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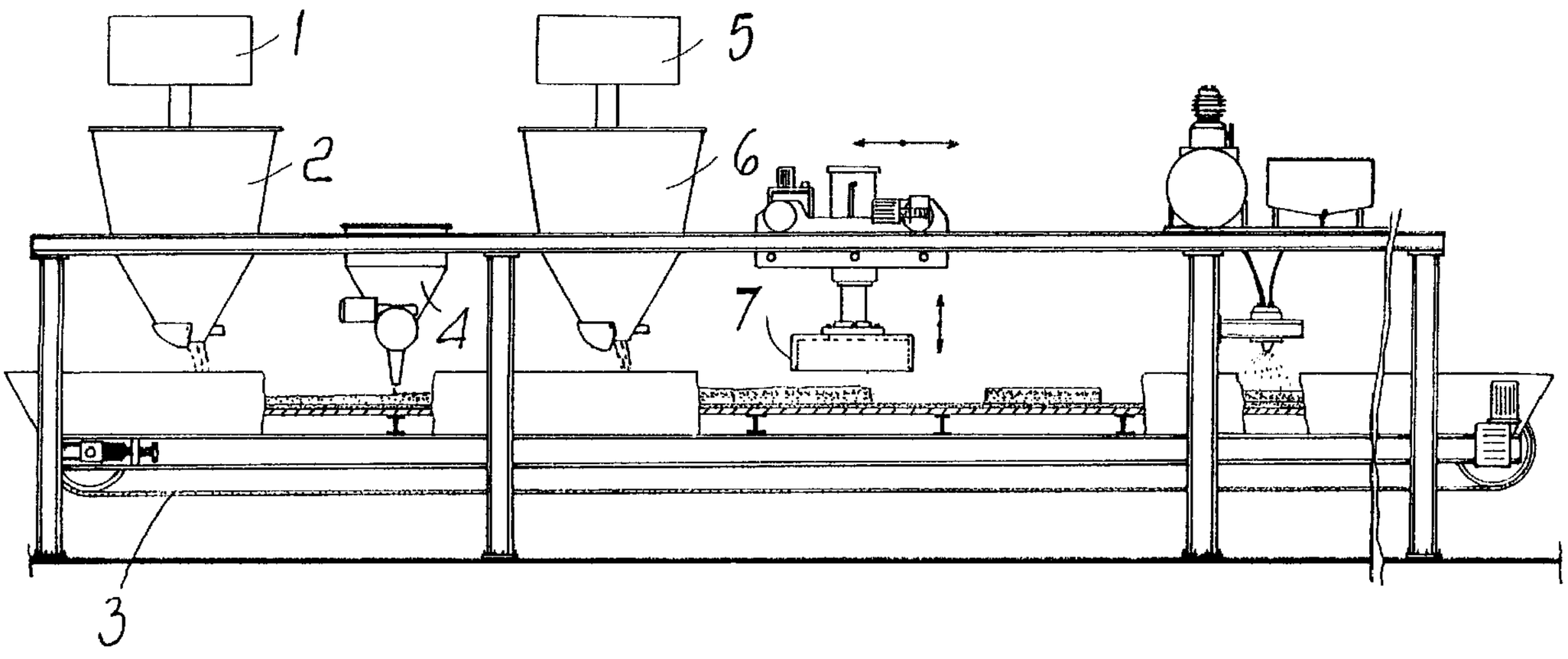
(54) Titre : PLAQUE DE GAZON COMPRENANT DES ELEMENTS AGRICOLES UTILISEE PLUS PARTICULIEREMENT POUR FORMER DES PELOUSES, PROCEDE DE PRODUCTION ASSOCIE

(54) Title: SOD COMPRISING AGRICULTURAL COMPONENTS PARTICULARLY FOR FORMING LAWNS, AND METHOD FOR PRODUCING IT



(57) Abrégé/Abstract:
A sod of cultivation soil, complete with lawn grass seeds, fertilizers, selective herbicide and a bonding agent for the cohesion of the various elements contained therein. The sod has the conventional geometric shapes of paving tiles and allows to cover continuously, i.e. without gaps, the soil to be revegetated. A method for producing the sod makes it possible to store it and subsequent reuse it while obtaining optimum and rapid growth, of lawns, grassy layers, flowers and the like.

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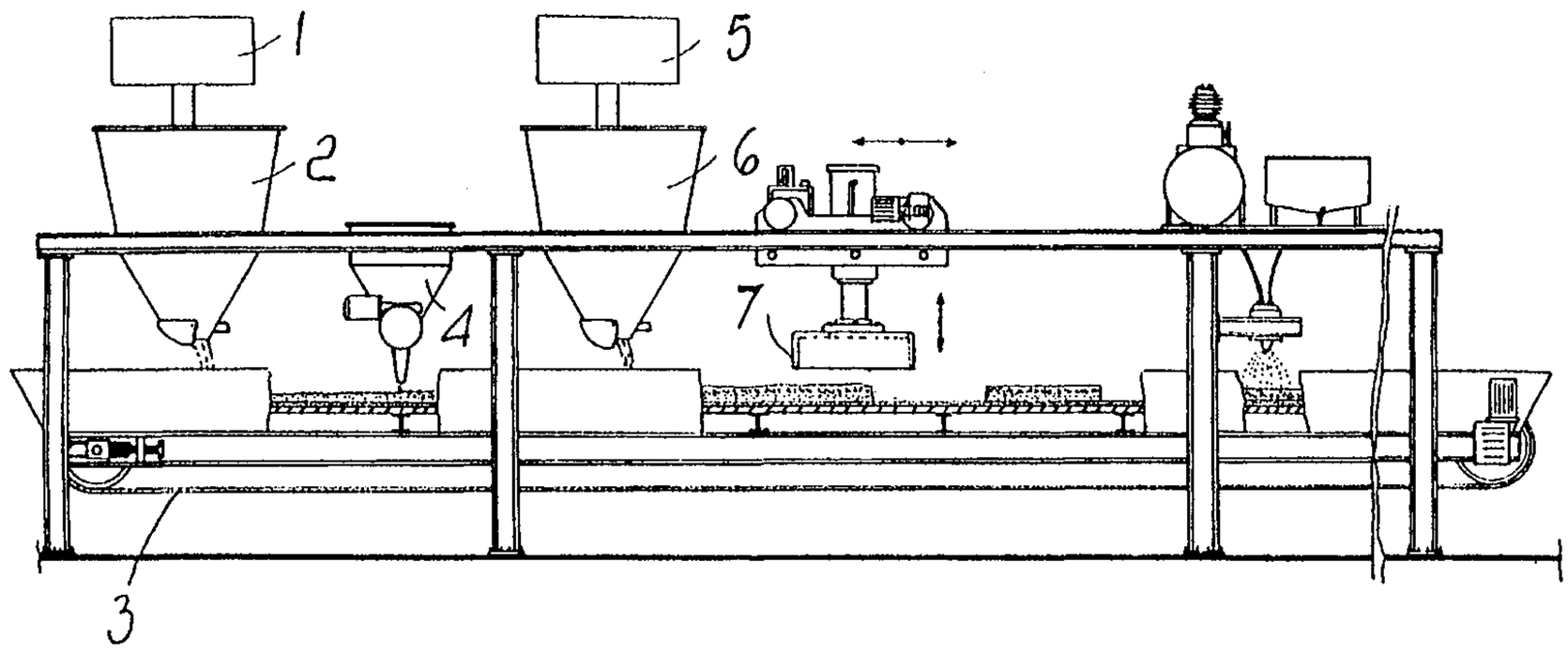


(57) Abstract

A sod of cultivation soil, complete with lawn grass seeds, fertilizers, selective herbicide and a bonding agent for the cohesion of the various elements contained therein. The sod has the conventional geometric shapes of paving tiles and allows to cover continuously, i.e. without gaps, the soil to be revegetated. A method for producing the sod makes it possible to store it and subsequent reuse it while obtaining optimum and rapid growth, of lawns, grassy layers, flowers and the like.

SOD COMPRISING AGRICULTURAL COMPONENTS PARTICULARLY FOR FORMING LAWNS, AND METHOD FOR PRODUCING IT

Technical Field

The present invention relates to the production of a modular sod of cultivation soil which comprises all the components and ingredients required for preservation, subsequent laying, germination and growth of grassy species, such as grasses, for forming lawns and grassy layers or for growing other plants, said sod being particularly useful both in professional and hobby gardening.

Background art

Traditionally, lawns and grassy layers not for agricultural use are usually formed by the following steps.

First of all, a subsoil is prepared by clearing the area away of rocks, rubble, waste, shrubs and weeds, tilling the soil from a minimum of 15 cm to a maximum of 150 cm of depth, performing thorough fertilization with organic fertilizers and phosphate and potassium fertilizers, and providing drainage systems which make use of sand, gravel and optionally deeply buried pipes, leveling and rolling the entire surface.

This preparation of the subsoil is common for all lawns, although there are variations depending on whether an ornamental lawn or a sports field is to be provided.

Two methods, seeding and sodding, are currently used in order to cover the soil thus prepared with a layer of grass. Sodding consists in laying grass sods previously cultivated elsewhere, whereas with seeding the grass is grown entirely on-site.

These two methods of seeding and sodding necessarily entail particular care.

Seeding must be performed only in certain periods of the year at suitable adequate temperatures. At latitudes of northern Italy, for example, seeding is

performed between mid-March and mid-October. In order to have a more moist soil and avoid the presence of rhizomes of weeds, seeding is preferably performed between the end of summer and the beginning of autumn.

Seeding must be performed by uniformly scattering seeds on the surface and at a correct surface density, and thus it is almost always necessary to resort to seeding machines or to an expert sower when seeding is performed manually, as is usually the case for small areas.

After distributing the seeds, said seeds must be covered with a thin layer of earth and peat and the soil is rolled in order to ensure adhesion of the seed to the soil. These operations must be performed unless seeding is performed by casting a mixture of seeds, bonding agent and sawdust, e.g. on the slopes.

Subsequently, erosion of the topsoil due to rain and infestation caused by weed seeds may occur.

After seeding, the soil must be watered regularly for several months.

Sodding is a much faster revegetation method with lower weed invasion and no surface erosion and soil subsidence in case of rain. However, the varieties of grasses suitable for the sodding method are limited. Moreover, it is necessary to have wide areas available and suitable procedures for cultivating the grass on the sods must be followed.

Grassy sods, which are generally 4 or 5 mm thick, are uprooted, optionally rolled up, transported and laid on the final soil, and all this must occur in no more than one-and-a-half days, unless the sods are climate-controlled.

Before the sods are laid, one must ensure that the soil is soft, moist and rich in organic substances. After laying, gentle rolling is performed in order to ensure adequate contact with the soil, and any gaps between the sods are filled with sand and peat. Regular watering in the weeks after laying is also important.

Prior art document WO 98/56232 discloses a plant seed germination method as claimed in the preamble of claim 1.

Disclosure of the Invention

The main object of the present invention is to provide a sod for forming lawns or other cultivations, which can be stored for a long time in environmental conditions without problems, so that it can be produced all over the year with no interruption.

Another object of the present invention is to provide a method for producing sods and for providing lawns, which is extremely simple to carry out.

According to a first aspect of the present invention, there is provided a method of preparing a plant cultivation, particularly a lawn, as defined in the appended claims,

Advantageously, after drying the sod can be packaged in a packaging material for storage and transport purposes.

According to another aspect of the present invention, there is provided a sod for cultivating plants, which comprises a seeded seeding bed which may have already received an addition of fertilizer and a suitable bonding agent for maintaining the parallelepiped-like shape given to it.

Brief description of the drawings

Further characteristics and advantages of the invention will become better apparent from the detailed description of some non-exclusive

embodiments thereof, illustrated only by way of non-limitative examples in the accompanying drawings, wherein:

Figures 1 and 2 shows each a schematic view of the procedure for obtaining sods according to the invention, and

Figure 3 is a perspective partial view of a store where sods obtained according to the invention are preserved.

Ways of carrying out the invention

Example 1

A lawn was provided in a shaded area of a home garden and parts of this area were decorated with jewelweeds - see Figure 1 of the drawings.

In order to provide a grassy layer, a mixer 1 was first used to mix the following components so as to obtain a granular mix:

-- 80-90% by volume of inert silica sand

-- 10-20% by volume of peat

-- potato starch as natural bonding agent

The mix was poured into a hopper 2 and from there it was deposited onto a conveyor belt 3 so as to form a non-interrupted layer of 1.5 to 8 cm.

Further along the path, the seeding machine 4 deposited onto the layer, carried by the conveyor belt 3, the mixture of seeds of the following species:

-- 15% Agrostis tennis

-- 30% Festuca ovina

-- 15% Festuca rubra commutata

-- 20% Poa nemoralis

-- 20% Poa pratensis

Inside the mixer 5, instead, a very rich mixture of fertilizer was prepared which also contained herbicide according to the following components: inert silica sand, peat, fertilizer providing slow release of nitrogenous substances, with phosphate and potassium, dicotyledon-selective herbicide, potato starch as natural bonding agent.

The preparation was fed beneath the hopper 6, from where it was poured

onto the conveyor belt, so as to form a 1/2-cm layer of soil which covered the seeds deposited earlier.

Through a press 7, the stratified mixture was die-cut or extruded through an extrusion die in order to form tiles, for example hexagonal in shape, measuring approximately 1.5 to 8 cm in thickness.

Instead of extruding the tiles at the end, it is possible to deposit successive layers in suitable molds in reverse order with respect to that of the above description. The mixture can be settled by means of vibrations imparted to the mold and left to rest for a short time, so that the bonding agent begins to bond. Finally, by turning over the molds, the seeds, the fertilizer and the herbicide lie directly below the surface of the tile.

The seeds were placed near the surface since that is their natural level, from which, after moistening, in the appropriate season and at suitable temperature, the bud will emerge promptly. The herbicide is useful only if it is located close to the surface in order to hinder germination of weed seeds carried by the wind or other carriers. A chemical fertilizer also was placed at a high level in order to be near the seeds, since due to watering it tends to percolate downwards, where there are no roots as they are not formed yet.

The chemical fertilizer is the first nutritional substance which provides minerals to the buds, even because said buds may not be formed straightaway and microorganisms and bacteria responsible for decomposition of any organic material may not be immediately available or become fully active.

In order to continuously cover the surface to be revegetated, it is possible in particular to use sods having geometric shapes which are commonly used for floor tiles, i.e. polygonal shapes, such as squares, rectangles and regular hexagons, octagons and triangles. Among these, however, preference is given to squares and rectangles for packaging and storing reasons. The hexagon has the advantage of having obtuse angles and therefore somewhat less brittle corners.

Potato starch was used as a bonding agent in this example, but as an alternative it is generally possible to use bonding agents obtained from plants (starches, fecula, flours, cellulose derivatives) or from animal tissues (fish glue, bone glue, skin glue), so long as they are biodegradable. Preferably bonding agents based on synthetic polymers are not used.

The bonding agent and other colloidal substances, such as humus and clay, cause the final structure of the resulting sod to be an aggregate of glomerules, whereby adequate porosity of the soil is ultimately obtained. The porosity involves micropores inside the glomerules, which are useful for future absorption of water, and macropores between the glomerules, which are useful for air circulation that is also very important for the roots. Porosity of the sod may also assist in drawing, by capillary action, water from subsoil in case of accidental lack of watering.

The formed tiles, carried by the conveyor belt 3 or by a second conveyor belt (not shown in the drawings), were laid in a store 10 provided with apertures to ensure ventilation, where the starch is set, thereby obtaining a suitable loss of moisture before packaging. Instead of a greenhouse, it is possible to use any source of heat at low temperature or any other dehumidification system. The same can also be done beforehand with the various materials before being mixed, although there is a higher risk of them being infested by weed seeds and spores and thus it is convenient to use dry materials which are possibly appropriately packaged. It is important that the components of the mixture and particularly the bonding agent do not release too much moisture to the seeds in the steps before dehumidification.

The tiles were then packaged under vacuum with impermeable films and stored.

After several months, they were transported to the laying site, where a subsoil had been prepared which consisted simply of 5 to 25 cm of growing medium on a main gravel layer with good permeability. The subsoil must of course have a surface which is arranged according to a final contour to be

achieved and must then be prepared so as to form the desired flat areas, elevations and depressions.

The tiles were laid at the end of March and watered with 5 liters of water per square meter every day in the early hours of the morning until the grass emerged. Subsequent watering was less frequent but more abundant, thus maintaining the average amount of water supplied. Once the tiles were removed from the packages, placed on the ground and moistened, the natural physical and biochemical phenomena of the soil were triggered. The slow-release fertilizer began to release its mineral salts into the solving water. Bacterial species taking part in nitrogen cycle transformations began to form and become active. In addition to other types of bacteria, many microorganisms such as algae, actinomycetes, protozoa were also formed, not to mention the many higher species. All these living beings contribute to the formation of humus and mineral substances, the decomposition of organic matter and bonding agent, the aggregation of particles and the churning of the soil.

If it is required to obtain grass bud quickly, one can perforate the impermeable packagings and moisten the tiles even before they are transported and laid, so as to activate their biochemical activity immediately.

The tiles have relatively precise geometric dimensions, so that no gaps remain between them during laying. However, if laying is executed in a hurry or there are sudden variations in level (steep elevations and depressions) and gaps are delimited between the tiles, the gaps can be filled with sand. This is useful, even because in laid-on gardens it is advisable to periodically perform more or less dense corings in the soil and fill the resulting holes with sand or sand mixed with peat. This operation, which is commonly performed on golf greens or sports fields, is known as aeration followed by plugging and is designed to eliminate compacting of the soil, to increase the percentage of macropores, to assist root growth, and to improve

microbiological activity and permeability to water.

It was found to be easy and creative to form flowerbeds including colorful floral patterns by alternating the tiles that formed the grassy sods described above with others which contained seeds of impatiens, which thrive in shaded areas and are suitable for forming borders and patches. Said tiles had been produced with the above described process and had the following composition:

-- soil composed of 1/3 sand, 1/3 clay and silt, 1/3 peat and amendments obtained from biocomposting;

-- fertilizer constituted by algae extract;

-- fish glue as natural bonding agent;

-- selective herbicide for monocotyledons;

-- seeds of perennial Impatiens Walleriana (impatiens).

The tiles can be colored on the surface with a harmless dye which makes it possible to distinguish them according to their type and to visualize them better during laying, when patterns are to be formed.

The tiles at the borders of the lawn or at the borders of the flowerbeds can be cut, if necessary, in order to obtain the right size and follow the border, especially in the case of lawns with curvilinear edges.

Example 2

Reference should be made to Figure 2 for this example.

A sports playing field according to DIN standards was provided by forming the entire cultivation medium by means of transportable blocks. Only the drainage system and, above it, a layer of 10-15 cm of fine gravel were prepared on-site.

The blocks were again produced by means of a conveyor belt on which hoppers dropped their contents in successive locations.

A hopper 2 contained a mixture of dry sands, dry-mixed beforehand by a mixer 1, so as to produce soil having the following grading:

-- maximum content of particles having a diameter of 0.02 mm: 10% by

weight;

-- maximum content of particles having a diameter of 0.06 mm: 18% by weight;

-- maximum content of granules having a diameter of 4 mm: 15% by weight;

-- maximum diameter of the contained granules: 8 mm

The hopper 2 poured a 2-cm layer of this soil onto a conveyor belt 3.

Immediately thereafter, a seeding machine 4 planted at an appropriate depth the following mixture of seeds:

-- 50-60% of 2 different varieties of Lolium perenne;

-- the remaining 50-40% of 3 different varieties of Poa pratensis.

This was followed by a hopper 5 which deposited chemical fertilizer and, in a downward location, a hopper 6 which deposited selective herbicide.

The layer thus obtained was then divided into blocks shaped like a parallelepiped by a die-cutter 7.

The blocks were then immersed in a tank 8, which contained a natural bonding agent which adhered, forming a layer on the entire outer surface, and while setting wrapped and protected the block, which would otherwise have been rather brittle. The same compacting can be achieved by spraying bonding agent onto the sods within a suitable chamber.

The block covered by set bonding agent, if kept dry, did preserve itself for a long time without using impermeable enclosures, whereas once it was laid and regularly watered the natural bonding agent dissolved and rapidly degraded, leaving the block free.

By placing the blocks on a layer of gravel prepared on-site and by watering them systematically, the sports green developed normally.

The behavior of the sods illustrated in the above examples is simply that of carrying out natural biochemical and physical activities of the soil, already mentioned above in connection with the production processes.

The invention is susceptible of numerous modifications and variations,

all of which are to be considered as falling within the scope of the invention. Thus, for example, the invention can be used not only for generating a lawn or a grassy layer, but also for floral borders used on the edges of ornamental lawns or pillows, wisps and cascades of flowers in flowerbeds. The invention is particularly suitable for perennial flowers which easily reproduce by seeds.

The invention can also be applied to edible species, such as many vegetables, which reproduce well from dry-stored seeds.

Almost all vegetables, even bulky ones (for example pumpkins and egg-plants) can develop well in a few centimeters of thickness. One must also consider that some aromatic plants (such as basil and parsley) are not used in large amounts and require very little space and an extremely small amount of soil. The invention is therefore very convenient for anyone who wishes to make, for example, a "hanging kitchen-garden".

The invention can also be used with inferior plants, such as the subkingdom Thallophyta and for mushroom cultivation.

The invention is applicable to all kinds of reproduction in the plant kingdom: i.e. sexual reproduction, asexual reproduction and vegetative reproduction.

A number of definitions in the present specification are given hereafter for correct interpretation of the claims:

Seed: the term designates the reproductive germs of phanerogam cormophyte plants, but is used here with a necessarily broader meaning, extending it to the entire plant kingdom, and is meant to indicate these parts of the plants that are designed for their germination, whether derived from gamic, agamic or vegetative reproduction. These parts can therefore be constituted by seeds, spores, rhizomes, bulbs and bulbils, gems, tubers or parts thereof, fragments of branches or of other parts of the plant.

Seeding bed: a material, usually fertile soil, in which germination of plants and development of their underground parts are possible.

Texture or grading: the percentage ratio among the various solid particles of the soil, graded according to their dimensions. The graded parts of the soil are constituted by the skeleton and fine earth, which, in turn, comprises coarse sand, fine sand, silt and clay.

Structure and porosity: the concept given in the specification is repeated for the sake of clarity: colloidal substances such as humus and clay cause the structure of fertile soil to become an aggregation of glomerules rather than a compact mixture of components, so that one obtains an adequate porosity which is useful for the growth of plants. Said porosity is due to micropores, which are internal to the glomerules and useful for absorbing water, and to macropores between the glomerules that are useful for air circulation, which is a very important factor for the roots. The porosity of the sod can also assist in drawing, by capillary action, water from underground if watering is insufficient.

Organic substance: a substance comprising plant or animal residues in a more or less advanced state of decomposition. The substance can be already partially transformed by soil-dwelling organisms and microorganisms into elementary inorganic substances and humus.

The disclosures in Italian Patent Application No. VR99A000021 from which this application claims priority are incorporated herein by reference.

I CLAIM:

1. A method of preparing a plant cultivation, comprising the following operating steps:

preparing a seeding bed of at least one frangible particulate component;

introducing seeds into the seeding bed;

dividing the seeding bed into sods with exterior surfaces defining a selected geometric shape and enclosing a volume of said particulate component and seeds;

exposing the sods to a cohesion treatment, wherein a liquid adhesive is applied over the entire exterior surfaces of said sod, thereby bonding said particulate component together on said exterior surfaces; and

non-destructively drying the sod.

2. The method according to claim 1 wherein the at least one frangible particulate component is selected from the group consisting of: soil particles; sand; silt; clay; peat; humus; herbicide; and fertilizer

3. The method according to claim 1 wherein the dividing step is at least one of: extrusion; moulding within a template and die cutting.

4. The method according to claim 1 wherein the exposing step is one of: spraying said liquid adhesive; and dipping said sods into a tank of said liquid adhesive.

5. The method according to claim 1 wherein the liquid adhesive is at least one of: water soluble; and bio-degradable.

6. The method according to claim 1, wherein after drying the sod is packaged in a suitable packaging material for its preservation, storage and transport.

7. The method according to claim 1, wherein said preparation of the seeding bed comprises the dosage of at least two of said components and mixing thereof.

8. The method according to claim 1, wherein said preparation of a seeding bed includes depositing successive layers of at least two of said components.

9. The method according to claim 1, wherein said introducing seeds step comprises implantation with a seeding machine.

10. The method according to claim 1, wherein said introducing seeds step comprises depositing a layer of seeds.

11. The method according to claim 1, wherein said non-destructive drying step reduces humidity in the seeding bed to a selected humidity level wherein seed germination does not occur while preserving the capability for future revival of micro organism activity and the natural and chemical organic substances present in the seeding bed.

12. The method according to claim 1, wherein said non-destructive drying step is performed by exposure in a ventilated greenhouse.

13. The method according to claim 1, wherein said non-destructive drying step is provided by means of a low-temperature heat source in combination with air change.

14. A sod for cultivating plants, comprising:

a seeding bed of at least one frangible particulate component;

seeds disposed within the seeding bed;

wherein the sod has exterior surfaces defining a selected geometric shape and wherein the exterior surfaces enclose the seeding bed and the seeds;

a dried liquid adhesive layer disposed over the entire exterior surfaces of said sod, thereby bonding said particulate component together on said exterior surfaces.

15. The sod according to claim 13, wherein said at least one frangible particulate component is selected from the group consisting of: soil particles; sand; silt; clay; peat; humus; herbicide; and fertilizer

16. The sod according to claim 14, wherein said adhesive is biodegradable.

17. The sod according to claim 14, wherein said adhesive comprises at least one colloidal substance.

18. The sod according to claim 17 , wherein said adhesive comprises glue selected from the group consisting of: glue of vegetable origin; and glue of animal origin.

19. The sod according to any one of claims 14 to 18, wherein said seeding bed comprises soil including mineral substances and at least one organic substance.

20. The sod according to claim 19, wherein said organic substance comprises at least one fertilizer.

21. The sod according to any one of claims 19 to 20, wherein the sod comprises at least one selective herbicide which hinders germination and growth of antagonistic plants which are different from, and antagonists of protagonist plants whose growth is sought.

22. The sod according to any one of claims 14 to 21, wherein the sod has a geometric shape selected to engage with mating sods to substantially continuously cover a planting surface.

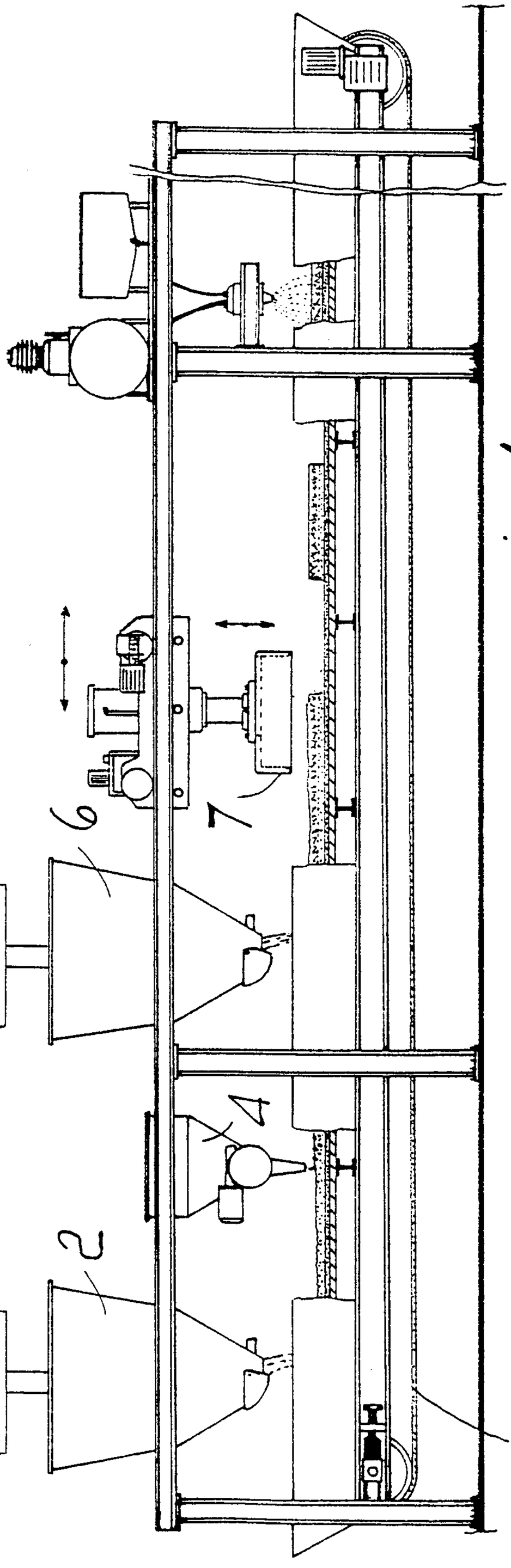


Fig. 1

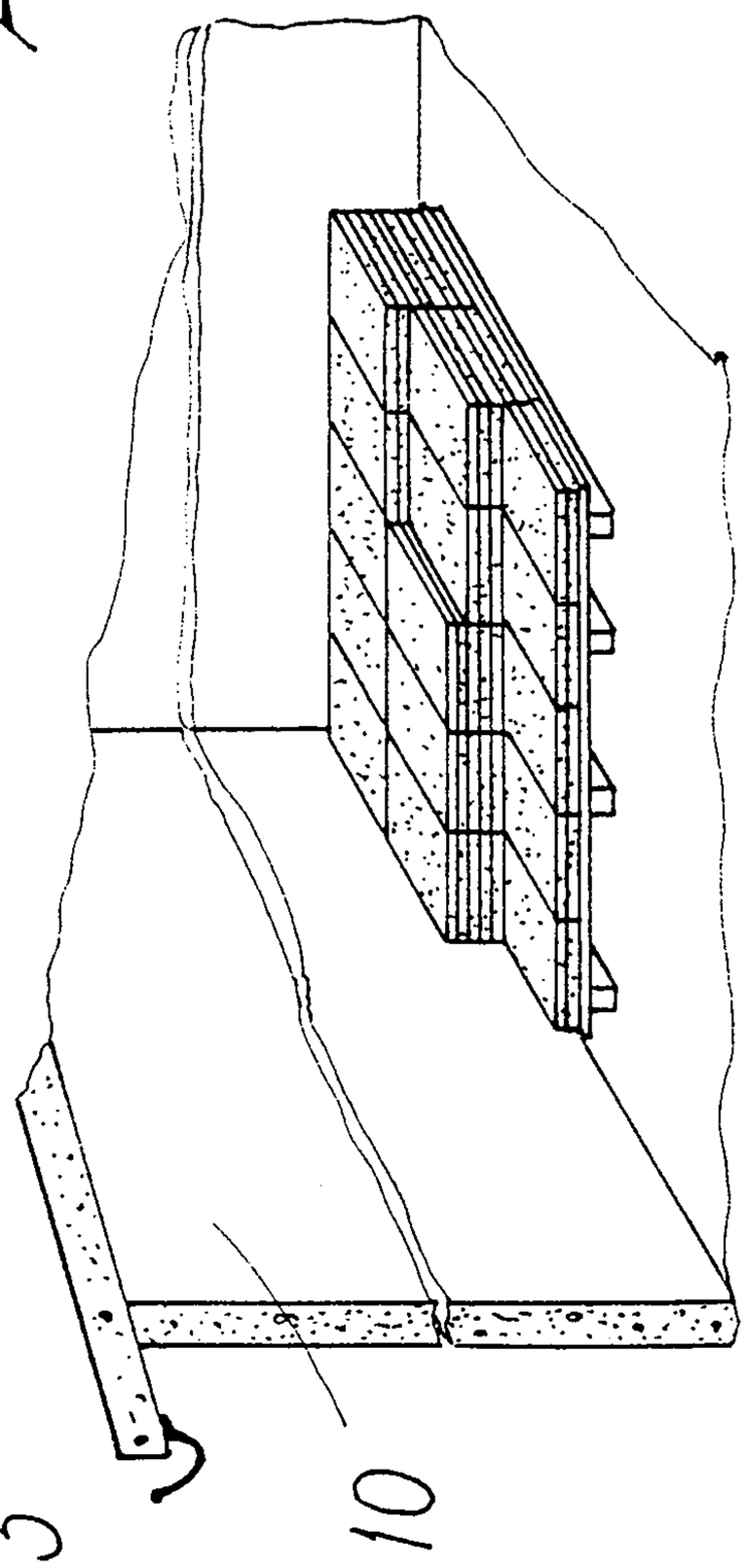
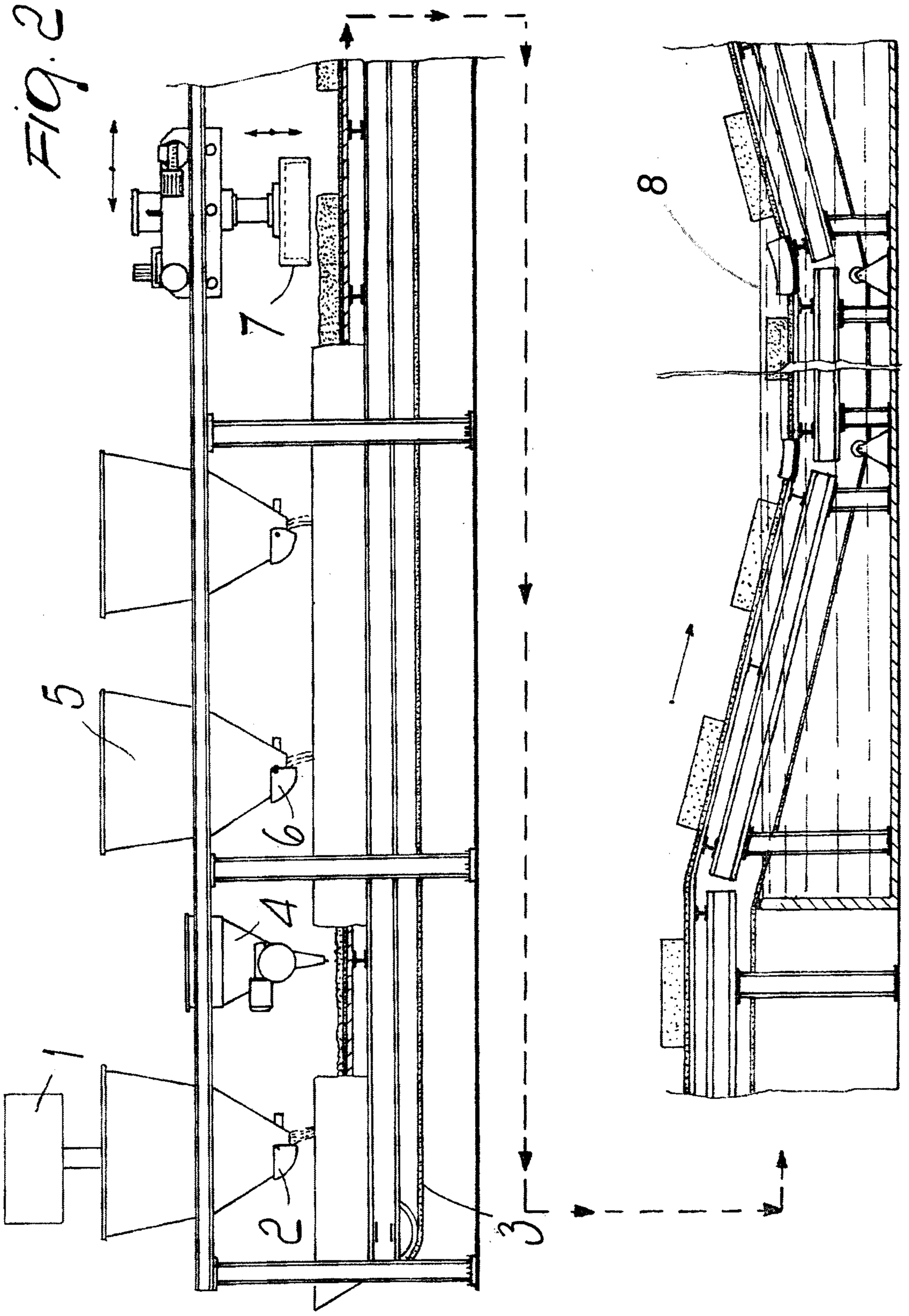


Fig. 3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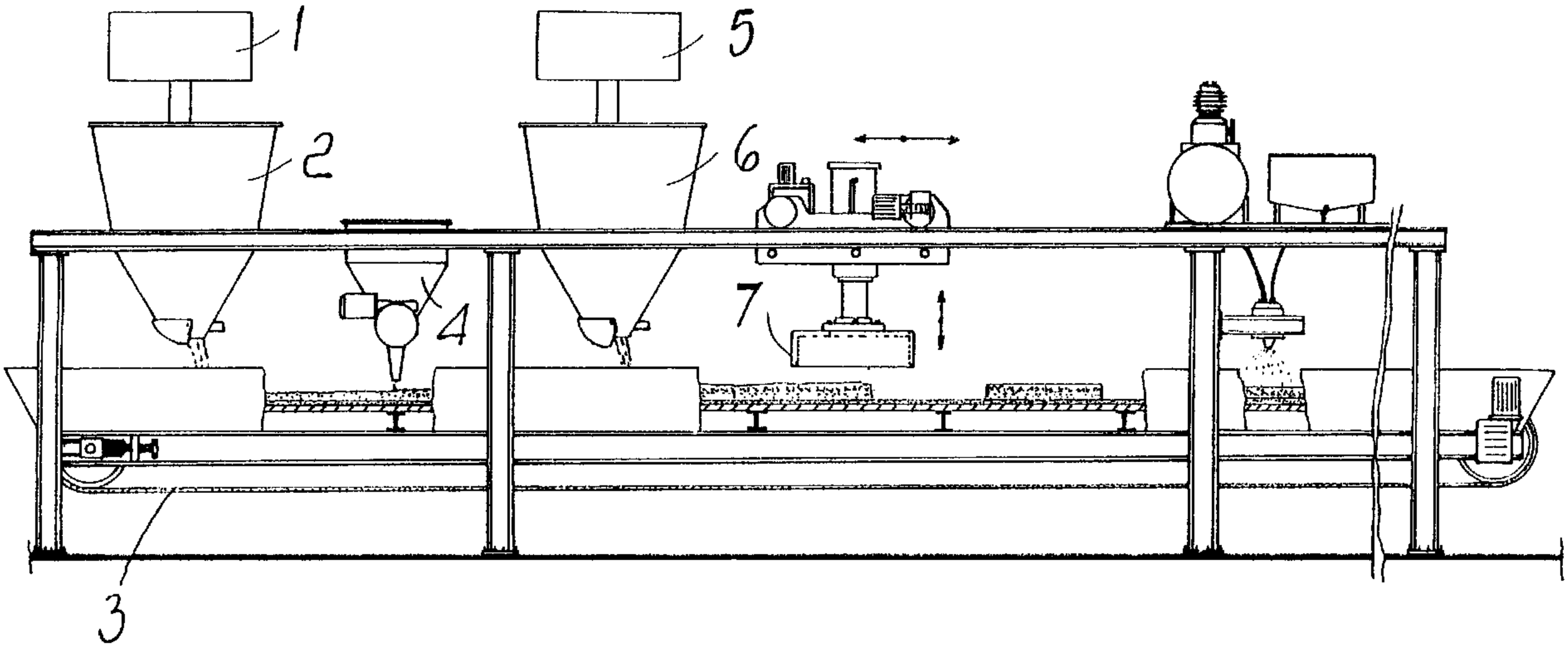
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