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Hydroponic culture procedure and device for implementing thereof

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(56) Related Art
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ABSTRACT

HYDROPONIC CULTURE PROCEDURE
AND DEVICE FOR IMPLEMENTING IT

On parallel filiform supports (2) successively hanged channel units are established. The upper sheet (1) is fitted with holes (6) for the implantation of respective plants; the lower sheet (3), devoid of holes, acts as a sump; the intermediate sheets (4) are fitted with the same number of holes as the upper sheet (1), although longitudinally offset. The channel units are fed by a tube (8) that supplies the water and nutrients, which also provides a temperature control. From this tube emerges, above the upper sheet, a micro-tube or similar device for feeding the water individually. The liquid descends in the form of a cascade along the channel units and through the holes (7, 7') down to the lower channel unit (3), and in turn directs the plant roots along the same path of the nutrients.

Fig. 2

P/00/011
Regulation 3.2

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COMPLETE SPECIFICATION

FOR A STANDARD PATENT

ORIGINAL

TO BE COMPLETED BY APPLICANT

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Invention Title: "HYDROPONIC CULTURE PROCEDURE AND DEVICE FOR IMPLEMENTING THEREOF"

The following statement is a full description of this invention, including the best method of performing it known to me:-

HYDROPONIC CULTURE PROCEDURE AND DEVICE FOR IMPLEMENTING IT

DESCRIPTION

OBJECT OF THE INVENTION

The present invention lies within the scope of hydroponic cultures, namely cultures without earth, the object being to achieve a substantial simplification of the facilities and an equally substantial increase in yield.

The invention is furthermore related to the device for implementing said procedure.

BACKGROUND OF THE INVENTION

It is known that a hydroponic culture consists in an artificial culture process normally performed in shallow buckets to which a fertilizer liquid is added with a formulation that meets the nutrient requirements of a specific type of plant being grown, so that with adequate lighting, which may also be artificial, and adequate concentrations and proportions of nutrients dissolved in water, the plant growing conditions are optimal, providing far greater crops than those obtained by traditional methods.

A series of other advantages are furthermore achieved, such as greater plantation density, perfect overall root and plant protection against pathogenic agents, etc.

However, hydroponic cultures present a vitally important problem in regard to the plant's physical support means. The root of a plant plays a double role, namely that of absorbing the nutrients required by the plant and that of providing a physical support for the plant by taking root in the ground.

Hydroponic cultures do not require earth and therefore the plant's traditional physical support means disappears, thus requiring said traditional support to be replaced by

some other means having no detrimental effect on the crop in any of the above aspects. In this regard, inert matter such as high granulometric sand is used as a rooting physical support means, although this sand is occasionally difficult to obtain, is quite expensive and also poses several limitations to the farming facility as a result of its nature and weight.

Furthermore, although sand is in fact an inert matter, it may carry harmful germs to the plants, an initial thorough washing step therefore being essential, which furthermore has a negative economical effect.

DESCRIPTION OF THE INVENTION

The procedure proposed by the invention solves the above problems in a fully satisfactory manner by eliminating the traditional need to provide a rooting substrate for the plants based on coarse sand or some similar inert matter.

Toward this end, and stated more specifically, said procedure consists in establishing a stratified laminar support, i.e. a support based on several superimposed sheets which, in addition to providing channel units for the fertilizer liquid, constitutes a means of attachment for the plant roots as it is fitted with offset holes through which labyrinthine conducts are formed for the roots, and thus, as the plant grows and consequently requires a greater stability, the roots become progressively lodged in the holes in the various strata, thereby providing an optimum mechanical attachment.

The implementation of this procedure involves the use of a device structured on the basis of a plurality of sheets having different widths designed to form a plurality of superimposed channel units of an indefinite length fitted with folded edges for supporting a pair of parallel

cables or rods, the ends of which are attached to supports of an adequate height conveniently designed to raise the multiple channels and to optimize the operators' working conditions.

More specifically, the various sheets form dihedrons having different angles which form superimposed channels with a common mouth, the lower sheet being totally closed whereas the remaining sheets are provided with holes which in the upper sheet are spaced from each other according to the spacing foreseen for the plants, the holes being offset in the lower sheets in order to achieve a "cascading" effect based on a certain lengthwise slant of the overall multiple channel units.

The upper sheet acts exclusively as a physical support for attaching the plants, while the intermediate sheets, in addition to taking part in the above-mentioned rooting effect, constitute cascading channels for the fertilizer liquid which is supplied through a tube with multiple outlets positioned within the recess of each channel unit and which flows on all of the channel units, cascading from one to the other and thus providing irrigation and oxygenation to the roots of the plants.

The lower sheet or channel unit acts as a sump for the residual fertilizer liquid, which is recycled and is therefore used in its entirety.

DESCRIPTION OF THE DRAWINGS

In order to complement this description and help to provide a better understanding of the characteristics of the invention, a set of drawings is attached to this specification, being an integral part thereof, wherein the following is represented with an illustrative, non-limiting character:

Fig. 1 shows a schematic, cross section view of a

hydroponic culture device fabricated according to the object of the present invention.

Fig. 2 shows a schematic, side elevation, longitudinal section view of the device shown in the previous figure, according to the A-B section line in said figure.

Finally, Fig. 3 shows a schematic, perspective view of the device in question.

PREFERRED EMBODIMENT OF THE INVENTION

In the example of a practical embodiment shown in the drawings, a hydroponic culture device is shown comprising an upper sheet (1), preferably made of plastic, in the form of a longitudinal band of an indefinite length which, with the assistance of a pair of lateral supports (2) composed of cables or rods, forms an obtuse dihedron, a second sheet (3), considerably wider than the previous sheet, also of a plastic nature, preferably opaque, in turn forms an acute dihedron and is supported by the same cables and rods (2), and between these end sheets (1) and (2), and a set of intermediate sheets (4), also having a dihedric shape and supported by the same marginal filiform elements (2). The number of intermediate sheets (4) may vary according to the specific requirements in each case, namely the type of plant being cultivated.

A cover (5) provides an initial protection for the small plants or seeds at the start of the culture process and protects the first roots from the light.

The upper sheet (1) is provided - along its median line, i.e. the dihedron edge formed by said line - with a plurality of evenly distributed holes (6) which correspond to the spacing foreseen for the plants to be grown, each of the intermediate sheets (4) being in turn provided with a number of holes (7) identical to that of the upper sheet (1), although longitudinally offset in a staggered manner, as can be seen particularly in Fig. 2. The last sheet (3)

is devoid of holes.

In the channel units established by the intermediate sheets (4), feeding tubes (8-8') are installed for the fertilizer liquid, which simultaneously acts as a liquid thermic transmitter for adequate temperature control in the culture facility.

According to this structure, the upper sheet (1) acts exclusively as a physical support for either the plant's bare root or for its root and substrate, the root becoming attached to the sheet by lodging inside the holes (6), the first roots being protected against the light, the intermediate sheets (4) also cooperating in said physical support function in view that, as the plant grows, the root in each plant first reaches holes (7), then holes (7') and so forth, in the event that a larger number of intermediate sheets (4) is provided, whereby rooting takes place at different levels and the mechanical attachment of the plant increases as its size increases, thereby remaining permanently stable.

The channel assembly is assisted by the water/nutrients and temperature control tube (8). From this tube emerges, toward the upper area above the upper sheet, a micro-tube or similar device for feeding each watering unit individually, so that the roots of the plants are fully immersed in said intermediate channel units, the fertilizer liquid descending in a cascade by virtue of the longitudinal offsetting between holes (7) and (7'), down to the lower channel unit (3) which, as previously stated, acts as a sump for the excess fertilizer liquid.

The longitudinal offsetting of the holes (6), (7) and (7') is oriented in the same direction as the slanting of the overall multiple channel unit, so that at the lower end (9) of said channel unit, i.e. its outlet, a general sump is established, not shown, wherein the liquid fertilizer is recycled toward the starting point (10) of the multiple

channel unit for the integral use thereof.

The roots follow the path of the liquid fertilizer, the rooting thus taking place according to the full lines (11) shown in Fig. 2.

This description need not be more extensive for an expert on the subject to understand the scope of the invention and the advantages deriving therefrom.

The materials, shape, size and arrangement of the elements are liable to variation provided no alteration to the essence of the invention is involved.

The terms of this specification should at all times be taken in their ample, non-limiting sense.

The claims defining the invention are as follows:

1. A procedure for hydroponic culture, comprising hanging, from a pair of slanting parallel filiform supports, a multiple channel unit based on superimposed laminar strata perforated in order to establish, along said channel unit, multiple cascading paths for fertilizer liquid as well as a staggered path for plant roots through the different strata, in a manner that said strata furthermore constitute the physical rooting support for said plants.

2. A device for implementing the hydroponic culture procedure as claimed in claim 1, formed from a laminar body of an indefinite length which forms a substantially obtuse dihedron attached through its marginal zones to filiform guides or supports, and which, along its median line, incorporates a plurality of evenly distributed holes corresponding to the spacing foreseen for said plants, and hanging from said lateral guides is a lower laminar body devoid of holes which acts as a general sump for said device, while between said laminar bodies and one or more intermediate laminar bodies is or are established which determine the equally intermediate channel units provided with holes that coincide numerically with those of the upper laminar body, although they are longitudinally offset to correspond with the general slanting of the overall multiple channel unit.

3. The device as claimed in claim 2 wherein, within a recess of said laminar bodies which determine said intermediate channel units, tubes are established which simultaneously act as supplies of fertilizer liquid and as a means of heat-conditioning the culture via the temperature of the fertilizer itself,

so that said tubes feed fertilizer liquid to all the upper channel unit holes, said fertilizer liquid cascading from one intermediate channel unit to the other down to the lower channel unit which acts as a sump.

4. The device as claimed in claim 2 or claim 3, wherein at the lower end of the multiple channel unit a sump is established wherefrom the excess fertilizer liquid is recycled toward the upper end for its full reuse.

5. The device as claimed in any one of claims 2 to 4, wherein on one of the lateral longitudinal guides a cover is attached for protecting the roots from the light.

6. A procedure for hydroponic culture, substantially as described herein with reference to the accompanying drawings.

7. A device for hydroponic culture, substantially as described herein with reference to the accompanying drawings.

DATED this 21st day of July, 1997.

INSTAIN, S.A.

By their Patent Attorneys:

CALLINAN LAWRIE

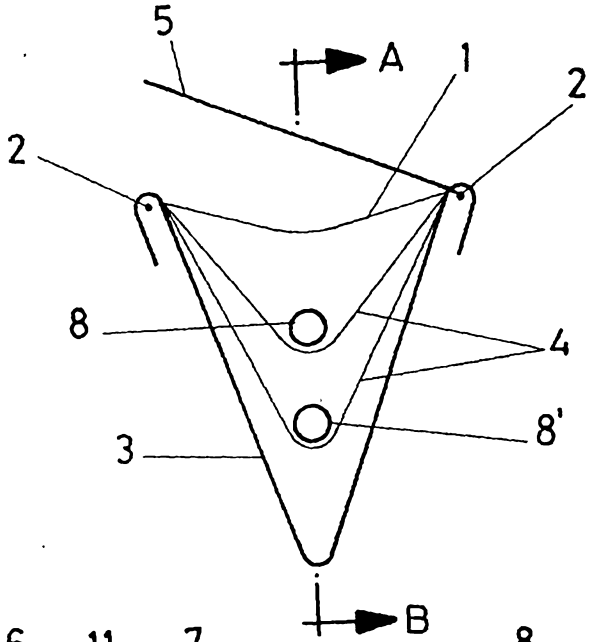
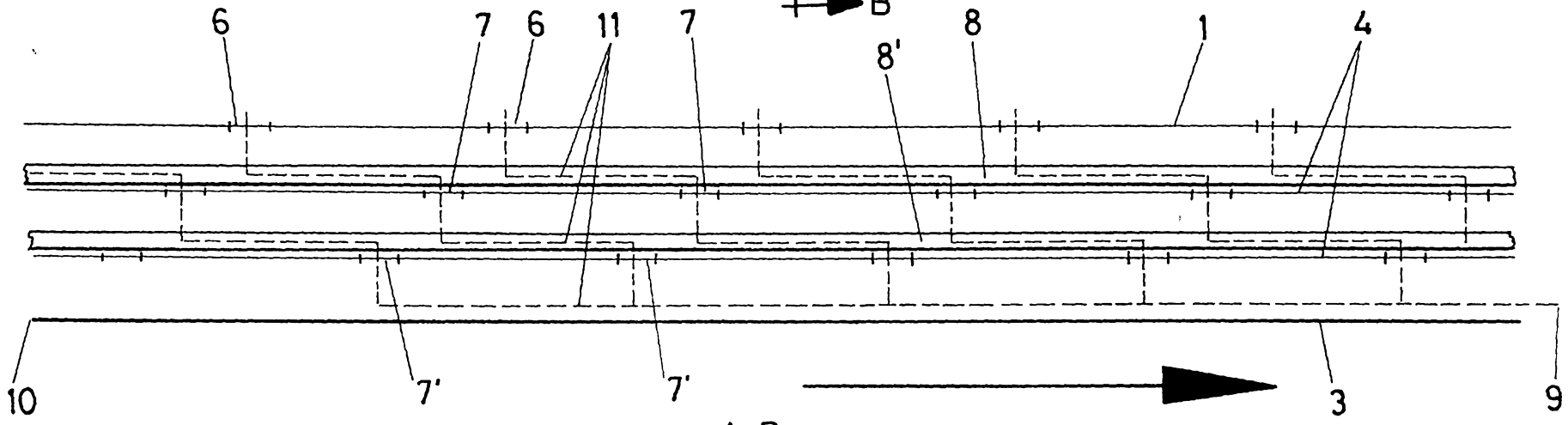


FIG.-1



A-B

FIG.-2

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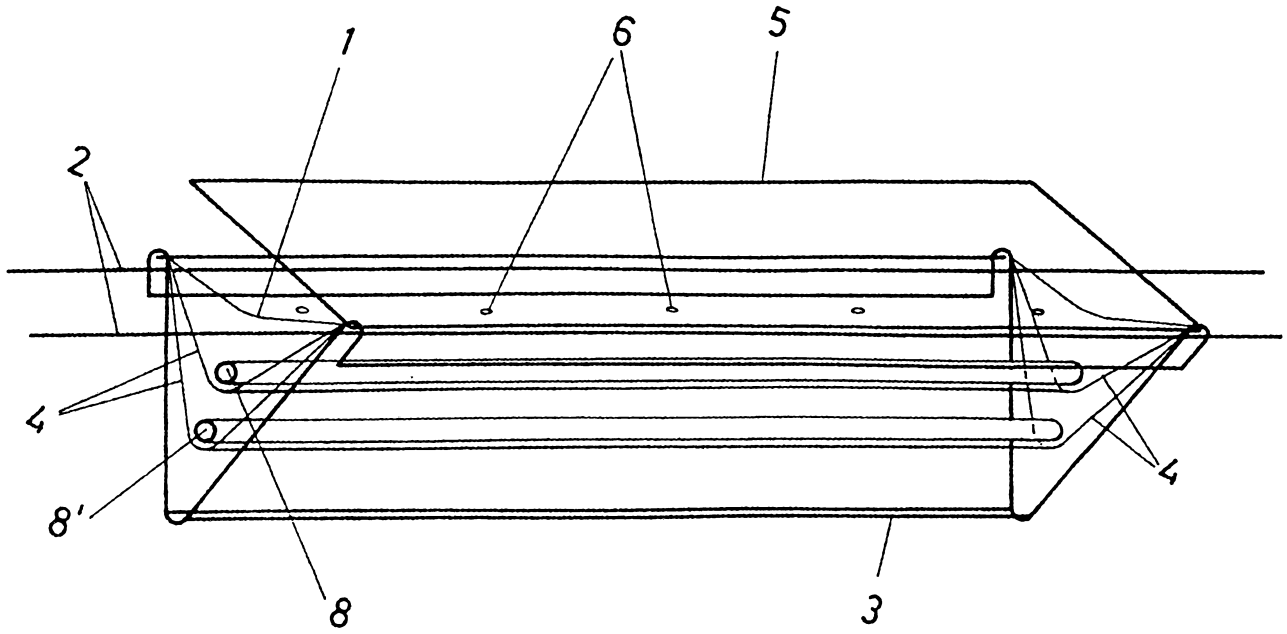

FIG.-3