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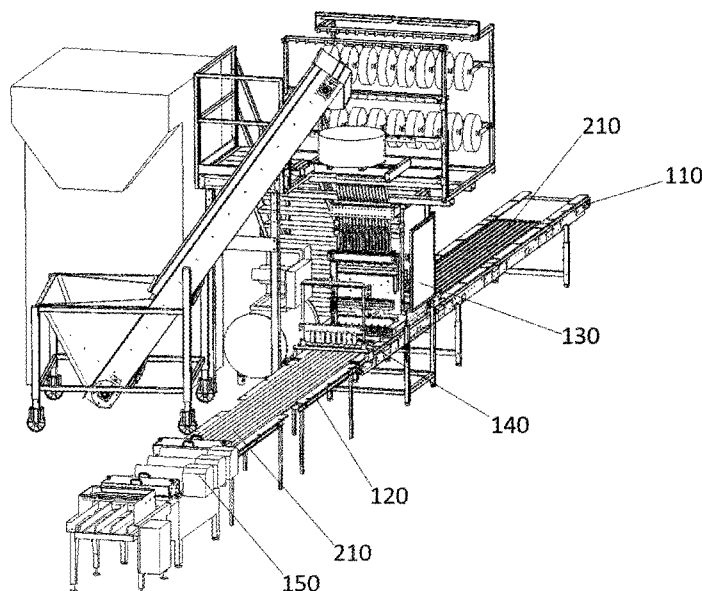


Fig. 1

(57) Abstract: The present invention relates to a process for line production of hydroponic systems, and to specific hydroponic systems.



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A hydroponic system, and a process for producing a hydroponic system

Technical field of the invention

The present invention relates to hydroponic production of plants.

Background of the invention

5 Hydroponics is a subbranch of hydroculture, which is a method of growing plants with a minimal amount of soil. The nutrients are supplied dissolved in water. The nutrients may be supplied by use of a Nutrient Film Technique (NFT) system. An NFT system is a recirculating hydroponic system that consists of long channels or trays through which a nutrient solution is constantly pumped, creating a nutrient film
10 into which the roots grow. Plants are often started in plastic pots with stone wool inside and then placed in the growing channels or trays. This is very problematic, as there is a dramatic increase of plastic waste in general in the world, and stone wool needs to be collected and deposited. Furthermore, when the herbs are harvested, the plastic pots and stone wool are seldom separated from the root and growth
15 medium, and both parts are therefore not recycled.

EP3192356 discloses a device for hydroponic growth in a modular tank with a U-shaped section adapted to receive a block of compressed growth medium, and a depression formed below the U-shaped section adapted to allow air circulation
20 beneath the growth medium block.

Description of the invention

It is an object of the present invention to provide an alternative hydroponic system to replace the environmentally unfriendly system with injection moulded plastic pots
25 with stone wool.

A first aspect relates to a hydroponic system comprising:

- an elongated hydroponic reservoir; and
- one or more elongated growth medium rods;

30 wherein said elongated hydroponic reservoir comprises:

- a1) one cavity of at least 0.5 meters, extending along the length of said reservoir and adapted for receiving an elongate growth medium rod; and

a2) one elongate growth medium rod positioned on its side within the cavity of said reservoir; or

b1) a plurality of elongated cavities of at least 0.5 meters, each cavity extending along the length of said reservoir, and each cavity adapted for receiving an elongate growth medium rod; and

b2) a plurality of elongated growth medium rods, each elongated growth medium rod positioned on its side within each cavity of said reservoir; wherein said elongated growth medium rod(s) has i) a length of at least 0.5 meters or ii) a length corresponding to the length of said cavity in which it is positioned.

Another aspect relates to a hydroponic system comprising:

- an elongated hydroponic reservoir; and
- one or more elongated growth medium rods;

wherein said elongated hydroponic reservoir comprises:

- one cavity of at least 0.5 meters, extending along the length of said reservoir and adapted for receiving an elongate growth medium rod; and
- one elongate growth medium rod positioned on its side within the cavity of said reservoir.

Yet another aspect relates to a hydroponic system comprising:

- an elongated hydroponic reservoir; and
- one or more elongated growth medium rods;

wherein said elongated hydroponic reservoir comprises:

- a plurality of elongated cavities of at least 0.5 meters, each cavity extending along the length of said reservoir, and each cavity adapted for receiving an elongate growth medium rod; and
- a plurality of elongated growth medium rods, each elongated growth medium rod positioned on its side within each cavity of said reservoir.

In one or more embodiments, the elongated growth medium rod(s) has i) a length of at least 0.5 meters or ii) a length corresponding to the length of said cavity in which it is positioned.

Preferably, the elongated medium rod(s) comprises an amount of growth medium held in a water and air permeable sheet material.

- 5 By using a water and air permeable sheet material, preferably biodegradable, woven or nonwoven, there is no need for the environmentally unfriendly injection moulded plastic pots with stone wool. Rather, the water and air permeable sheet material may be recycled together with the plant roots and growth medium. The sheet material must be water and air permeable in order for the produced rod with plants
10 to be able to absorb water and dissolved nutrients. The hydroponic system may be line produced by the method according to the present invention.

The length of the growth medium rod is at least 0.5 meters or at least corresponding to the length of the cavity, which is at least 0.5 meters. Shorter lengths of 0.3 meters
15 or 0.4 meters, are contemplated by the present invention, but less preferred.

Compared to a traditional growth medium pot, which have a bottom end and a top end, this type of growth medium rod is configured with a front end and a rear end as its length requires it to lie down within the cavity of the hydroponic reservoir. This configuration reduces the area of growth medium, which is not covered by the sheet
20 material and thereby reduces the risk of growth medium clogging the hydroponic system's filters, pumps, and tubing recirculating the nutrient solution.

The length of the growth medium rod may preferably be within the range of 0.5-20 meters, such as within the range of 1-18 meters, e.g., within the range of 2-16 meters, such as within the range of 3-14 meters, e.g., within the range of 4-15
25 meters, such as within the range of 5-14 meters, and even more preferably within the range of 5-10 meters.

The term "biodegradable" as used herein describes the chemical dissolution of materials by bacteria or other biological means.

30

As used herein, the term "nonwoven sheet material" means a sheet material that has a structure of individual fibers or threads, which are interlaid, but not in an identifiable repeating manner. Nonwoven sheet materials may be formed by a variety of processes such as, for example, meltblowing processes, spunbonding

processes, coforming processes, airlaying processes, wetlaying processes, and hydroentangling.

The fibers used for the water permeable sheet material are preferably
5 biodegradable, which can be natural or synthetic fibers, e.g., cellulosic fibers, protein fibers or synthetic polymer fibers. Natural fibers can comprise pulped or shredded cellulose fibers, such as wood pulp, shredded wood, shredded paper (tissue, newsprint and the like), straw, cotton fiber, composted vegetation, fibrous sphagnum moss, peat moss, shredded stalks including shredded corn stalks and shredded
10 pine straw (including needles, twigs, cones and small branches). Shredded vegetation is preferably dry before shredding. Protein fibers can e.g., be hair or gelatin. Biodegradable synthetic fibers can comprise reconstituted cellulose fibers, such as rayon fibers, vinyl polymer fibers, such as fibrous polyvinyl alcohol, poly lactic acid, and polyamide fibers.

15 The term "cellulosic fibers" as used herein describes fibers made from an organic compound derived primarily from plants such as trees.

The term "wood pulp fibers" as used herein describes a type of cellulosic fiber made
20 from a lignocellulosic fibrous material prepared by chemically or mechanically separating cellulosic fiber from plants such as trees or cotton.

The term "regenerated/reconstituted cellulosic fibers" as used herein describes a type of cellulosic fiber made from wood pulp using a solvent fiber spinning process.
25 The process involves dissolving wood pulp in a solvent and spinning the resultant spinning solution into fibers.

In one or more embodiments, the biodegradable and water permeable sheet material consist of spunlaced fibers without fiber binding materials. The term
30 "spunlaced" as used herein refers to a structure of individual fibers or threads, which are physically entangled, without thermal bonding. Physical entanglement may be achieved using a water entanglement process, or alternatively, a needling process or a combination of both processes. The spunlaced fibers provide the strength to the

water permeable sheet without the need for a binder, also, and very importantly for the present use, when the water permeable sheet is wet.

5 In order for the water permeable sheet material to be sealable, at least some of the fibers should preferably be made from, or coated with, a thermoplastic material. Alternatively, the water permeable sheet material could be coated with a hotmelt composition. Another method for sealing the sheet material tube may be to emboss or sew the sheet parts together.

10 In one or more embodiments, the water permeable sheet material is heat sealable.

In one or more embodiments, the water and air permeable sheet material comprises a) fibers coated with a thermoplastic material and/or b) fibers of a thermoplastic material; and wherein the sealings are made by heating.

15 In one or more embodiments, the sheet material is formed as a tube or cylinder covering the amount of growth medium.

20 In one or more embodiments, the tubular, or cylindrical sheet material is open in at least one of the ends.

In one or more embodiments, the growth medium rod comprises a plurality of cavities positioned along its length. The cavity may in some embodiments be formed in the growth medium rod without penetrating or perforating the water and air permeable sheet material but could in other embodiments penetrate and perforate the water and air permeable sheet material. The distance between the cavities depends on the type of plant to be grown, but could e.g., be within the range of 3-30 cm, such as within the range of 4-25 cm, preferably within the range of 5-20 cm, e.g., within the range of 10-15 cm. The cavity is adapted for receiving a seed or a seedling. The seedling may be a potted seedling, and hence, the cavity may be adapted for receiving a plant pot or bag. The plant pot or bag preferably consists of the same materials as the growth medium rod. Obviously, such a pot or bag is relatively smaller than the growth medium rod with the cavities. The cavity may be formed by drilling or indentation. A drilled cavity is preferably suitable for receiving a

seedling in a plant pot or bag, and the cavity is formed by drilling through the side of the growth medium rod that is facing upwards when positioned within the reservoir, i.e., the sheet material is penetrated. An indented cavity is preferably suitable for receiving a seed and may be formed by punching a dibble into the side of the growth medium rod that is facing upwards when positioned within the reservoir. For an embodiment where the sheet material should be penetrated, the dibble is preferably configured with a cutting edge or other cutting means.

10 In one or more embodiments, a plurality of said cavities each contains one or more seeds.

In one or more embodiments, a plurality of said cavities each are filled with a seedling, such as a seedling in a plant pot or bag.

15 In one or more embodiments, the cavities are distributed at equidistance along the length of said growth medium rod.

In one or more embodiments, the growth medium rod is pre-seeded with seeds in or on the growth medium, preferably with a predefined distance between said seeds.

20 This may be performed by positioning or dropping a seed into the growth medium before the water and air permeable sheet material is sealed around said growth medium.

In one or more embodiments, the elongated hydroponic reservoir is a tube, pipe, or gutter. The length of the elongated hydroponic reservoir may vary, but is preferably at least 2 meters long, such as within the range of 2-50 meters, e.g., at least 3 meters, such as within the range of 3-45 meters, e.g., at least 4 meters, such as within the range of 4-40 meters, e.g., at least 5 meters, such as within the range of 5-35 meters, e.g., at least 6 meters, such as within the range of 6-30 meters, e.g., at least 7 meters, such as within the range of 7-25 meters, e.g., at least 8 meters, such as within the range of 8-20 meters, e.g., at least 9 meters, such as within the range of 9-15 meters, e.g., at least 10 meters.

A process for producing the hydroponic system according to the present invention could comprise the steps of:

i) providing an elongated hydroponic reservoir comprising one or more elongated cavities of at least 0.5 meters, extending along the length of said reservoir and

5 adapted for receiving an elongate growth medium rod; and

ii) positioning an elongated growth medium rod within said one or more cavities; said growth medium rod having a) a length of at least 0.5 meters or b) a length corresponding to the length of said cavity;

10 wherein said growth medium rod comprises an amount of growth medium held in a water and air permeable sheet material.

The process could further comprise the steps of:

iii) drilling or indenting a plurality of cavities along the length of said growth medium rod; and

15 iv.a) inserting a seedling in a plant pot or bag into a plurality of cavities of said growth medium rod; and/or

iv.b) positioning or dropping a seed into a plurality of cavities of said growth medium rod.

20 The process could further comprise the steps of:

iii) drilling or indenting a plurality of cavities along the length of said growth medium rod; and

iv.a) inserting a seedling in a plant pot or bag into a plurality of cavities of said growth medium rod.

25

The process could further comprise the steps of:

iii) drilling or indenting a plurality of cavities along the length of said growth medium rod; and

30 iv.b) positioning or dropping a seed into a plurality of cavities of said growth medium rod.

The process could further comprise the steps of:

iii) drilling a plurality of cavities along the length of said growth medium rod; and
iv.b) positioning or dropping a seed into a plurality of cavities of said growth medium rod.

- 5 A second aspect relates to a system for use in a process of producing a hydroponic system, comprising:
- a conveyor system adapted for transporting an elongated hydroponic reservoir comprising one or more elongated cavities of at least 0.5 meters and extending along the length of said reservoir and adapted for receiving an elongate growth
10 medium rod;
 - a growth medium rod distributor unit adapted for positioning growth medium rods into said cavity or cavities of said elongated hydroponic reservoir, said growth medium rods having a) a length of at least 0.5 meters or b) a length corresponding to the length of said cavity;
 - 15 - at least one of a drilling unit and indentation unit, the drilling unit adapted for drilling a plurality of cavities along the length of said growth medium rod positioned within said hydroponic reservoir, and the indentation unit adapted for indenting a plurality of cavities along the length of said growth medium rod positioned within said hydroponic reservoir; and
 - 20 - at least one of a seedling delivery unit and a seed delivery unit, the seedling delivery unit adapted for inserting a seedling in a plant pot or bag into a plurality of cavities of said growth medium rod, and the seed delivery unit adapted for positioning or dropping a seed into a plurality of cavities of said growth medium rod; wherein said conveyor system is adapted for transporting an elongated hydroponic
25 reservoir through said growth medium rod distributor unit, at least one of a drilling unit and indentation unit, and at least one of a seedling delivery unit and a seed delivery unit.

The conveyor may comprise one or more conveyors, e.g., a first conveyor
30 positioned upstream to the growth medium rod distributor unit, and a conveyor positioned downstream to the growth medium rod distributor unit. The first conveyor may be a stepper conveyor, which is configured to move the hydroponic reservoir in successive distance movements, also called discrete step increments. The first conveyor may be a belt conveyor driven by an electric stepper motor to producing a

torque to the pulley so by friction of the conveyor belt on the powered pulley the conveyor belt and the load is moved in a conveying direction. A stepper motor is commonly used for position control. The use of an electric stepper motor makes the transport of the hydroponic reservoir more controllable, e.g., to change the speed of conveying and move the hydroponic reservoir on the conveyor belt in successive distance movements. These successive distance movements allow the growth medium rod distributor unit, drilling unit, and indentation unit enough time to perform their action at a specific location relative to the hydroponic reservoir. The growth medium rod distributor unit will have time to position a growth medium rod at a specific position within the hydroponic reservoir, and the drilling unit and indentation unit will have enough time to act on a positioned growth medium rod.

The growth medium rod distributor unit may be of any type known within the art being configured for distributing, and optionally also producing, growth medium rods comprising an amount of growth medium held in a water and air permeable sheet material. Suitable types of distributor units may be as disclosed in WO2017216146, WO2017216145, or WO19001944, hereby incorporated by reference.

In one or more embodiments, the distributor apparatus comprises a growth medium rod production unit. Such a unit may be as disclosed in WO1992003914 or WO19011742, hereby incorporated by reference. The main difference is that the length of the rod will be substantially longer than the traditionally produced pot. A fewer number of cuts per time period is obviously needed.

The system also comprises at least one of a drilling unit and indentation/dibbling unit. The drilling unit and the indentation unit may be present in the same system. In this situation, the system further comprises a controller configured for activating either the drilling unit or the indentation unit. The drilling unit is adapted for drilling a cavity in the side of a growth medium rod positioned within the hydroponic reservoir. The drilling unit may e.g., comprise a column drill and optionally means adapted for removing the by the drill removed growth medium. The indentation unit is adapted for indenting a cavity in the side of a growth medium rod positioned within the hydroponic reservoir and may comprise a dibble tool, preferably comprising means adapted for penetrating the rod's sheet material.

The system also comprises at least one of a seedling delivery unit and a seed delivery unit. The seedling delivery unit and the seed delivery unit may be present in the same system. In this situation, the system further comprises a controller
5 configured for activating either the seedling delivery unit or the seed delivery unit. The seedling delivery unit is adapted for inserting a seedling in a plant pot or bag into a cavity of said growth medium rod. The seedling delivery unit may e.g., comprise a robotic arm or a distributor adapted for positioning or dropping the seedlings positioned in a plant pot or bag into the cavity of the relatively larger
10 growth medium rod positioned within the hydroponic reservoir. The seed delivery unit is adapted for positioning or dropping a seed into a cavity of said growth medium rod, and may e.g., comprise a distributor adapted for positioning or dropping a seed into the cavity of the growth medium rod positioned within the hydroponic reservoir. Such seeding equipment is known within the art and may e.g.,
15 be a drumseeder, needleseeder, transplanter, or the like.

As used in the specification and the appended claims, the singular forms "a", "an", and "the" include plural referents unless the context clearly dictates otherwise. Ranges may be expressed herein as from "about" or "approximately" one particular
20 value and/or to "about" or "approximately" another particular value. When such a range is expressed, another embodiment includes from the one particular value and/or to the other particular value. Similarly, when values are expressed as approximations, by use of the antecedent "about", it will be understood that the particular value forms another embodiment.

25

It should be noted that embodiments and features described in the context of one of the aspects of the present invention also apply to the other aspects of the invention.

Brief description of the figures

30 Figures 1-3 show different views of systems for line production of a hydroponic system according to various embodiments of the present invention.

Detailed embodiments of the invention

Figures 1-3 show different views of systems for line production of a hydroponic system according to various embodiments of the present invention. The shown system is capable of handling nine juxtaposed hydroponic reservoirs at the time but
5 may be used with fewer, such as one, and can also be configured to handle even more. Figure 1 shows a perspective view of the system. The system comprises a conveyor system 110, 120 adapted for transporting (juxtaposed) elongated hydroponic reservoirs 210; a growth medium rod distributor unit 130 adapted for positioning growth medium rods into elongated hydroponic reservoirs 210; an
10 indentation unit 140 adapted for indenting/dibbling a cavity (not shown) in the side of a growth medium rod positioned within said hydroponic reservoir 210; and a seed delivery unit 150 adapted for positioning or dropping a seed into a formed cavity of each of said growth medium rods. A mechanism adapted for aligning the hydroponic reservoirs 210 before loading the growth medium rod 220 therein is not shown but
15 may be present.

Figure 2 shows a closeup view of the system at the location of the indentation unit 140. A hydroponic system has just been produced and is forwarded to the seed
20 delivery unit 150 (Figure 1) adapted for positioning or dropping a seed into a cavity of a growth medium rod 220.

Figure 3 shows a perspective view of a growth medium rod distributor unit 130 adapted for positioning growth medium rods 220 into an elongated hydroponic reservoir 210. The remaining part of the system is not shown. This apparatus is only
25 capable of filling a single elongated hydroponic reservoir at the time.

References

- 110 Conveyor
- 120 Conveyor
- 5 130 Distributor unit
- 140 Indentation unit
- 150 Seed delivery unit
- 210 Hydroponic reservoir
- 220 Growth medium rod
- 10

Claims

1. A hydroponic system comprising:

- an elongated hydroponic reservoir (210); and
- one or more elongated growth medium rods (220);

5 **characterized in that** said elongated hydroponic reservoir (210) comprises:

a1) one cavity of at least 0.5 meters, extending along the length of said reservoir (210) and adapted for receiving an elongate growth medium rod (220); and

a2) one elongate growth medium rod (220) positioned on its side within the cavity of said reservoir (210); or

10 b1) a plurality of elongated cavities of at least 0.5 meters, each cavity extending along the length of said reservoir (210), and each cavity adapted for receiving an elongate growth medium rod (220); and

b2) a plurality of elongated growth medium rods (220), each elongated growth medium rod (220) positioned on its side within each cavity of said reservoir (210);

15 wherein said elongated growth medium rod(s) (220) has i) a length of at least 0.5 meters or ii) a length corresponding to the length of said cavity in which it is positioned.

2. The hydroponic system according to claim 1, wherein the elongated growth

20 medium rod(s) (220) comprises an amount of growth medium held in a water and air permeable sheet material.

3. The hydroponic system according to any one of the claims 1-2, wherein the length of the growth medium rod(s) (220) is within the range of 0.5-20 meters.

25

4. The hydroponic system according to any one of the claims 1-3, wherein the growth medium rod(s) (220) comprises a plurality of cavities positioned along its length.

30 5. The hydroponic system according to claim 4, wherein a plurality of said cavities each contains one or more seeds.

6. The hydroponic system according to any one of the claims 4-5, wherein a plurality of said cavities each are filled with a seedling, e.g., a seedling in a plant pot or bag.

7. The hydroponic system according to any one of the claims 4-6, wherein said cavities are distributed at equidistance along the length of said growth medium rod.

5 8. The hydroponic system according to claim 1, wherein said growth medium rod(s) (220) are pre-seeded with seeds in or on the growth medium, preferably with a predefined distance between said seeds.

9. A system for use in a process of producing a hydroponic system, comprising:

10 - a conveyor system (110, 120) adapted for transporting an elongated hydroponic reservoir (210) comprising one or more elongated cavities of at least 0.5 meters and extending along the length of said reservoir (210) and adapted for receiving an elongate growth medium rod (220);

- a growth medium rod distributor unit (130) adapted for positioning growth medium rods (220) into said cavity or cavities of said elongated hydroponic reservoir (210), said growth medium rods (220) having a) a length of at least 0.5 meters or b) a length corresponding to the length of said cavity;

15 - at least one of a drilling unit and indentation unit (140), the drilling unit adapted for drilling a plurality of cavities along the length of said growth medium rod (220) positioned within said hydroponic reservoir (210), and the indentation unit (140) adapted for indenting a plurality of cavities along the length of said growth medium rod (220) positioned within said hydroponic reservoir (210); and

- at least one of a seedling delivery unit and a seed delivery unit (150), the seedling delivery unit adapted for inserting a seedling in a plant rod into a plurality of cavities of said growth medium rod (220), and the seed delivery unit (150) adapted for positioning or dropping a seed into a plurality of cavities of said growth medium rod (220);

25 wherein said conveyor system is adapted for transporting an elongated hydroponic reservoir (210) through said growth medium rod distributor unit (130), at least one of a drilling unit and indentation unit (140), and at least one of a seedling delivery unit and a seed delivery unit (150).

10. The system according to claim 9, wherein the conveyor system (110, 120) comprises a first conveyor (110) positioned upstream to the growth medium rod

distributor unit (130), and a second conveyor (120) positioned downstream to the growth medium rod distributor unit (130).

11. The system according to claim 10, wherein the first conveyor (110) is a stepper
5 conveyor configured to move the hydroponic reservoir (210) in successive distance movements.

12. The system according to any one of the claims 9-11, wherein the growth
medium rod distributor unit (130) comprises a growth medium rod production unit.
10

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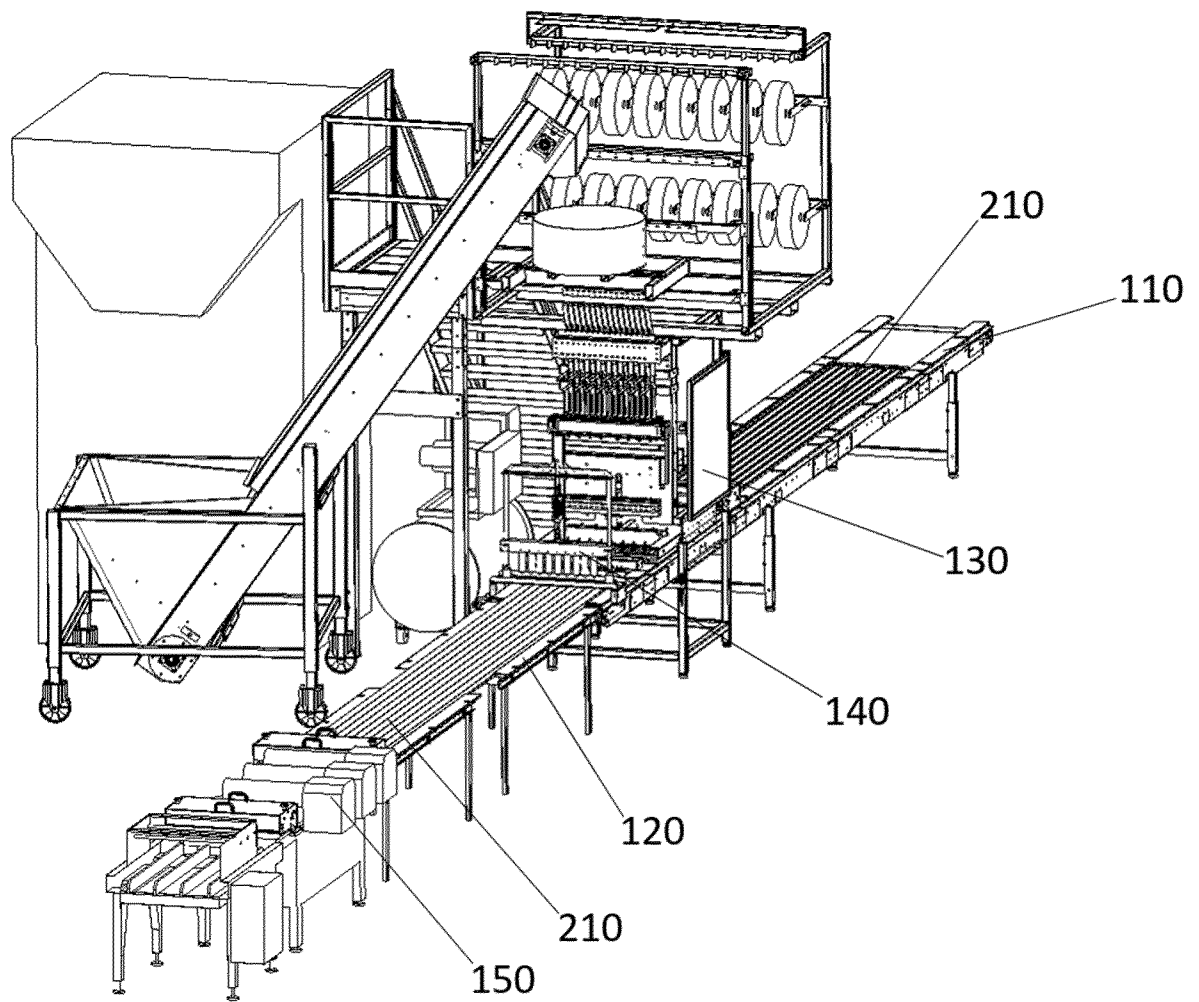


Fig. 1

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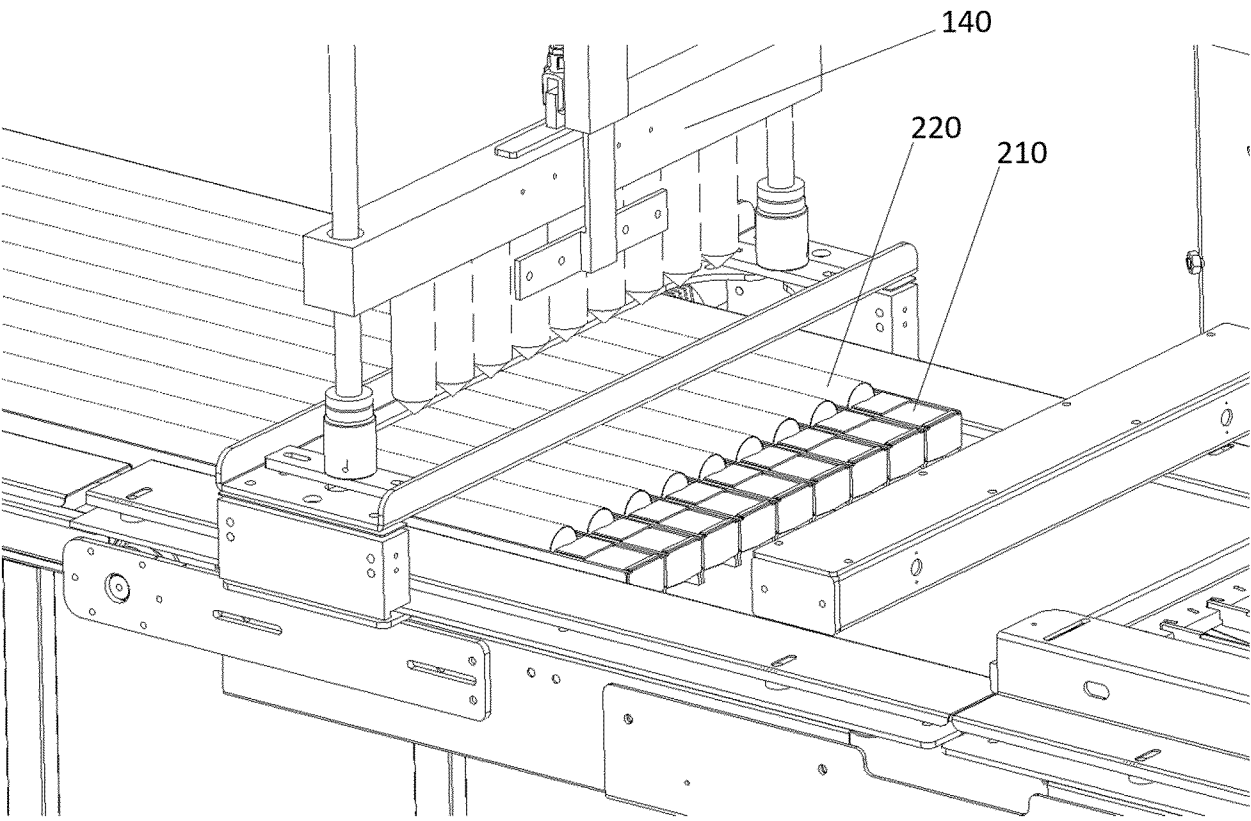


Fig. 2

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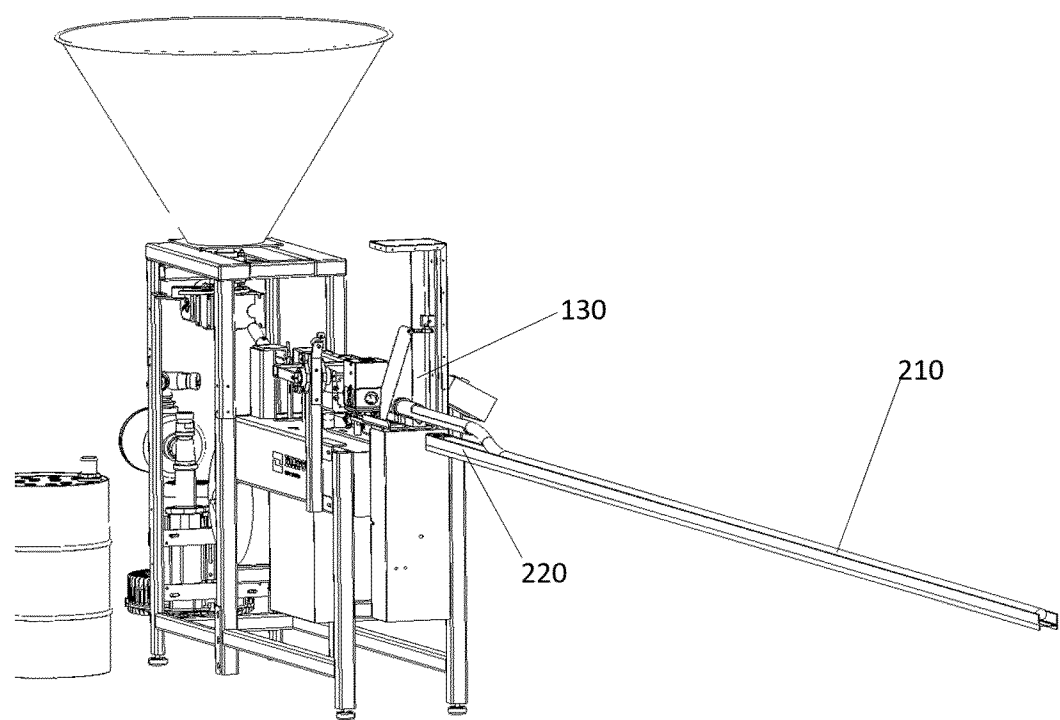


Fig. 3

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2021/077362

A. CLASSIFICATION OF SUBJECT MATTER INV. A01G31/04 A01G9/029 A01G9/04 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 practicable, 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	WO 2009/154829 A1 (SUSTAINABLE STRATEGIES LLC [KN]; KING MARK J [US]; KING MARTIN A [CA]) 23 December 2009 (2009-12-23) paragraph [0013] - paragraph [0039]; figures 1-3 -----	1-8
A	WO 2017/216146 A1 (ELLEPOT AS [DK]) 21 December 2017 (2017-12-21) cited in the application page 10, line 25 - page 12, line 8; figures 1-5 -----	1-12
A	NL 8 000 659 A (VISSER TUINBOUWTECH) 1 September 1981 (1981-09-01) page 2, line 30 - page 4, line 25; figures 1-2f ----- -/-	1-12
☒ 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 application or patent 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 12 January 2022		Date of mailing of the international search report 20/01/2022
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016		Authorized officer Vehrer, Zsolt

INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2021/077362

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4 312 152 A (DRURY DANIEL ET AL) 26 January 1982 (1982-01-26) column 4, line 60 - column 8, line 22; figures 1-9 -----	1-12

INTERNATIONAL SEARCH REPORT

Information on patent family members

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