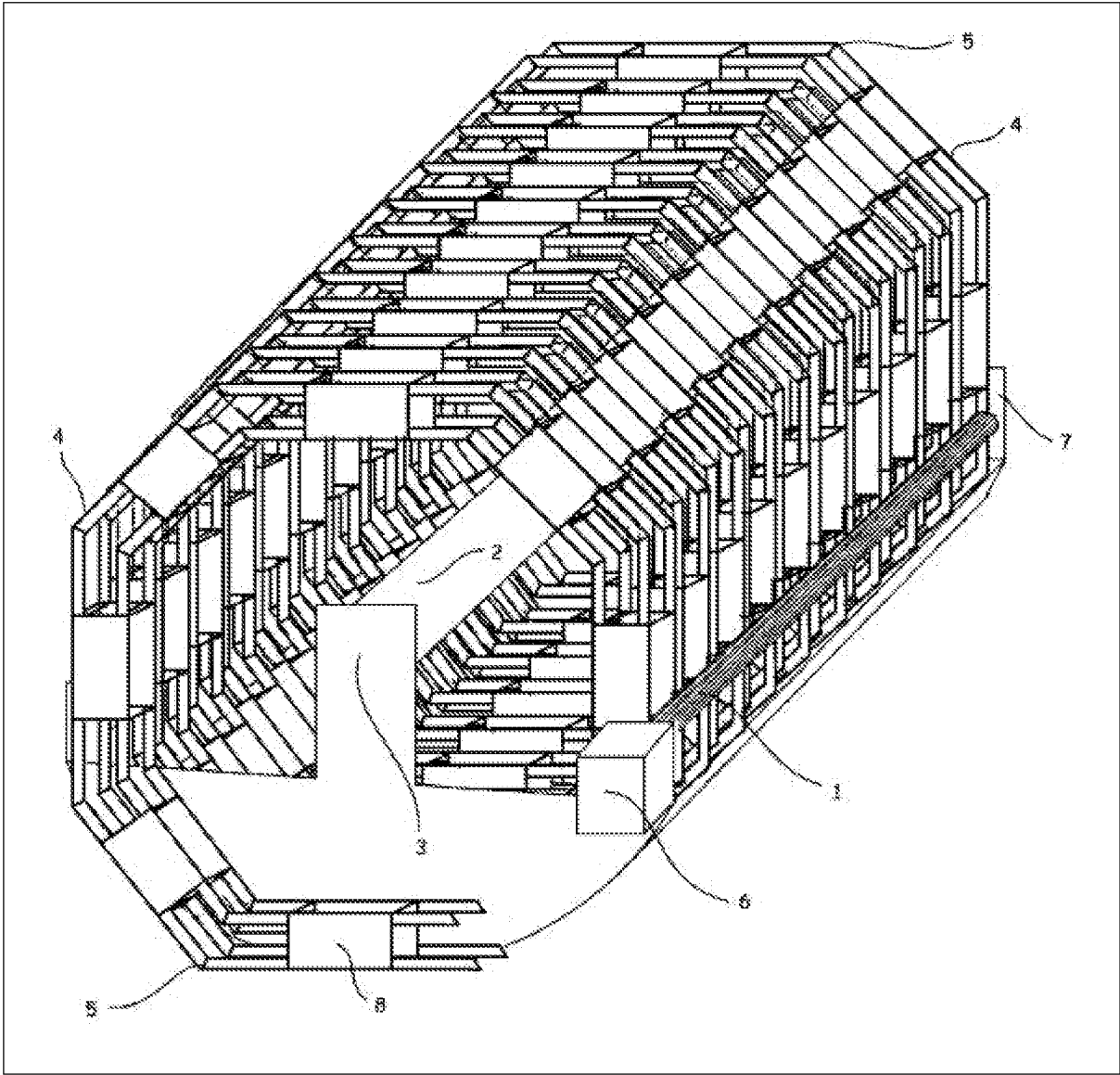


Figure 2

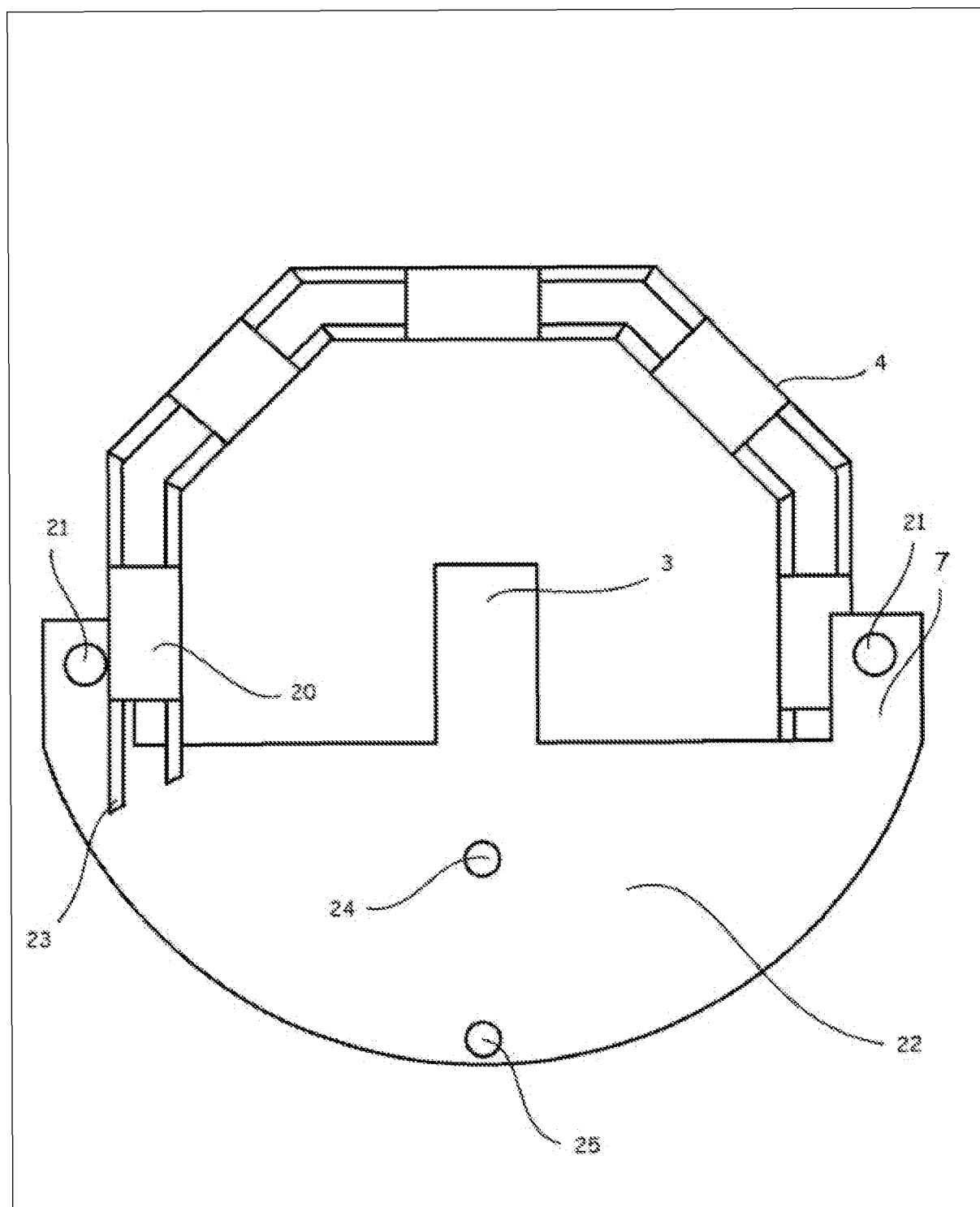


Figure 3

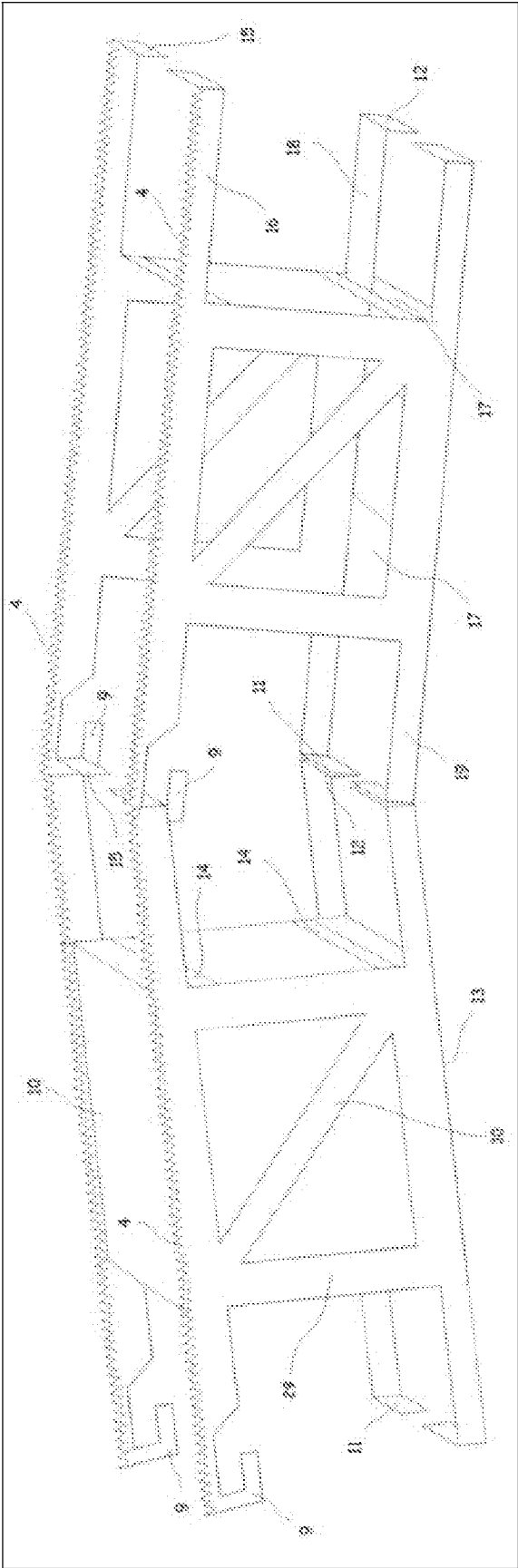


Figure 4

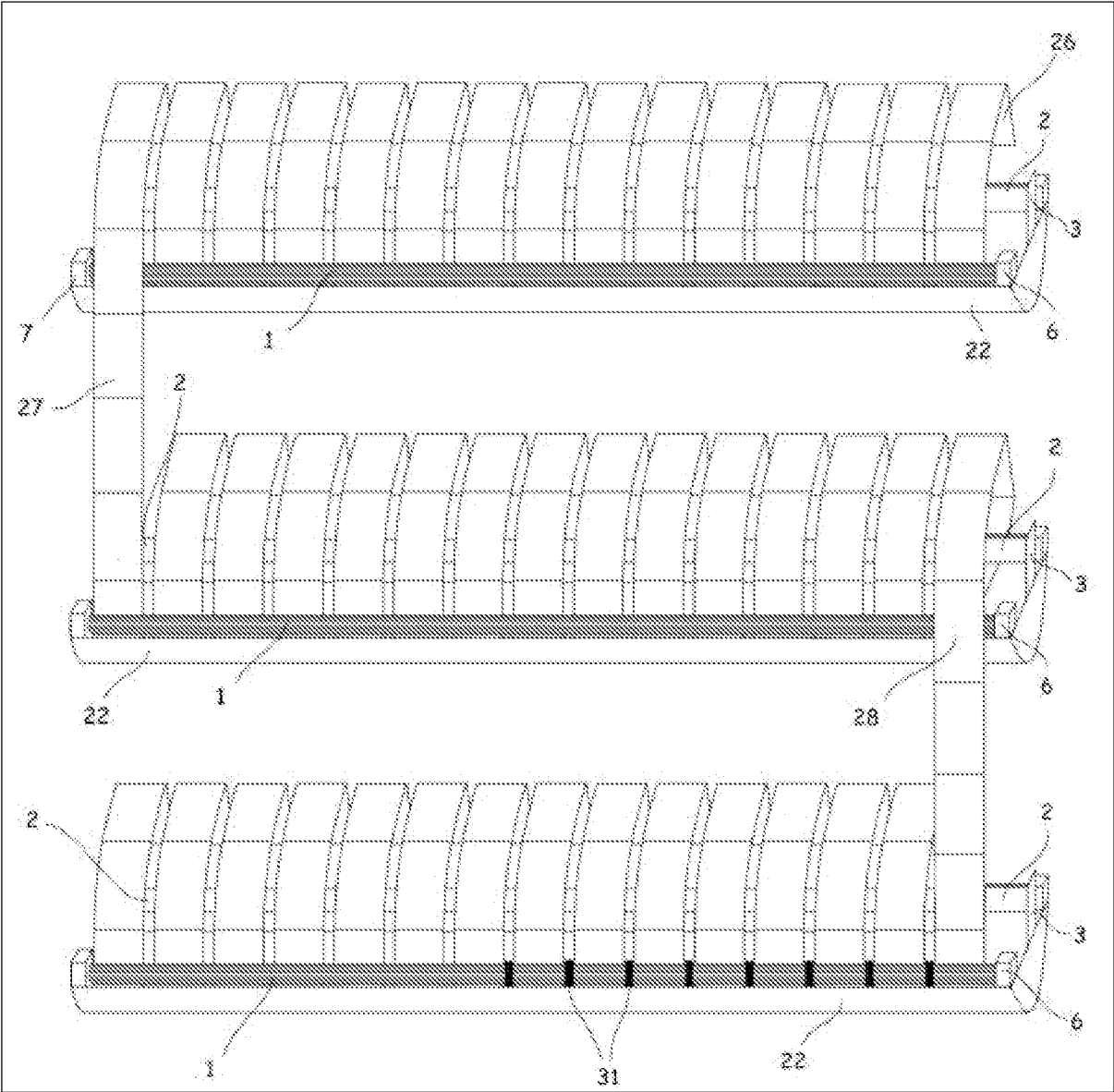


Figure 5

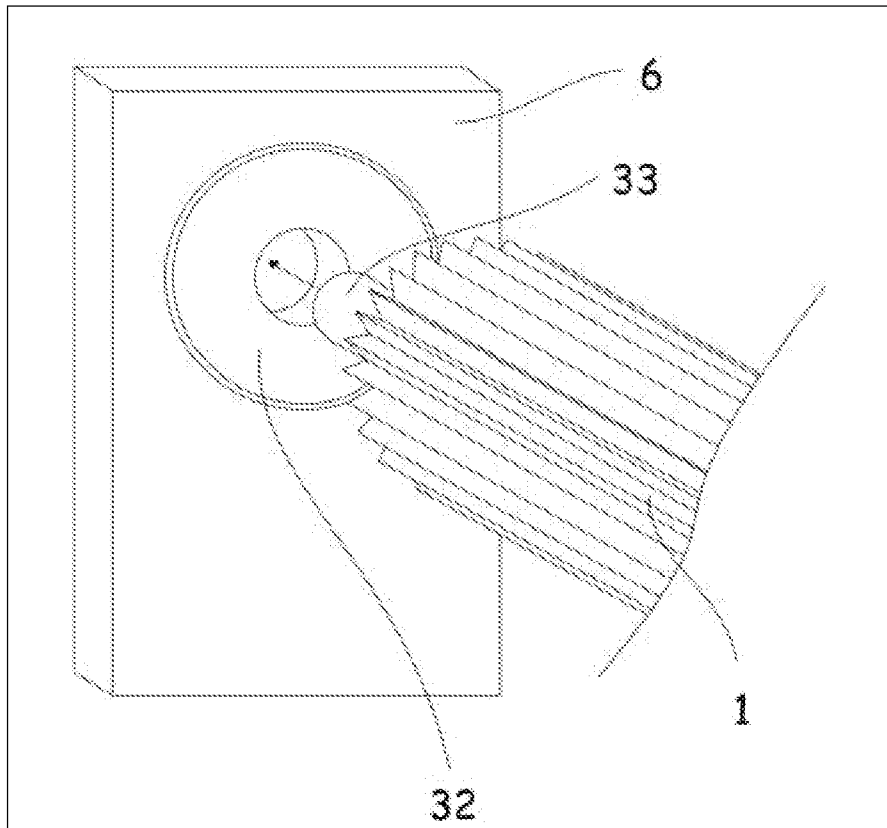
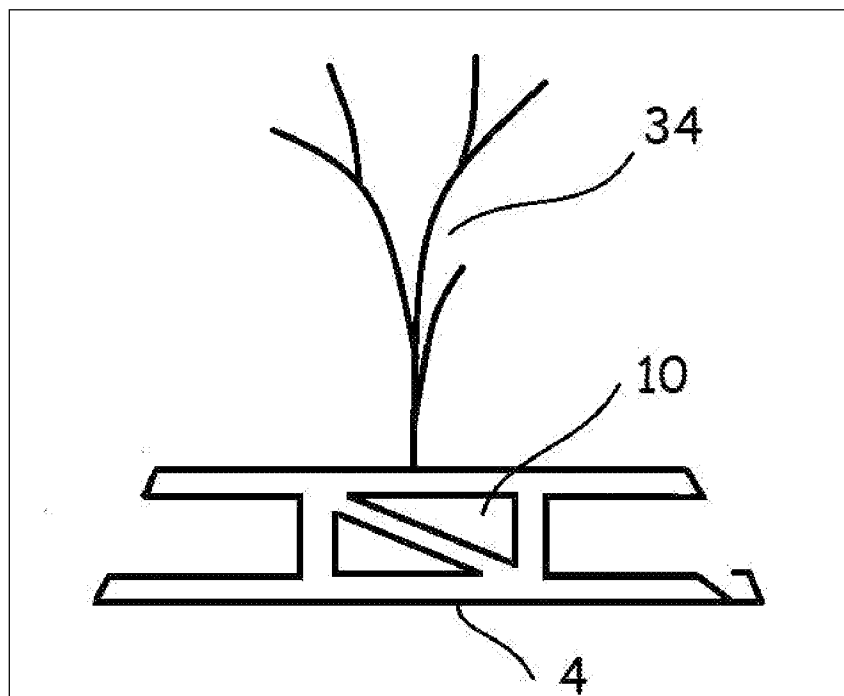


Figure 6



INTERNATIONAL SEARCH REPORT

International application No
PCT/GB2011/050421

A. CLASSIFICATION OF SUBJECT MATTER
INV. A01G31/04
ADD.

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)
A01G

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 practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	GB 2 121 263 A (LANGE ARTHUR HENRY; KAY ALAN WILLIAM; KAY ELIZABETH ANN; BURDGE JOHN H) 21 December 1983 (1983-12-21) page 2, line 46 - page 3, line 52; figures 1-5 -----	1-3,5-7



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"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)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"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

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"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.

"&" document member of the same patent family

Date of the actual completion of the international search

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25/01/2012

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/GB2011/050421

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
GB 2121263	A	21-12-1983	NONE
