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(54) NATURAL SWIMMING POOL WITH IMPROVED STRUCTURE

(57) We describe a natural swimming pool consisting of layered components on a basin (8) excavated in the ground, including at least one protective geotextile material fabric on which a waterproofing sheet is laid, in which said layered components define a first functional layering above which a second completion layering is arranged that includes a floor made of natural materials such as sand, gravel or pebbles,
in which
said first functional stratification includes in sequence:
a first set of delivery (12a) and suction (12b) pipes,
a first protective sheet (13) of geotextile material,
an elastic waterproofing sheet (14),
a second protective sheet (15) of geotextile material,
a plurality of perimeter retaining rocks,
a second set of perforated delivery pipes (19), joined to multi-outlet distributors (18) by means of connection flanges (17) made at least in said sealing sheet (14) and connected to said first set of delivery pipes (12a), and
a set of suction nozzles (20) connected by connection flanges (17) to said first set of suction pipes (12b), in which said completion layer comprises in sequence,
a layer of consolidation gravel where a third set of perforated (22) pressurized air supply pipes is embedded, and
a third protective sheet (21) of geotextile material on which said floor made of natural materials is placed.

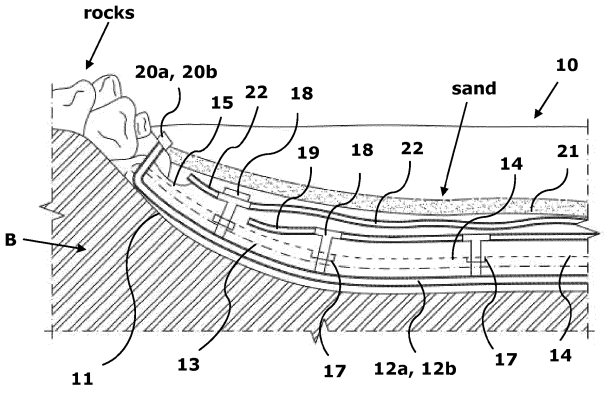

Fig. 2

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Description

TECHNICAL FIELD

[0001] The present invention relates to a natural in-ground
swimming pool. More specifically, the invention relates to a swimming pool with an improved structure using natural materials.

BACKGROUND ART

[0002] As is well known, artificial in-ground pools are water reservoirs used for various purposes, manufactured by using appropriate waterproofing materials placed in an excavation in the ground. For the most part, artificial pools are manufactured to allow users to engage in recreational, sporting (such as swimming) or relaxation activities, but there are also applications intended for the reconstruction of natural environments for private or public use.

[0003] Classic swimming pools for human use, especially of the type installed around dwellings or facilities that provide accommodation to customers (such as clubs, hotels, etc.), can be of various shapes and sizes, and of various depths. Typically, they either have a reinforced concrete structure cast directly into a special excavation or consist of an impermeable hard shell (metal or composite materials) lying in the excavation. The supporting structure is then covered with ceramics or only painted with special plasticising paints, in order to give it an attractive appearance and retain the water inside the pool, preventing leakage.

[0004] Since the water in swimming pools is stagnant, it is necessary to perform a treatment, usually chemical treatment, to sterilise the water, preventing the proliferation of bacteria, viruses and mould. At the same time, it is preferable to establish a movement of the water that allows the surface free surface to be cleaned of coarse impurities (leaves, insects, ...) and causes a recirculation in special filtering elements. To this end, it is common practice in classic swimming pools to install inlets components (skimmers) and outlet components at selected points of the structure to perform water recirculation and treatment.

[0005] In recent years, other types of pools that have less impact on the ground and visually mimic natural basins have gained some success. These solutions, referred to here as 'natural pools', provide that the containment structure is not rigid, but consists of waterproofing sheets laid in an excavation in the ground, with bank edges that respect the natural friction angle of the ground.

[0006] A typical configuration of a natural swimming pool of prior art is illustrated in Fig. 1. It involves laying one or more layers of non-woven protective fabric 2 on the bottom 1 of a excavation, above which is arranged at least one waterproofing layer 3, such as an elastic EPDM sheet.

[0007] Stone material 4, such as sand, gravel or other cover stones, is placed on top of the waterproofing sheet 3.

[0008] Natural pools, as they normally employ natural lining materials, are not suitable for establishing a classical water circulation and rely on a flora specifically selected for the purpose to purify and oxygenate the water.

[0009] This solution is evidently particularly pleasing from the point of view of environmental impact, but it causes complications in guaranteeing clear water because it does not accommodate efficient water sterilisation/hygienisation systems, so much so that it has so far only found widespread application in the reproduction of lake environments (ponds, fish ponds, ...) and little use as a natural pool for human recreational/sports activities.

[0010] Prior art solutions using natural materials to define the pool floor are described in FR 2668527, WO01/66275 and WO2014/087330.

[0011] These solutions have not yet proven to be entirely satisfactory, especially with respect to speed of construction and installation as well as water cleaning efficiency.

[0012] In particular, WO2014/087330 envisages placing a base layer consisting of a stable agglomerate of pebbles and resin underneath any loose sand layer. The porous consistency of the base layer allows air to be injected into the sand, but over time it tends to retain sediment and allows micro-algae to form.

PROBLEM AND SOLUTION

[0013] The problem behind the invention is therefore to propose a natural in-ground pool that overcomes the aforementioned drawbacks and allows for good water circulation and sterilisation, making it usable and pleasant for people to bathe in.

[0014] This is achieved through the features mentioned in claim 1. Subordinate claims describe preferred features of the invention.

BRIEF DESCRIPTION OF THE DESIGNS

[0015] Further features and advantages of the invention will, however, be more evident from the following detailed description and accompanying drawings, in which

fig. 1, as already mentioned, is a perspective and partially sectional view of a natural pool according to prior art;
fig.2 is a partial sectional view of a natural swimming pool according to the present invention; and
Figs. 3A-3P are schematic views representing some of the steps in the sequence of setting up a natural pool according to the invention.

DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT

[0016] The present invention relates to a natural swimming pool of the type disclosed above with reference to the prior art. Referring now to Fig. 2, an improved natural swimming pool according to the invention is illustrated, equipped with a water recirculation, filtration and sterilisation system that makes it suitable for human recreational use.

[0017] A natural pool is basically formed by an excavation, made directly in the earth, defining a water reservoir B with banks having an inclination that respects the natural friction angle of the ground.

[0018] On the bottom 11 of reservoir B, the following components are arranged one on top of the other, defining a first functional stratification:

a first set of delivery pipes 12a and suction pipes 12b,
a first protective sheet 13 of geotextile material,
an elastic waterproofing sheet 14,
possibly a second protective sheet 15 of geotextile material in the perimeter area, on which a possible buffer layer containing fine sand is laid down
a plurality of perimeter retaining rocks,
a second set of perforated delivery pipes 19, connected to multi-outlet distributors 18, which in turn are connected to the first set of delivery pipes 12a by means of appropriate connecting flanges 17.

[0019] In particular, multi-outlet distributors 18 have a turret shape, with a cylindrical main body, in communication with the underlying delivery pipe 12a, from which a plurality of side sockets, four to eight in number, radially branch off, to which the perforated pipes 19 engage.

[0020] In addition, a set of delivery nozzles 20a and suction nozzles 20b are connected by additional connecting flanges (not illustrated) to the first set of delivery pipes 12a and suction pipes 12b, respectively. Preferably, the suction nozzles 20b are arranged at least about half the height of the pool in order not to suck in bottom sand, while the delivery nozzles 20a are arranged at least 3/4 of the height in order to create a recirculation flow of water near the surface free surface.

[0021] On the edges of the pool reservoir/basin, at the height of the free surface of the water, skimmers are also arranged in the traditional manner for suction of the water, which, together with the water coming from the suction pipes 12b, converge towards a technical room equipped with classical sand filtration with relative pumps, which send the filtered water back towards the delivery pipes 12a for re-entry into the pool.

[0022] The first set of delivery pipes 12a and suction pipes 12b are preferably 50 mm diameter coiled pipes, which are laid on the ground, and terminate with sockets to be joined later to flanges 17 applied to the waterproofing sheet 14.

[0023] The first protective sheet 13 is preferably a 300 g/m^2 non-woven fabric geotextile material e.g. a suitably needle-punched polyester-based non-woven fabric, which has the purpose of protecting the overlying waterproofing sheet 14 from possible damage due to sharp stones or roots. The second protective sheet 15 may also be made of the same material, similarly having the purpose of protecting the waterproofing sheet 14 from possible damage due to the laying of the perimeter stones. In addition to the second protective sheet 15, at least in proximity to the perimeter areas where the perimeter monolithic consolidation stones are to be laid, it is possible to provide cushion structures made of 300 g/m^2 non-woven fabric sandwiched around a layer of sieved sand: this layer has the further purpose of creating a sort of natural mattress, which further protects the waterproofing sheet from the perimeter stones that are laid to consolidate the layered structure to the ground.

[0024] Elastic waterproofing sheet 14 is preferably an EPDM sheet with a thickness of 1.2 mm, whose high elasticity (300%) allows it to accommodate any movement of the soil without being damaged and without water leakage.

[0025] The consolidation rocks are preferably monolithic rocks of 5 to 15 quintals in size of non-calcareous origin (granite, serizzo, or river stones are used) between which a fill made of selected quarry pebbles, not of calcareous origin, is placed.

[0026] Connection flanges 17 are provided on the EPDM waterproofing sheet 14, which provide local reinforcement of the sheet and allow the connection of the multi-outlet distributor 18 (e.g. with 6 outlet socket) made of PVC to the underlying sockets of the delivery pipe 12a and suction pipe 12b with a smaller diameter.

[0027] The flanging 17 can be obtained by gluing on the waterproofing sheet 14 - in correspondence of passage openings - a reinforcing piece, already perforated in the desired diameter and provided with perimeter holes for the passage of attaching means to an underlying flange of the circular socket of the delivery and suction pipes 12a and 12b.

[0028] The water suction nozzles 20b are positioned between the rocks, always connected to other flanged multi-outlet distributors on the sheet 14, arranged halfway up the reservoir/basin, so that no sand is sucked up on the bottom.

[0029] The second set of perforated delivery pipes 19, joined to the multi-outlet distributors 18, have a smaller diameter than the first set of pipes, e.g. 25 mm, and are equipped with small holes from which chlorinated water escapes, the function of which is to keep the sand on the seabed (as will be seen later) constantly sterilised.

[0030] Above this functional layering, a completion layer of consolidation gravel is laid on top of which is a third protective sheet 21 of geotextile material.

[0031] Embedded in the consolidation gravel is also a third set of perforated pipe 22 for the supply of compressed air, preferably arranged as a flat coil.

[0032] Above the completion layer is the actual pool

floor, consisting of a layer of a few centimetres (e.g. 15-20 cm) of sand, gravel or pebbles. This gravel or sand allows the sheets to be covered, making the surface non-slip and, at the same time, determining the colour of the floor and the water and the desired scenography of the natural pool.

[0033] The perforated pipe 22 for compressed air delivery is connected to a pressurized air delivery system to create turbulence in the water, which facilitates cleaning. This pipe 22 consists of e.g. 15 mm diameter hose that is perforated with small holes every 10 to 20 cm for uniform air output. The perforated pipe 22 for air delivery is preferably connected to the air delivery system by means of appropriate ducts that exit above the pool, passing between rocks for example, and do not pass through the first functional stratification.

[0034] For this purpose, a pressurized air blower is also provided in the technical room where the filtering units and water recirculation pumps are housed: for example, an impeller (not illustrated) suitable for feeding a high flow rate of pressurised air into the third series of perforated pipes 22. By means of a suitable valve and branch system, it is envisaged that the pressurized air can be fed only into the third series of perforated pipes 22 or, by means of control valves, also into the water delivery pipes and the second series of pipes 19.

[0035] The air injected into the pipes moves the water within the porous material of the bottom (pebbles, sand, ...), lifting both the sand and the organic material that has precipitated on the bottom, thus bringing dirt back into suspension that can then be filtered along with the water. The third protective sheet 21 of geotextile material has sufficient porosity to allow chlorinated water and pressurized air to escape through the final layer of sand, ensuring constant sterilisation and at the same time preventing entering of sand. For example, cloth 21 is a 200 g/m^2 polyester-based non-woven fabric.

[0036] The natural pool according to the invention is constructed through the following steps.

Shaping an excavation

[0037] As mentioned in the preamble, the initial phase involves an excavation of a basin B (Fig. 3A). The excavation will subsequently give shape and depth to the bottom 11 of pool 10. The depth may vary depending on the availability of space. The depth of pool 10 is usually at most 1.5 metres.

[0038] As a secondary benefit, since the amount of soil removed (in terms of weight) is greater than the amount of water contained in pool 10, dangerous settlements of pool 10 are avoided, ensuring its stability.

Laying the first set of delivery and suction pipes

[0039] The first set of pipes 12a and 12b is installed directly on the ground (Fig. 3B), after the initial excavation, and the skimmer(s) is (are) set at the desired height (Fig. 3C).

Laying the first protective sheet

[0040] The first protective sheet 13 (Fig. 3D), defined to protect the waterproofing sheet from sharp stones or roots, is installed over the excavation and the first set of pipes 12a and 12b.

Laying of waterproofing sheet

[0041] On top of the protective geotextile fabric 13, the waterproofing sheet 14 is laid (Fig. 3E). The waterproofing sheet 14 is preferably made of EPDM (acronym derived from *EthylenePropylene Diene Monomer*). The waterproofing sheet 14 preferably has a thickness of 1-2 mm, and possesses a high elasticity (300%). The high elasticity allows it to accommodate any movement of the ground without causing any damage to the pool components, which can lead to water leakage.

Laying second geotextile protective fabric

[0042] Above the waterproofing sheet 14, the second protective sheet 15 is installed, at least in the perimeter area, possibly providing sandwich cushions with sand only in the perimeter areas where the consolidation rocks are to be placed (Fig. 3F). The purpose of the second protective sheet 15 is to protect the EPDM waterproofing sheet 14 from possible damage due to the monolithic stones. For this purpose, sandwich buffer zones containing sand (preferably sieved sand) can also be placed between the second geotextile sheet 15 and the monolithic rocks to create a natural mattress, which further protects the EPDM sheet.

Laying rocks

[0043] Monolithic rocks 16 (Fig. 3G) are placed inside the basin B, possibly on top of the sand sandwich pads, in order to create solid retaining and containment walls of the functional layered structure. A backfill material, such as pebbles, also of non-calcareous origin, is placed between the monolithic rocks.

Flange series

[0044] On the waterproofing sheet 14, a series of flanges 17 (Fig. 3H) is made (glued) in order to reinforce the underlying structure and to be able to connect the plurality of multi-outlet distributors 18. The plurality of multi-outlet distributors 18 are connected to the first series of delivery pipes 12a and suction pipes 12b.

Second series of perforated tubes

[0045] Once the multi-outlet distributors 18 have been coupled to the pipes below, the second set of perforated

pipes 19 (Fig. 3I) can be extended by joining them to the outlet sockets of the distributors 18 connected to the delivery pipes 12a. The distributors 18 connected to the suction pipes 12b are instead connected to the suction nozzles 20b, appropriately positioned at mid-height of the pool (Fig. 3L) to prevent the suction of bottom sand. Similarly, delivery nozzles 20a are connected to delivery pipes 12a.

Air system

[0046] The additional perforated pipe series 22 for pressurized air (Fig. 3M) is then installed at certain areas of the basin B. Similar to the pipe series 19, a serpentine installation scheme is also preferred for the pipe series 22.

Laying third protective sheet

[0047] The pipe series 22 is consolidated by means of a layer of gravel or pebbles and then covered with a third protective sheet 21, preferably made of geotextile material. On top of the third protective sheet 21, the floor layer (Fig. 3N), which is approximately 15-20 cm high, is laid. The floor layer is composed by pouring sand, gravel or pebbles and covering all the pool components, actively contributing to the formation of a floor that can recreate beaches or lakes, depending on the end customer's requirements.

[0048] In the peripheral area of the pool, where a kind of sloping sand beach is formed coming out of the submerged area, a further measure to stabilise the sand is preferred. An additional layer of pebbles (Fig. 3P) is placed on top of the third protective sheet (Fig. 3O) before pouring the top beach sand.

[0049] As can be understood from the above description, the invention perfectly achieves the purposes set out in the introduction. The proposed layering of materials is optimised to facilitate construction and to obtain a stable and at the same time aesthetically pleasing floor. The different sets of piping envisaged allow for good water recirculation and pressurized air supply to be obtained, even in the presence of natural materials and without a rigid basin, guaranteeing sanitation that makes recreational use of the pool pleasant for people.

[0050] The invention has the following additional advantages:

- the construction system is perfectly compatible with the environment, because there is a total absence of reinforced concrete or other structures in contact with the ground soil; as previously announced, the bottom 11 of basin B has "self-supporting" walls, and does not alter the geological stability of the site.
- the waterproofing implemented by sheet 14 is chemically stable and certified;
- the layered structure is easily removable if necessary and therefore has no irreversible effects on the soil;
- the efficient recirculation of water, also amplified by the injection of compressed air between the granular materials, minimises the required maintenance.

[0051] The construction system according to the invention advantageously allows for a completely natural water basin that enhances the environment with a structure that can be completely removed and disposed of in all its components.

[0052] It is understood, however, that the invention is not to be considered limited to the particular arrangements illustrated, which are only exemplary embodiments of the invention, but that several variants are possible, all within the reach of a person skilled in the art, without thereby going beyond the scope of protection of the invention itself, as defined by the following claims.

[0053] For example, although a sterilisation method using chlorinated water has been described, it is possible to adapt an ozone or salt water or other purification system.

[0054] Furthermore, if preferred for aesthetic reasons, large monolithic retaining rocks can be replaced by smaller retaining rocks such as pebbles or gravel.

[0055] Finally, depending on the size of the pool, the third set of perforated pipes 22 for pressurized air supply can be divided into separate sections, each section being connected with a respective valve to the pressurized air blower. In this way, by appropriately controlling the valves, it is possible to supply pressurized air separately and alternately to the individual sections, thus ensuring sufficient pressure in each section without having to oversize the blower.

Claims

1. A natural swimming pool consisting of layered components on a basin (B) excavated in the ground, comprising at least a protective geotextile material fabric on which a waterproofing sheet is laid, in which said layered components define a first functional layering above which a second completion layering is arranged that includes a floor made of natural materials such as sand, gravel or pebbles,
characterised by that
said first functional stratification includes in sequence:

a first set of delivery (12a) and suction (12b) pipes,
a first protective sheet (13) of geotextile material,
an elastic waterproofing sheet (14),
a second protective sheet (15) of geotextile material,
a plurality of perimeter retaining rocks,
a second set of perforated delivery pipes (19), joined to multi-outlet distributors (18) by means of connecting flanges (17) made at least in said

waterproofing sheet (14) and connected to said first set of delivery pipes (12a), and
a set of suction nozzles (20) connected by means of connecting flanges (17) to said first set of suction pipes (12b), and by that
said completion layer comprises in sequence,
a layer of consolidation gravel where a third set of perforated pressurized air supply pipes (22) is embedded, and
a third protective sheet (21) of geotextile material on which said floor made of natural materials is placed.

2. Natural pool as in claim 1, wherein said first set of delivery pipes (12a) and suction pipes (12b) comprises coiled pipes having a diameter of about 50 mm.

3. Natural swimming pool as in claim 1 or 2, wherein said second set of perforated delivery pipes (19) comprises pipes having a diameter of about 25 mm.

4. Natural swimming pool as in any one of the preceding claims, wherein said perforated pipe (22) is formed of pipes with a diameter of about 15 mm perforated with small holes every 10 to 20 cm.

5. Natural swimming pool as in any one of the preceding claims, wherein said first (13) and said second (15) protective sheet is made of 300 g/m^2 non-woven fabric.

6. Natural swimming pool as in any one of the preceding claims, wherein said third protective sheet (21) of geotextile material is made of 200 g/m^2 non-woven fabric.

7. Natural pool as in any one of the preceding claims, wherein said waterproofing sheet (14) is made of EPDM with a thickness of about 1-2 mm.

8. Natural pool as in any of the preceding claims, wherein said floor of natural materials is at least 15 cm thick.

9. Natural pool as in any one of the preceding claims, wherein between the second protective sheet (15) and said retaining rocks, a sandwich structure of non-woven fabric sheet containing screened sand defining cushion means is arranged.

10. Natural pool as in any one of the preceding claims, wherein said third series of perforated pressurized air supply pipes (22) is connected with an air compressor blower.

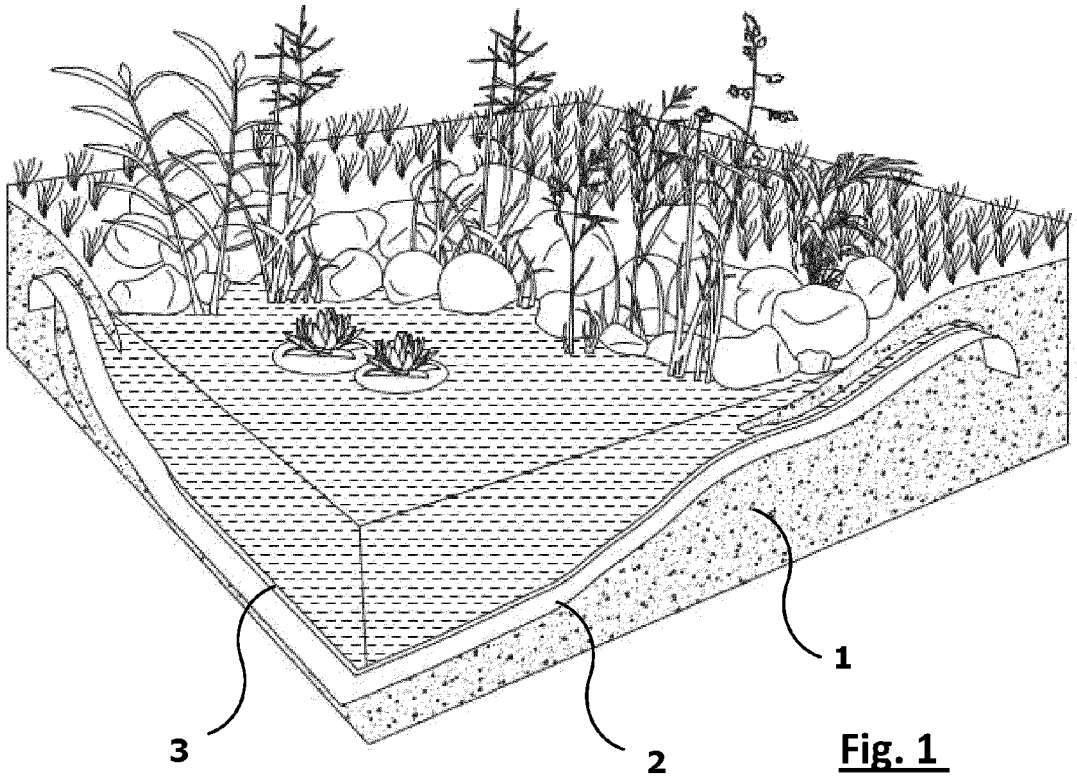

Fig. 1
(prior art)

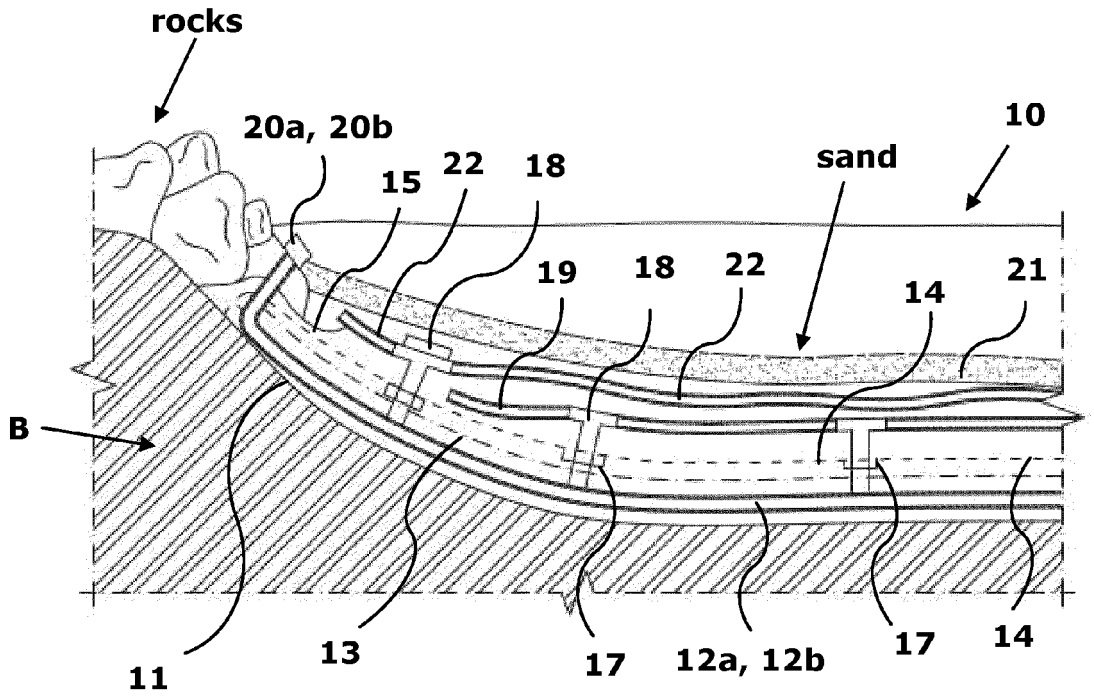

Fig. 2

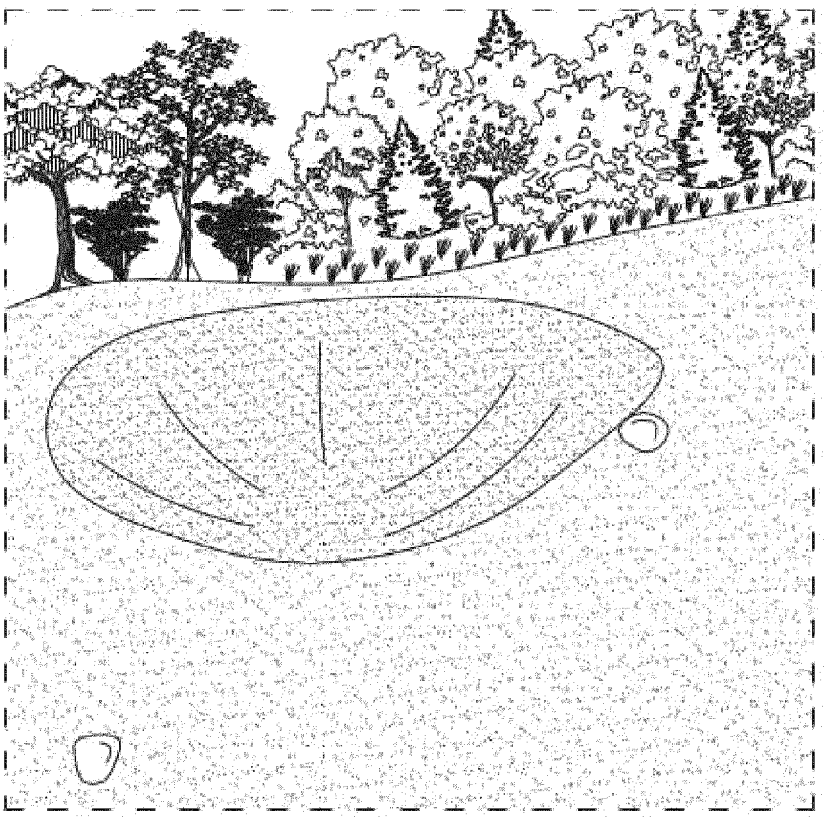

Fig. 3A

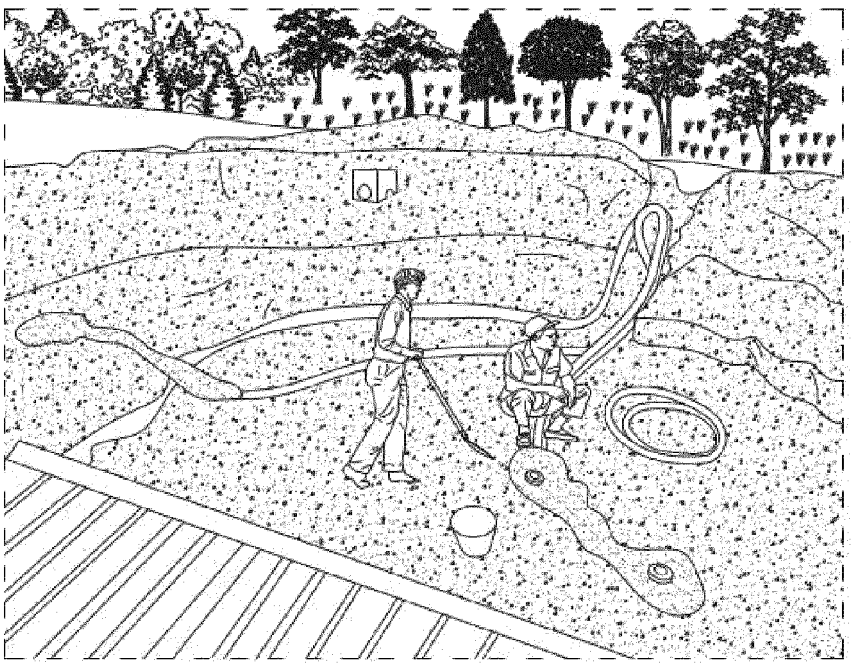

Fig. 3B

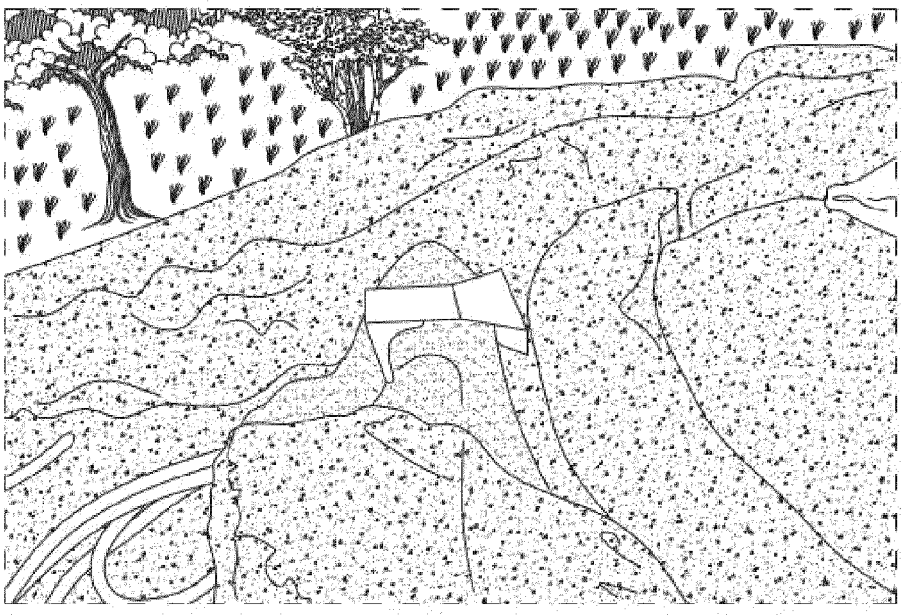

Fig. 3C

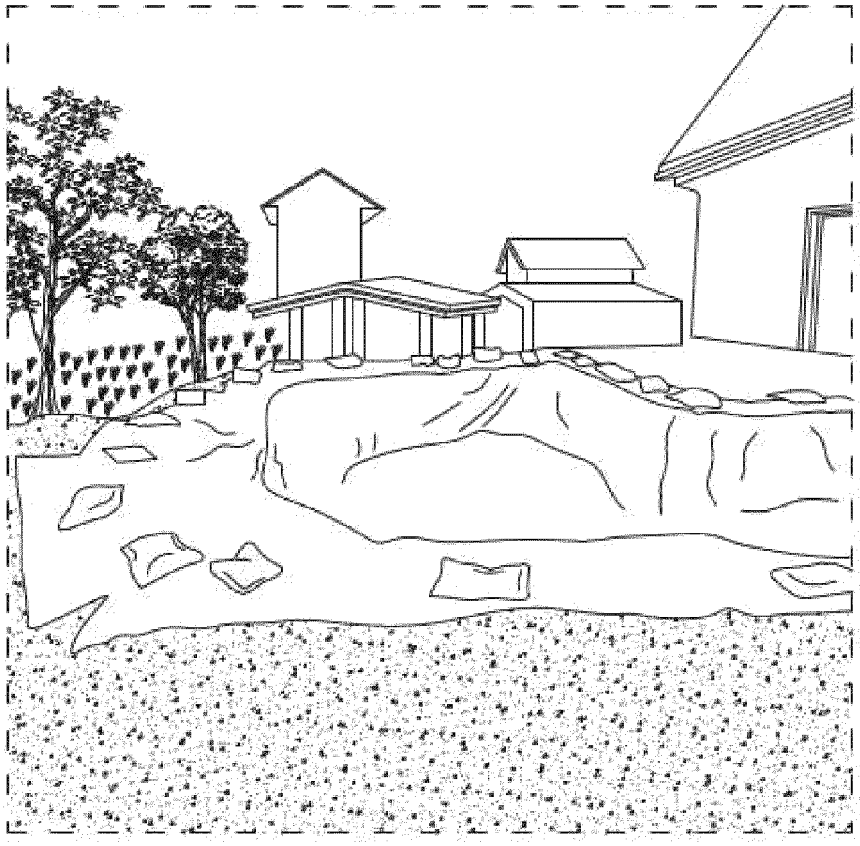

Fig. 3D

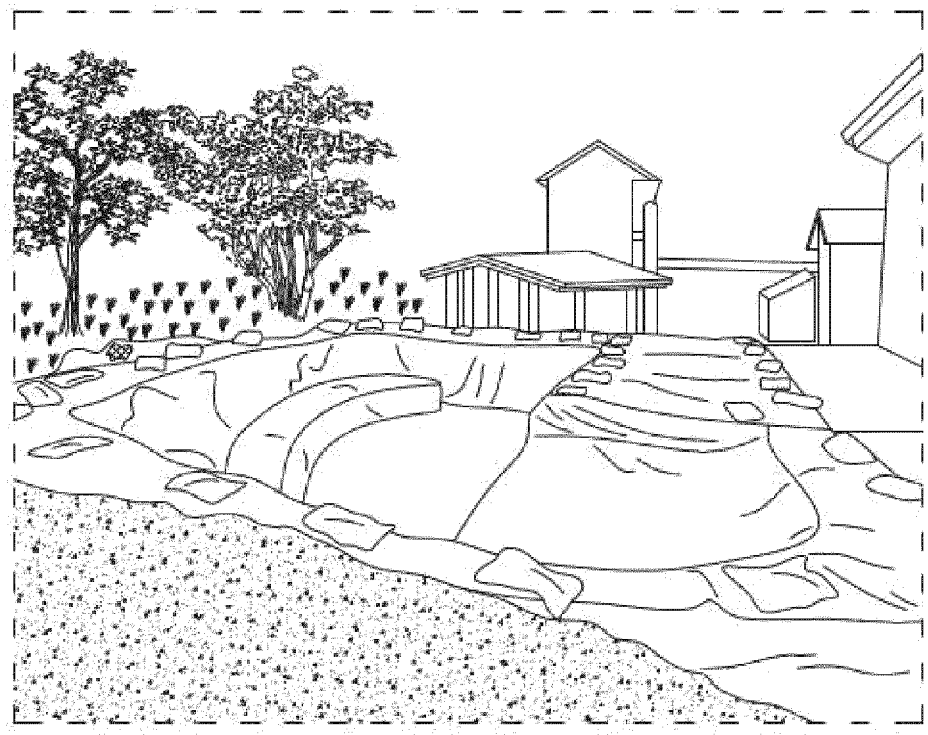

Fig. 3E

Fig. 3F

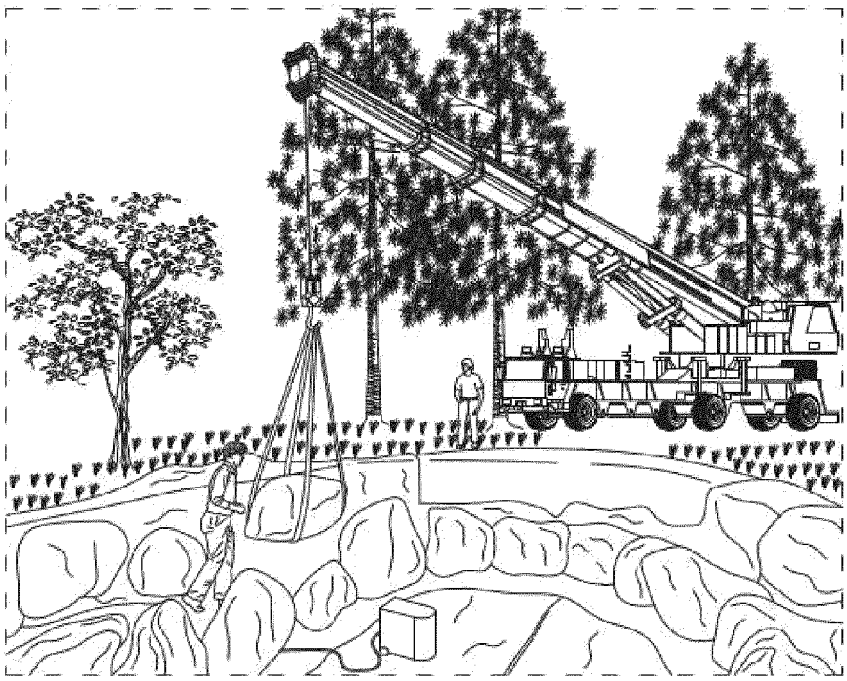

Fig. 3G

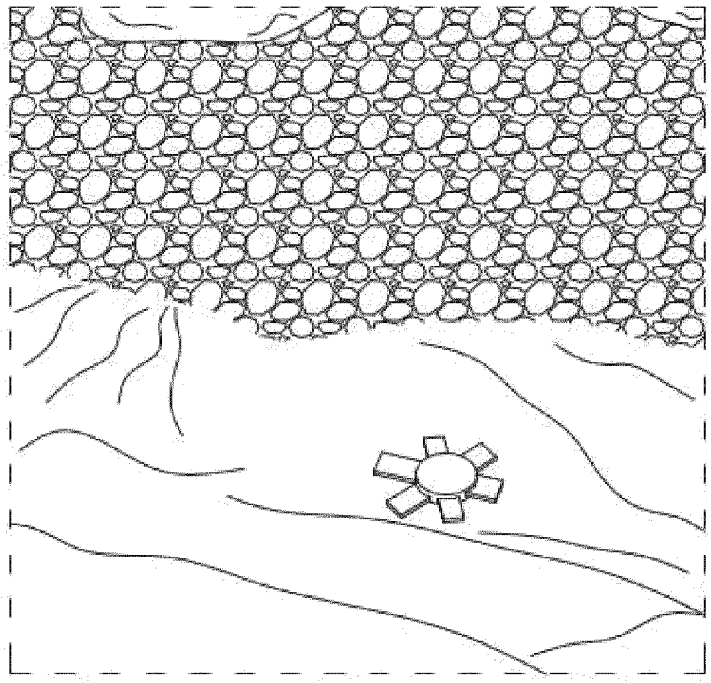

Fig. 3H

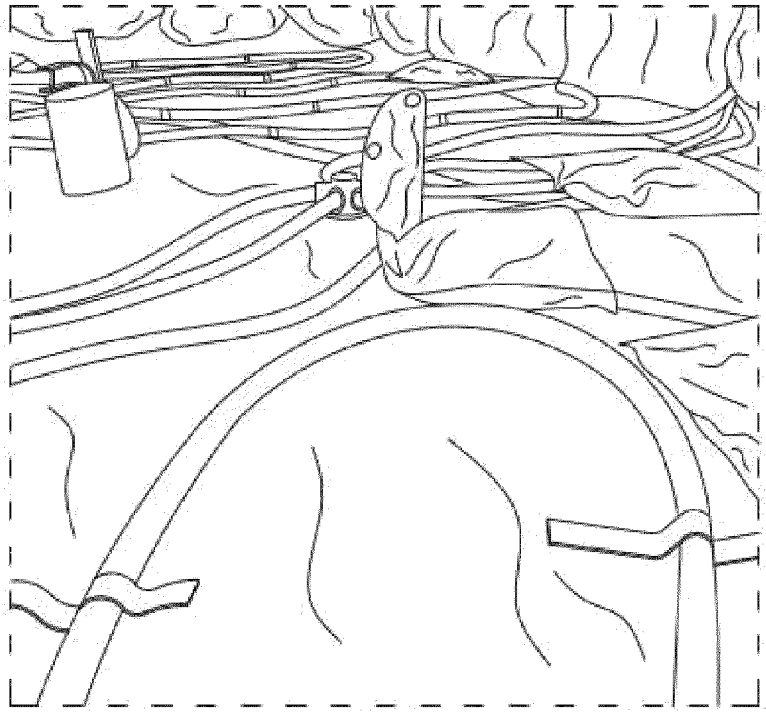

Fig. 3I

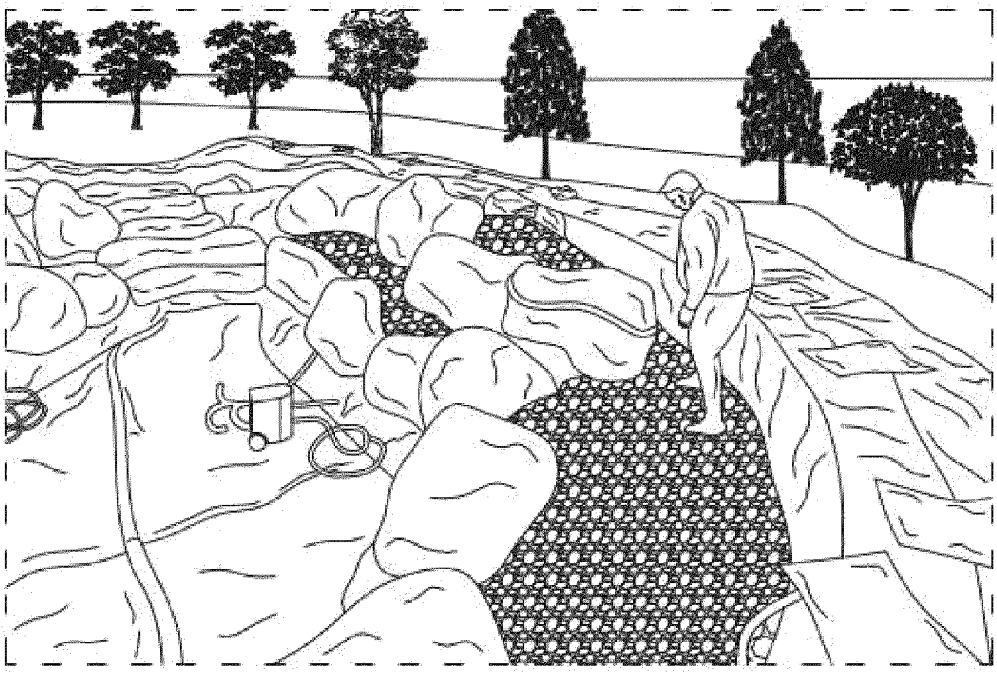

Fig. 3L

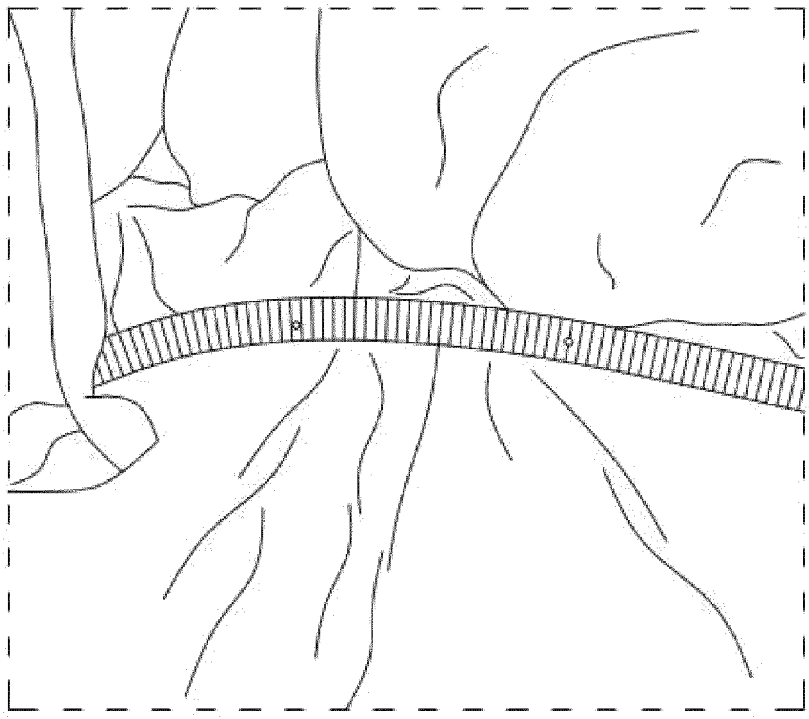

Fig. 3M

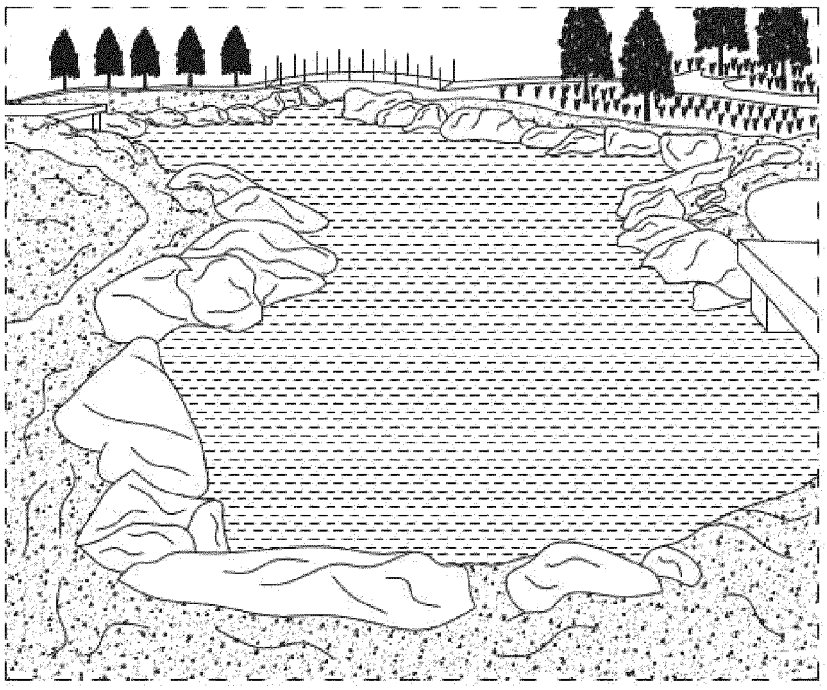

Fig. 3N

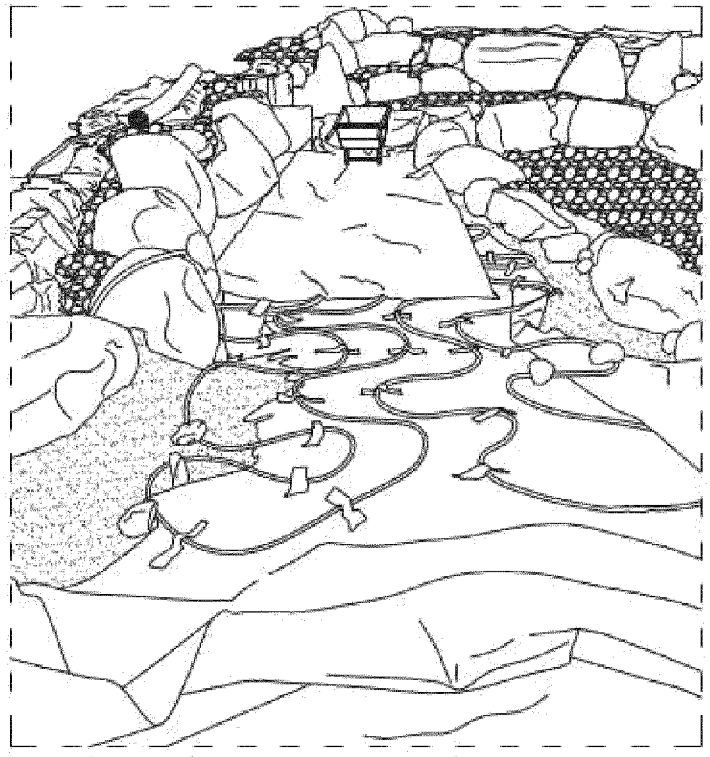

Fig. 3O

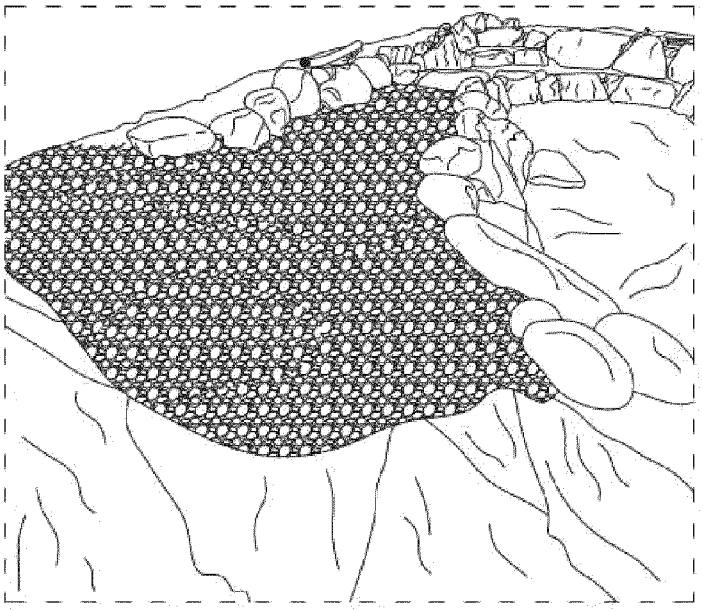

Fig. 3P

Europäisches Patentamt
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EUROPEAN SEARCH REPORT

Application Number
EP 24 17 8968

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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Place of search	Date of completion of the search	Examiner
Munich	2 October 2024	Brucksch, Carola

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