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(54) **METHOD FOR PROVIDING A CAST IN SITU SWIMMING POOL**

(57) A method for providing artificial basins, swimming pools, and the like, which consists in excavating (2) the basin; arranging on the entire surface of the basin, a first layer (4) of non-woven fabric; arranging the equipment (5) and the piping (6) for feeding and draining water on the first layer (4); distributing on the first layer (4) a second layer (7) constituted by a mixture of water, calcareous-siliceous binding agent, sand with low particle size value, and acrylic resin; distributing a third layer (8), which is at least partially impermeable; after the consolidation of the third layer (8), shaping the surface thereof with abrasive tools and instruments; spreading at least one fourth layer (9, 10); spreading a fifth at least partially waterproof layer (11).

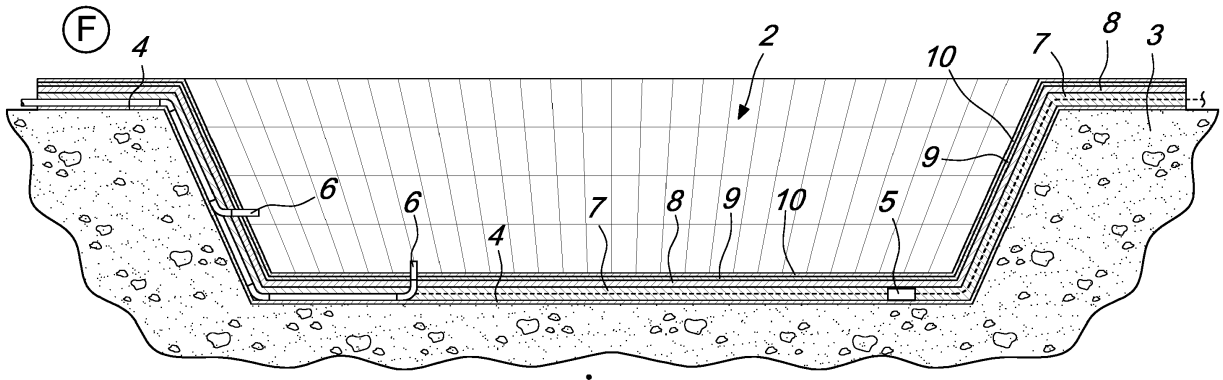

Fig. 6

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Description

[0001] The present invention relates to a method for providing artificial basins, swimming pools, and the like.

[0002] In recent years there has been a significant spread of swimming pools and, more generically, of basins suitable for bathing built with aesthetic criteria that bring to mind natural environments, such as for example beaches, cliffs and the like.

[0003] Construction technologies very similar to those used by set designers in reconstructing landscapes for cinema or theatrical use are used in order to provide this type of basin.

[0004] In other words, ordinary methods for building masonry basins have been abandoned, allowing to adopt particular techniques for lining the excavations that constitute the storage of the basin itself.

[0005] The most appreciated techniques in use entail the placement of a lower impermeable sheath that constitutes the water containment layer: the upper layers, with a structural, support and aesthetic function, are then deposited on this sheath.

[0006] In this manner, the sheath, pressed by the pressure of the water (which is applied through the covering and structural layers) on the walls of the excavation, is not subjected to any mechanical load but performs only the liquid containment function. The shape of the basin, the particular contour of its surface, as well as the aesthetic appearance and the superficial characteristics of the material that constitutes it will depend solely on the raw materials used.

[0007] It is thus possible to provide surfaces adapted to faithfully reproduce sandy shores, cliffs and other natural environments.

[0008] Unfortunately, this embodiment, too, has considerable problems: first of all, the waterproofing performed with the deepest layer (the sheath rested on the ground of the excavation) entails a constant impregnation of the structural, supporting and decorative layers. This impregnation entails the stagnation of water, with the consequent forming of algae and an overall aesthetic deterioration (but also a functional one, since some surfaces can become slimy and therefore dangerous).

[0009] Also during the periodic drainings of the basin it is in practice impossible to perform a washing that eliminates fouling and deposits inside the structural and decorative layers. It is not even possible to exclude that such pockets of stagnant water might facilitate the proliferation of bacteria that might, in particularly negative cases, be harmful or pathogen.

[0010] The prolonged impregnation might moreover cause degradation of the mechanical properties of such layers: the superimposed layers might lose elasticity and rigidity. The forming of a crack in these layers might generate a sharp edge which, in contact with the lower sheath, might compromise the functionality of the artificial basin.

[0011] The aim of the present invention is to solve the above mentioned problems, by proposing a method for providing artificial basins, swimming pools, and the like with water-repellent surfaces that resemble, in their appearance and shape, natural environments.

[0012] Within this aim, an object of the invention is to propose a method for providing artificial basins, swimming pools, and the like that are not subject to the forming of algae.

[0013] Another object of the invention is to propose a method for providing artificial basins, swimming pools, and the like with procedures that are easy and quick to perform and utilize the same principle of impermeableness of natural basins.

[0014] This aim and these and other objects which will become better apparent hereinafter are achieved by a method for providing artificial basins, swimming pools, and the like, which consists in

- excavating the basin, according to the design specifications;
- arranging on the entire surface of the basin, excavated previously in the ground, a first layer of non-woven fabric;
- arranging the equipment and the piping for feeding and draining water on the first layer of non-woven fabric;
- distributing on the first layer of non-woven fabric, and on the overlying equipment and piping, a second layer constituted by a mixture of water, calcareous-siliceous binding agent, sand with low particle size value, and acrylic resin, in a percentage that is variable between 1% and 10% with respect to the calcareous binding agent, adapted to render said second layer suitable for the optimum adhesion of additional layers for covering it, the water being the most abundant component of the mixture in order to ensure the maximum fluidity of said mixture;
- distributing a third layer, which is at least partially impermeable, constituted by a mixture of water, calcareous-siliceous binding agent, sand with low particle size value, and acrylic resin, in a percentage that is variable between 1% and 10% with respect to the calcareous binding agent, fibers of silica, glass, and the like, having a length comprised between 1.0 cm and 6 cm, and material that can be shaped with a low relative density preferably chosen from cork chips, granules of expanded polymeric material, and the like;
- after the consolidation of said third layer, proceeding to shaping the surface thereof with abrasive tools and instruments, until it is rendered fully even and compliant with the design standards;
- spreading at least one fourth layer constituted by a mixture of water, calcareous-siliceous binding agent, sand with low particle size value, acrylic resin in a percentage that is variable between 1% and 10% with respect to the calcareous binding agent, and at least one structural mesh made of fiber of silica,

glass, and the like, with at least unidirectional mechanical properties;

- spreading a fifth layer, which is at least partially impermeable, constituted by a mixture of water, light-colored calcareous-siliceous binding agent, siliceous sand with low particle size value, silicone-based additives in powder form to increase the degree of surface impermeableness of the layer in a percentage that can vary between 0.1% and 1% with respect to the calcareous binding agent, acrylic resin, in a percentage that can vary between 1% and 10% with respect to the calcareous binding agent, and fibers of silica, glass, and the like, having a length comprised between 1.0 cm and 6 cm.

[0015] Further characteristics and advantages of the invention will become better apparent from the description of a preferred but not exclusive embodiment of the method for providing artificial basins, swimming pools, and the like according to the invention, illustrated by way of non-limiting example in the accompanying drawings, wherein:

Figure 1 is a schematic view of a first step of the method according to the invention;
Figure 2 is a schematic view of a second step of the method according to the invention;
Figure 3 is a schematic view of a third step of the method according to the invention;
Figure 4 is a schematic view of a fourth step of the method according to the invention;
Figure 5 is a schematic view of a fifth step of the method according to the invention;
Figure 6 is a schematic view of a sixth step of the method according to the invention;
Figure 7 is a schematic perspective view of a sixth step of the method according to the invention;
Figure 8 is a schematic view of the seventh and eighth steps of the method according to the invention;
Figure 9 is a view of the seventh and eighth steps of the method according to the invention.

[0016] With reference to the figures, an artificial basin provided by means of a method according to the invention is generally designated by the reference numeral 1.

[0017] The method for providing artificial basins 1, swimming pools and the like entails the execution of a series of consecutive steps.

[0018] In a first step A it is necessary to perform the excavation 2 of the basin, according to the design specifications, in the ground 3 of the area where one wishes to perform the installation.

[0019] Subsequently, it is necessary to perform a step B wherein a first layer 4 of non-woven fabric is arranged on the entire surface of the excavation 2 (which will constitute the containment storage of the artificial basin 1).

[0020] In a subsequent step C it is necessary to arrange the equipment 5 and the piping 6 for feeding and draining water on the first layer 4 of non-woven fabric.

[0021] Consequently, in a step D, it is necessary to spread on the first layer 4 of non-woven fabric and on the overlying equipment 5 and piping 6 a second layer 7 constituted by a mixture of water, calcareous-siliceous binding agent, sand with low particle size value, and acrylic resin in a percentage that is variable between 1% and 10% with respect to the calcareous binding agent.

[0022] The acrylic resin present in the layer 7 has the purpose of rendering it suitable for the optimum adhesion of additional covering layers thereof: therefore it behaves like a "grip promoting agent" or a "primer" to facilitate the correct mating with the upper layers.

[0023] In practice, this layer 7 ensures that the surface on which the subsequent covering layers will be deposited is perfectly suitable to ensure perfect adhesion thereof, allowing to obtain the best structural performance from the artificial basin 1 that will be provided.

[0024] In the mixture used to provide the second layer 7, the most abundant component is water, in order to ensure the maximum fluidity of the mixture and facilitate its distribution and diffusion (as well as the possible impregnation, even an only partial one, of the first layer 4 made of non-woven fabric).

[0025] A subsequent step E provides for the distribution of a third layer 8 constituted by an at least partially impermeable mixture of water, calcareous-siliceous binding agent, sand with low particle size value, in a percentage that is variable between 1% and 10% with respect to the calcareous binding agent, fibers of silica, glass, and the like, having a length comprised between 1.0 cm and 6 cm (referred to the length of the individual filaments of fiber), and material that can be shaped with a low relative density, preferably chosen from cork chips, granules of expanded polymeric material, and the like.

[0026] The fact that the layer 8 is at least partially impermeable is due to the inherent characteristics of the materials that constitute it in the particular formulation with which they are combined. Impermeableness can be also ensured totally, as a function of the specific requirements of each individual project to be executed. The material used is within the broad type of materials for building artificial basins devised by the same Applicant of the present application and known commercially as Idrocon® (and at least partially described in the following prior patents in the name of the same Applicant: no. 1363172, no. 1363726 and no. 1417981).

[0027] This third layer 8, by virtue of presence of fibers made of siliceous material, glass fibers and the like, has excellent mechanical properties and therefore is suitable to give the basin 1 being built the correct rigidity and the necessary dimensional stability.

[0028] At the end of the consolidation of the third layer 8, which can occur in short times (substantially measurable in minutes and/or tens of minutes) or also in significantly longer times (days) depending on the climate conditions and the dosages of the various components of

the mixture constituting the layer 8, it is possible to proceed with the shaping of the surface of said layer 8 with abrasive tools and instruments, until it is rendered fully even and compliant with the design standards.

[0029] This shaping is possible owing to the fact that the layer 8 is the thickest one (on the order of about ten centimeters, although versions in which the thickness of the layer 8 is even much greater or lower are not excluded).

[0030] Rasps, files, saws, and tools provided with abrasive belts and/or disks for cutting and the like can be used for the shaping operations.

[0031] Subsequently, there is the need to implement a step F in which it is necessary to spread at least one fourth layer 9, constituted by a mixture of water, calcareous-siliceous binding agent, sand with low particle size value, and resin in a percentage that is variable between 1% and 10% with respect to the calcareous binding agent, and at least one structural mesh made of fiber of silica, glass, and the like, with at least unidirectional mechanical properties. In particular, the mesh used inside the fourth layer 9 has a high tensile strength with respect to at least one particular predefined direction: in this manner the mesh, being embedded in the mixture of the fourth layer 9, is rigidly coupled to the surfaces of the basin 1 being provided, giving it a high mechanical strength in the privileged direction (or directions) of traction identified thereby.

[0032] It is specified that in order to render the behavior of the basin 1 more uniform, it is possible to spread a subsequent additional fourth layer 10 that is substantially identical to the fourth layer 9 but in which the mesh made of silica fiber, glass fiber and the like has different privileged directions of tensile strength.

[0033] This can be obtained simply by using a different orientation of the meshes of the various superimposed layers, so as to ensure that the finished basin 1 has mechanical properties that are as uniform as possible.

[0034] It is clear that if the basin 1 requires greater mechanical strength with respect to a particular and specific direction (for design or installation reasons), the meshes may be arranged so as to privilege that direction.

[0035] One then proceeds with the execution of a step G, by spreading a fifth impermeable (finishing) layer 11, constituted by a mixture of water, light-colored calcareous-siliceous binding agent, siliceous sands with low particle size value, acrylic resin in a percentage that can vary between 1% and 10% with respect to the calcareous binding agent, and fibers of silica, glass, and the like, having a length comprised between 1.0 cm and 6 cm (referred to the length of the individual filaments of fiber). In this case also, the impermeableness can be partial or total according to the requirements expressed in the design; the level of impermeableness is obtained from the particular dosage of the components of the mixture used to provide the layer 11.

[0036] The layer 11 comprises advantageously also silicone-based additives in powder form to increase the degree of surface impermeableness of the layer 11 itself, which are present in a percentage that can vary between 0.1% and 1% with respect to the calcareous binding agent.

[0037] This layer 11 (having structural properties) gives the walls and the bottom of the basin 1 the necessary elasticity, i.e., preventing impacts or mechanical loads from producing fractures or cracks. The length of the reinforcement fibers used is in fact such as to ensure the best cohesion between each portion of the basin 1 and the contiguous ones.

[0038] Finally, it is possible to perform a further step H of spreading a sixth and final finishing layer 12 constituted by a mixture of water, calcareous-siliceous binding agent, sand, having the final color to be given to the artificial basin being provided, with a particle size that is variable between 0.01 mm and 1.8 mm, silicone-based additives in powder form to increase the degree of surface impermeableness of the layer in a percentage that is variable between 0.1% and 1% with respect to the calcareous binding agent, acrylic resin in a percentage that can vary between 1% and 10% with respect to the calcareous binding agent.

[0039] This sixth layer 12 (also impermeable) has the purpose of contributing to the final appearance of the basin 1, having the color of the sand used in the mixture and also the surface roughness that depends on the particle size of the sand itself. The impermeableness of the layer 12 is obtained through a higher dosage of siliceous sands in the constituting mixture.

[0040] As in the cases of the layers 7, 8, 9, 10, 11 described previously, the acrylic resin present in the mixture ensures the mutual adhesion of the various layers 7, 8, 9, 10, 11, while the impermeableness is ensured by the silica crystals that will form naturally during the "maturing" of the layers (understood as the set of chemical-physical processes that occur in the layers 7, 8, 9, 10 during their consolidation).

[0041] It is specified that, unlike all the constructive solutions of the known type for providing basins 1 and/or swimming pools by stratification, the method according to the invention ensures that each one of the superimposed layers 7, 8, 9, 10, 11 and 12 is independently water-repellent (in an at least partial manner), avoiding any impregnation of the layers 4, 7, 8, 9, 10, 11 and 12 themselves, with consequent preservation of the initial mechanical properties and of the original aesthetic characteristics of the basin 1 and/or the swimming pool for an indefinite time. It is clear that this embodiment allows to obtain basins 1 and/or swimming pools that are substantially free from the forming of algae inside the layers 4, 7, 8, 9, 10, 11 and 12 and are subjected to minimal bacterial proliferation (because areas of water stagnation that cannot be reached during cleaning are substantially absent).

[0042] The step A for providing the excavation 2 entails that advantageously the respective walls 13 can have an inclination comprised between 30° and 80° and are sur-

rounded by slightly downward sloping areas 14 that constitute wide steps and perimetric beaches.

[0043] The specified inclinations ensure optimum adhesion of the layers 7, 8, 9, 10, 11 and 12, which are distributed preferably by spraying the mixtures (by means of specific tools of any type and shape), although the use of pouring and/or manual distribution of the mixtures is not excluded.

[0044] It is furthermore necessary to specify that before arranging the piping 6 and the equipment 5 (which might be constituted by electric circuits for lighting and management and control of pumps and the like), it is possible to provide validly the insertion and stable locking, in the walls 13 and in the bottom 15 of the excavation 2, of at least one structural tension member for each surface module of predefined area.

[0045] In practice, the structural tension member is of the type of threaded bars, rods, cables and the like, and can then be secured subsequently in a rigid and stable manner to the layers 7, 8, 9, 10, 11 and 12 subsequently superimposed on the layer 4 of non-woven fabric for their rigid coupling to the walls 13 of the excavation 2.

[0046] This option is particularly useful if water-bearing levels are present in the area of the excavation 2: in fact, any inflow of water from the water-bearing levels to the excavation 2 (because of the at least partial water-repellency of the layers 7, 8, 9, 10, 11 and 12) would determine a thrust on the basin 1 that would tend to unseat it from the excavation 2; the tension members secure the basin 1 to the ground, preventing the water from the water-bearing levels from being able to displace it from its own installation seat.

[0047] Furthermore, it is useful to point out that the equipment 5 and the piping 6, arranged above the first layer 4 of non-woven fabric, can be conveniently coupled to it by means of castings provided by means of a mixture of inert materials and calcareous-siliceous binding agent, arranging the piping 6 so that only portions of rigid or flexible pipes protrude toward the inside of the concavity of the excavation 2.

[0048] In this manner, the correct arrangement of the equipment 5 and of the piping 6 is ensured and stabilized, and said equipment and piping do not risk being moved accidentally during the placement of the overlying second layer 7.

[0049] The calcareous binding agent used may be constituted by concrete, although it is not excluded to use other types of calcareous binding agents (for example, still with a cement matrix, but differently provided with additives and/or modified, and/or binding agents in which concrete constitutes a minor and/or negligible part).

[0050] It is specified that the mixture used to provide the second layer 7 is constituted by a part of solid premix, which comprises calcareous-siliceous binding agent and sand with low particle size, and a part of a mixture of water and acrylic resin (the latter in a low percentage in order to prevent the layer 7, once finished, from having a rubbery consistency: said layer 7 in fact must be substantially rigid).

[0051] The mixture of water and acrylic resin (both in the liquid state) facilitates the impregnation of the non-woven fabric that constitutes the first layer 4, with a consequent increase of the cohesion of the second layer 7 with the non-woven fabric proper.

[0052] According to a constructive solution of unquestionable interest in practice and application, it is specified that the fibers of silica, glass and the like comprised in the third layer 8 have a length comprised between 1.2 cm and 5 cm and are present in a percentage comprised between 3% and 5%.

[0053] This concentration and this length allow to obtain the mechanical characteristics most suitable for the purpose, combining rigidity and elasticity of the material, without introducing tangible weight increases thereof.

[0054] It is specified, moreover, that the material of the third layer 8 is mixed by means of a cement mixer, with the addition of water and acrylic resin (the latter in a low percentage in order to prevent the layer 8, once finished, from possibly having a rubbery consistency: this layer 8, too, in fact must be substantially rigid). In particular, the acrylic resin is present with respect to the water in a percentage that can vary from 1% up to 10% with reference to the weight of the calcareous binding agent.

[0055] The third layer 8 has a substantially uniform thickness comprised between 2 cm and 10 cm, preferably between 3 cm and 5 cm, covering completely the excavation 2 to the end of the perimetric beaches 14.

[0056] With reference to a constructive solution of unquestionable interest in practice and in application, the third layer 8 may favorably comprise shaped solid components made of material with low relative density, of the type of an expanded polymer, and arranged so as to rest on the second layer 7.

[0057] These shaped solid components are preferably chosen among steps, seats, decorative sculpted blocks, functional sculpted blocks, and the like. By way of example, the possibility is noted to provide slides, seats and/or areas with particular shapes giving a scenographic effect which, once covered by the subsequent layers 9, 10, 11, 12, will have the same aesthetic appearance as the rest of the basin 1 and/or swimming pool (and therefore will be completely embedded and integrated therein).

[0058] It is specified that the fourth layer 9 (and also any additional fourth layers 10 superimposed on the fourth layer 9) may validly comprise a superimposition of at least two stratifications: at least one first stratification comprises at least a mesh with at least unidirectional mechanical properties along the direction of the length of the basin 1, at least one second stratification comprising at least one mesh with at least unidirectional mechanical properties along the direction of the width of the basin 1.

[0059] In practice, each layer 9 (and optionally the layer 10 superimposed on it) may comprise multiple meshes distributed with a different orientation in order to ensure that a mechanical behavior compliant with design re-

quirements is obtained.

[0060] In particular, it is noted that the meshes used will have a tensile strength, along the at least one direction of intervention, of no less than 2100 N for each strip having a width of 5 cm.

[0061] Moreover, it is specified that the impermeable finishing fifth layer 11 and sixth layer 12 may conveniently comprise sand with a particle size that can vary between 0.02 mm and 1.5 mm, acrylic resin in a percentage that can vary between 3% and 7% with respect to the water and anti-filming additives, to avoid the forming of surface films on the layer, and anti-cracking additives, to avoid cracks of the layer 12.

[0062] Moreover, the sixth impermeable layer 12 (thanks to the forming of silica crystals described earlier and by virtue of the additional presence of silicone powders in the percentages described earlier) may advantageously undergo, within 3-5 hours after its spreading, combing of the silica sands by means of polymeric spatulas in order to highlight the surface and optimize it aesthetically and make it more uniform and smoother: this operation will make each grain of sand more visible, giving a particularly pleasant overall appearance. It is not excluded, in any case, that the same treatment might be performed also to the layer 11.

[0063] Therefore, it has been demonstrated that the artificial basins 1 provided by following the method according to the invention are innovative and original because:

- they do not require the presence of preliminary concrete castings;
- they can incorporate layouts depicting rocks, stones, sand, and the like with particularly modest thicknesses (even just 1 cm);
- they can incorporate dedicated shapes without the need to provide them in concrete, such as deck chairs, seats, islands, decorative walls, technical elements of whirlpool baths and the like;
- they are impermeable from the surface without the need to use cement mixtures rendered impermeable by a high component of acrylic resins, which, being rubbery, would undergo severe deteriorations over time, losing their impermeabilizing properties;
- they use the presence of silica crystals in the mixture of the components of each layer in order to obtain the impermeableness of each layer 7, 8, 9, 10, 11, 12, without assigning this task to the acrylic resin (the only purpose of which is to allow better cohesion between siliceous sand, limestone, siliceous fibers).

[0064] The mechanical performance of the basin 1 according to the invention is ensured also by the presence of the structural meshes made of silica fiber (or glass fiber).

[0065] It is specified that from a constructive point of view, the layers 7, 9, 10, 11, 12 have a thickness of a few centimeters (indicatively between 1 and 5 cm); the layer 8 alone is thicker, even up to about ten centimeters (constructive solutions in which said layer 8 has a thickness of even more than 10 cm are not excluded).

[0066] Generally, with reference to a particularly efficient embodiment with excellent installation, all the layers 7, 8, 9, 10, 11, 12 may preferably comprise acrylic resin in a percentage comprised between 3% and 7% with respect to the calcareous binding agent.

[0067] Advantageously, the present invention solves the above mentioned problems, proposing a method for providing artificial basins 1, swimming pools, and the like with water-repellent surfaces that resemble, in their appearance and shape, natural environments.

[0068] Profitably, the method according to the invention allows to produce artificial basins 1 and/or swimming pools that are not subject to the forming of algae, preventing the forming of pockets of stagnation of water inside the walls of the basin 1 itself.

[0069] Conveniently, the method according to the invention is easy to perform.

[0070] Validly, the method for providing artificial basins 1, swimming pools and the like according to the invention can be performed with modest costs in a substantially simple manner: these characteristics make the method according to the invention an innovation of assured application.

[0071] The invention thus conceived is susceptible of numerous modifications and variations, all of which are within the scope of the appended claims; all the details may furthermore be replaced with other technically equivalent elements.

[0072] For example, the distribution of the mixtures on the underlying layers may be performed by spray casting, of the type used in spray-mix distribution or the like.

[0073] The most suitable production method in the manufacturing process is the spray method.

[0074] In the spraying method, the glass fibers, in the form of a continuous bundle, are inserted in a gun that gives the fibers the desired length (for example 30 to 50 mm) and propels them together with the mortar directly onto the layers below.

[0075] In the exemplary embodiments shown, individual characteristics, given in relation to specific examples, may actually be interchanged with other different characteristics that exist in other exemplary embodiments.

[0076] In practice, the materials used, as well as the dimensions, may be any according to requirements and to the state of the art.

[0077] The disclosures in Italian Patent Application no. 102017000038974, from which this application claims priority, are incorporated herein by reference.

[0078] Where technical features mentioned in any claim are followed by numerical reference and/or abbreviations, those numerical reference and/or abbreviations have been included for the sole purpose of increasing the intelligibility of the claims and accordingly such numerical reference and/or abbreviations do not have any limiting effect on the interpretation of each element iden-

tified by way of example by such numerical reference and/or abbreviations.

Claims

1. A method for providing artificial basins, swimming pools, and the like, which consists in

   - excavating (2) the basin, according to the design specifications;
   - arranging on the entire surface of the basin, excavated previously in the ground (3), a first layer (4) of non-woven fabric;
   - arranging the equipment (5) and the piping (6) for feeding and draining water on the first layer (4) of non-woven fabric;
   - distributing on the first layer (4) of non-woven fabric and on the overlying equipment (5) and piping (6) a second layer (7) constituted by a mixture of water, calcareous-siliceous binding agent, sand with low particle size value, and acrylic resin, in a percentage that is variable between 1% and 10% with respect to the calcareous binding agent, adapted to render said second layer (7) suitable for the optimum adhesion of additional layers for covering it, the water being the most abundant component of the mixture in order to ensure the maximum fluidity of said mixture;
   - distributing a third layer (8), which is at least partially impermeable, constituted by a mixture of water, calcareous-siliceous binding agent, sand with low particle size value, and acrylic resin, in a percentage that is variable between 1% and 10% with respect to the calcareous binding agent, fibers of silica, glass, and the like, having a length comprised between 1.0 cm and 6 cm, and material that can be shaped with a low relative density preferably chosen from cork chips, granules of expanded polymeric material, and the like;
   - after the consolidation of said third layer (8), proceeding to shaping the surface thereof with abrasive tools and instruments, until it is rendered fully even and compliant with the design standards;
   - spreading at least one fourth layer (9, 10), constituted by a mixture of water, calcareous-siliceous binding agent, sand with low particle size value, and acrylic resin, in a percentage that is variable between 1% and 10% with respect to the calcareous binding agent, and at least one structural mesh made of fiber of silica, glass, and the like, with at least unidirectional mechanical properties;
   - spreading a fifth waterproof layer (11), constituted by a mixture of water, light-colored calcareous-siliceous binding agent, siliceous sands with low particle size value, silicone-based additives in powder form to increase the degree of surface impermeableness of the layer in a percentage that can vary between 0.1% and 1% with respect to the calcareous binding agent, acrylic resin, in a percentage that can vary between 1% and 10% with respect to the calcareous binding agent, and fibers of silica, glass, and the like, having a length comprised between 1.0 cm and 6 cm;

2. The method according to claim 1, **characterized in that** a sixth and last impermeable finishing layer (12) is applied which is constituted by a mixture of water, calcareous-siliceous binding agent, sand, having the final color to be given to the artificial basin being provided, with a particle size that is variable between 0.01 mm and 1.8 mm, silicone-based additives in powder form to increase the degree of surface impermeability of the layer in a percentage that is variable between 0.1% and 1% with respect to the calcareous binding agent, acrylic resin in a percentage that can vary between 1% and 10% with respect to the calcareous binding agent.

3. The method according to claim 1, **characterized in that** the walls (13) of the excavation (2) provided initially have an inclination comprised between 30° and 80° and are surrounded by slightly downward sloping areas (14) that constitute perimetric beaches.

4. The process according to claim 1, **characterized in that** before arranging said pipes (6) and said equipment (5), at least one structural tension member for each surface module of predefined area is inserted and locked stably in the walls (13) and in the bottom (15) of the excavation (2), said structural tension member being of the type of threaded bars, rods, cables and the like, said structural tension member being stably associable with the layers (7, 8, 9, 10, 11, 12) successively superimposed on the layer (4) of non-woven fabric for the rigid coupling thereof to the walls (13) and to the bottom (15) of the excavation (2).

5. The process according to claim 1, **characterized in that** said equipment (5) and said piping (6), arranged above the first layer (4) of non-woven fabric, are coupled to it by means of castings provided by means of a mixture of inert materials and calcareous-siliceous binding agent, arranging said piping (6) so that only portions of pipes chosen between rigid and flexible protrude toward the inside of the concavity of the excavation (2).

6. The process according to claim 1, **characterized in**

that the mixture used to provide said second layer (7) is constituted by a part of solid premix, which comprises calcareous-siliceous binding agent and sand with low particle size, and a part of a mixture of water and acrylic resin in a percentage that can vary between 1% and 10% with respect to the calcareous binding agent.

7. The process according to claim 1, **characterized in that** the fibers of silica, glass and the like, comprised in said third layer (8) have a length comprised between 1.2 cm and 5 cm and are present in a percentage comprised between 3% and 5%.

8. The process according to claim 1, **characterized in that** the material of said third layer (8) is mixed by means of a cement mixer, with the addition of water and acrylic resin in a percentage that can vary between 3% and 7% with respect to the calcareous binding agent, and is distributed for a thickness comprised between 2 cm and 10 cm, preferably between 3 cm and 5 cm, covering completely the excavation (2) to the end of the perimetric beaches (14).

9. The process according to claim 1, **characterized in that** said third layer (8) comprises contoured solid components made of a material with low relative density, of the type of an expanded polymer and arranged so as to rest on said second layer, said contoured solid components being chosen preferably from steps, seats, decorative sculpted blocks, functional sculpted blocks, and the like.

10. The process according to claim 1, **characterized in that** said fourth layer (9, 10) comprising at least one structural mesh with at least unidirectional mechanical properties is constituted by the superimposition of at least two stratifications, at least one first stratification comprising at least one mesh with mechanical properties that are at least unidirectional along the direction of the length of the basin, at least one second stratification comprising at least one mesh with mechanical properties that are at least unidirectional along the direction of the width of the basin, said meshes having a tensile strength, along the at least one direction of intervention, of no less than 2100 N for each strip having a width of 5 cm.

11. The process according to claim 1, **characterized in that** at least one between said impermeable and finishing fifth layer (11) and sixth layer (12) comprises sand with a particle size that can vary between 0.02 mm and 1.5 mm, acrylic resin in a percentage that can vary between 3% and 7% with respect to the calcareous binding agent, silicone-based additives in powder form, in order to increase the degree of surface impermeableness of the layer, in a percentage that can vary between 0.1% and 1% with respect to the calcareous binding agent, and anti-filming additives, to avoid the forming of surface films on the layer, and anti-cracking additives, to avoid cracks of the layer.

12. The process according to claim 1, **characterized in that** at least one between said impermeable and finishing fifth layer (11) and sixth layer (12) is subjected, within 3-5 hours after spreading, to combing of the silica sands by means of polymeric spatulas in order to highlight and optimize aesthetically the surface and make it more uniform and smooth.

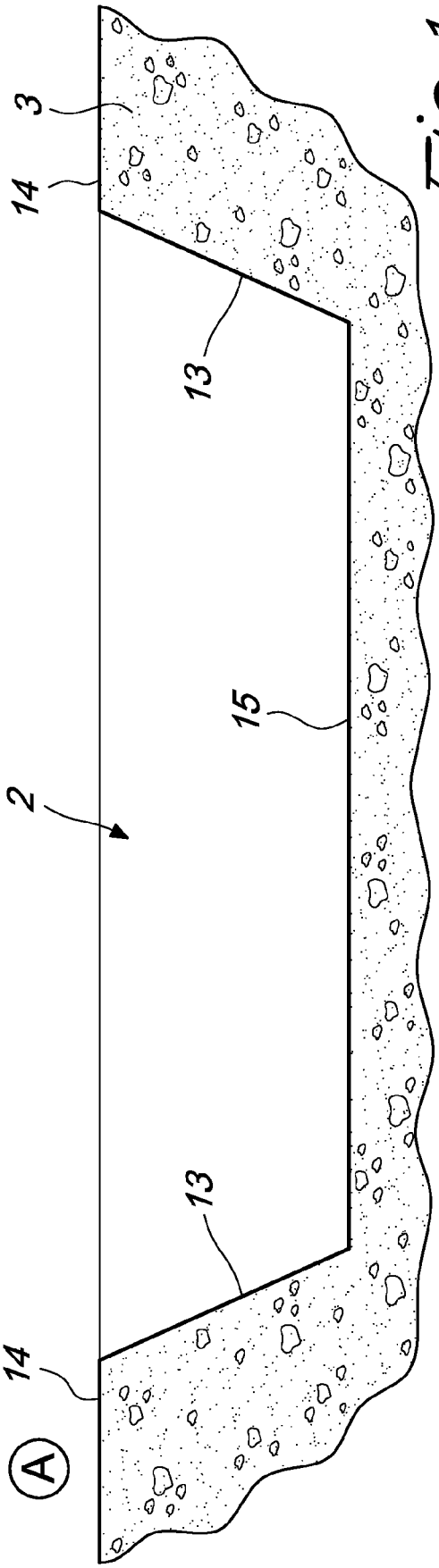

Fig. 1

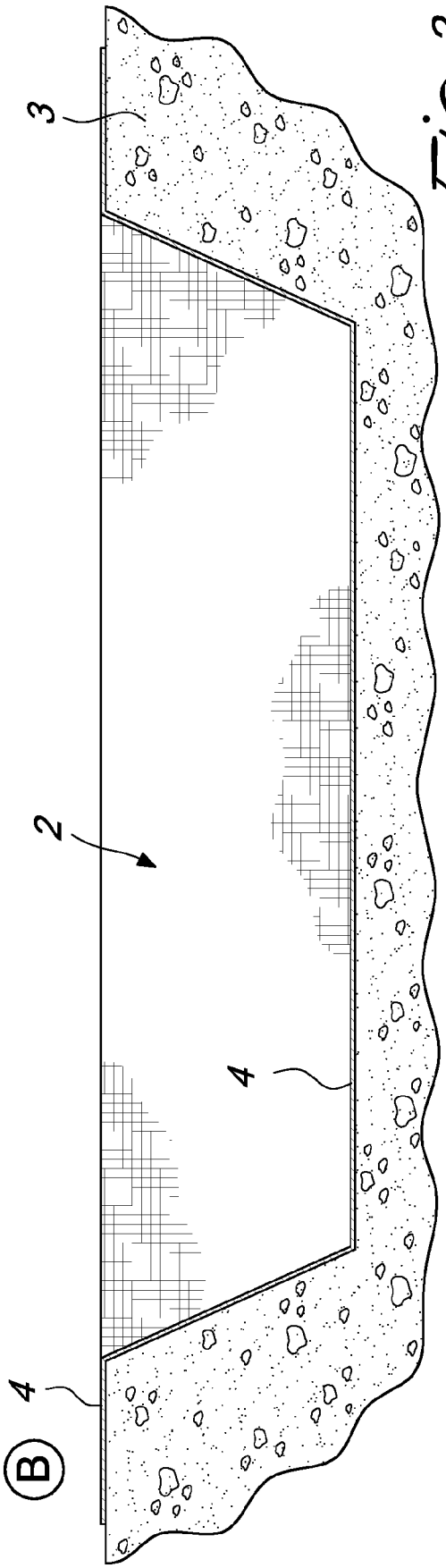

Fig. 2

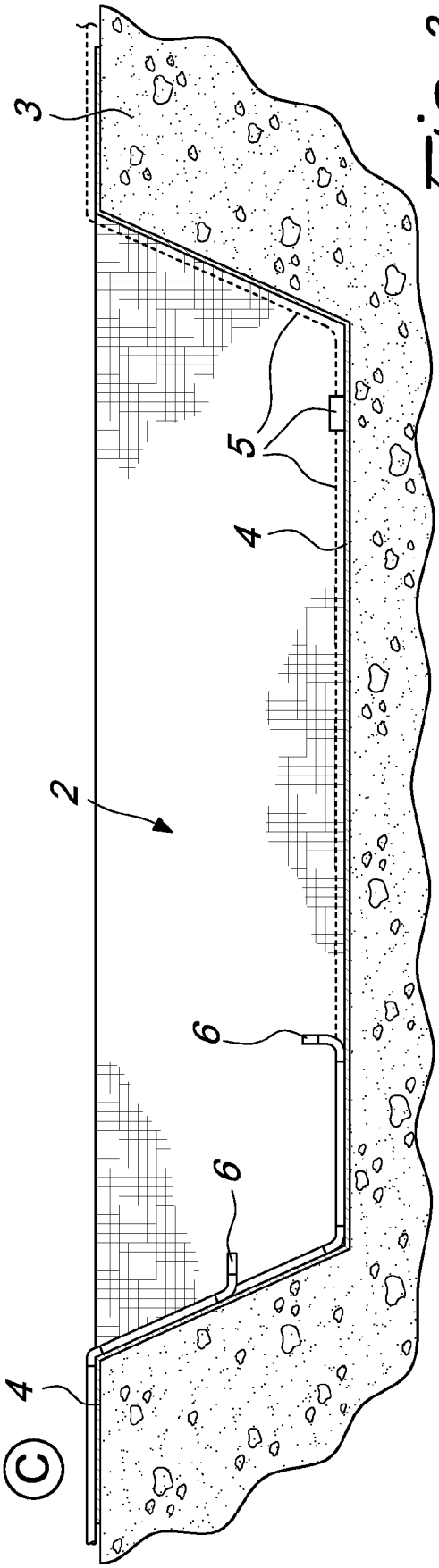

Fig. 3

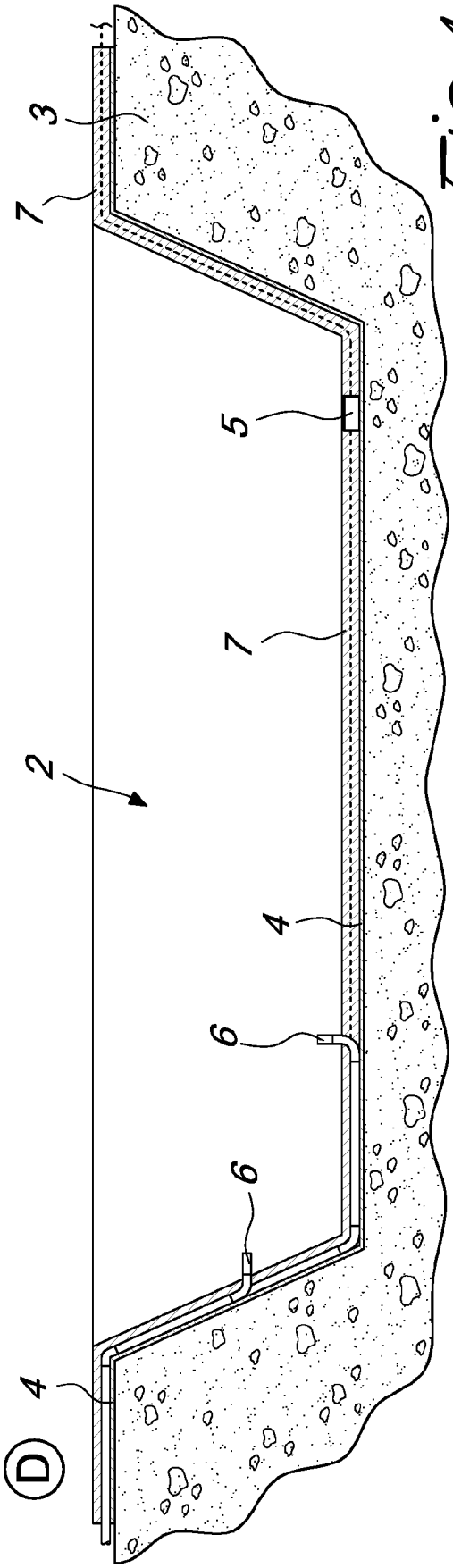

Fig. 4

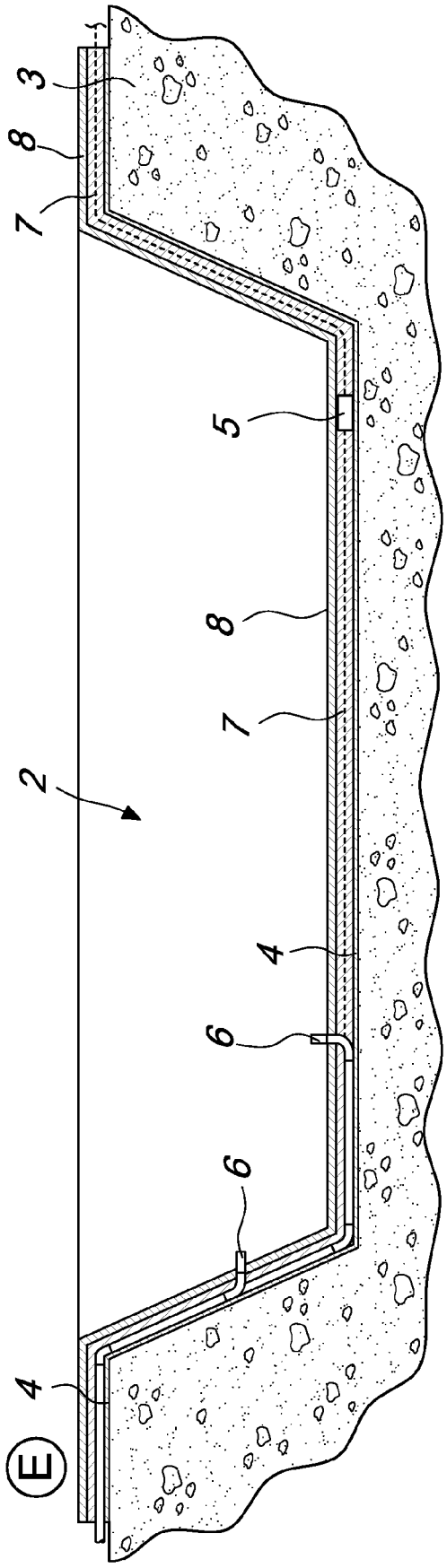

Fig. 5

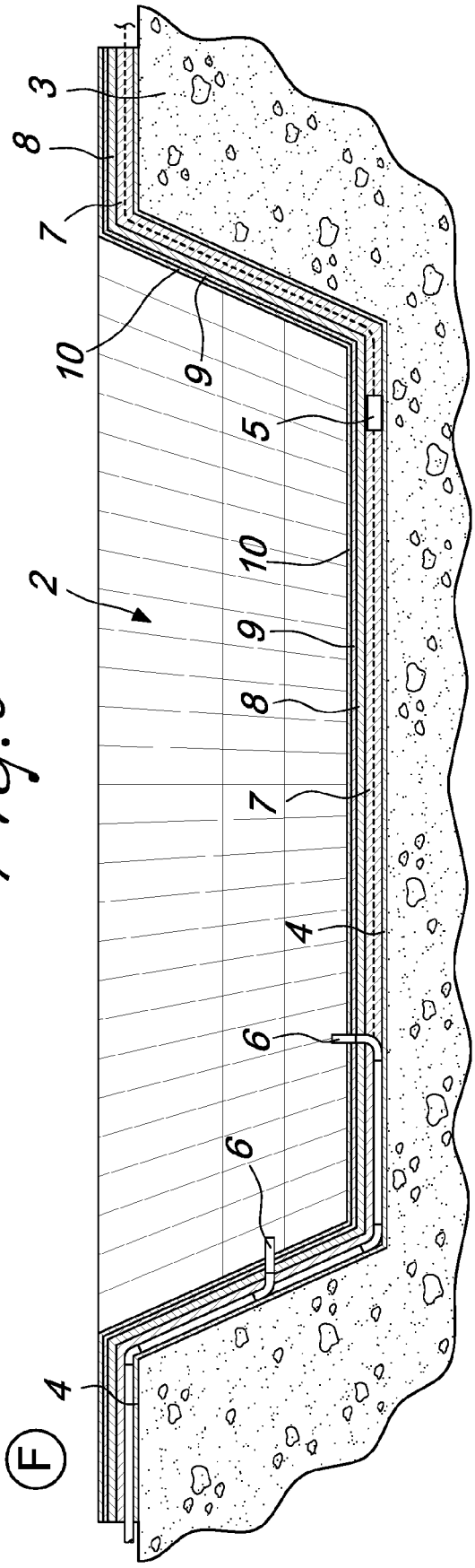

Fig. 6

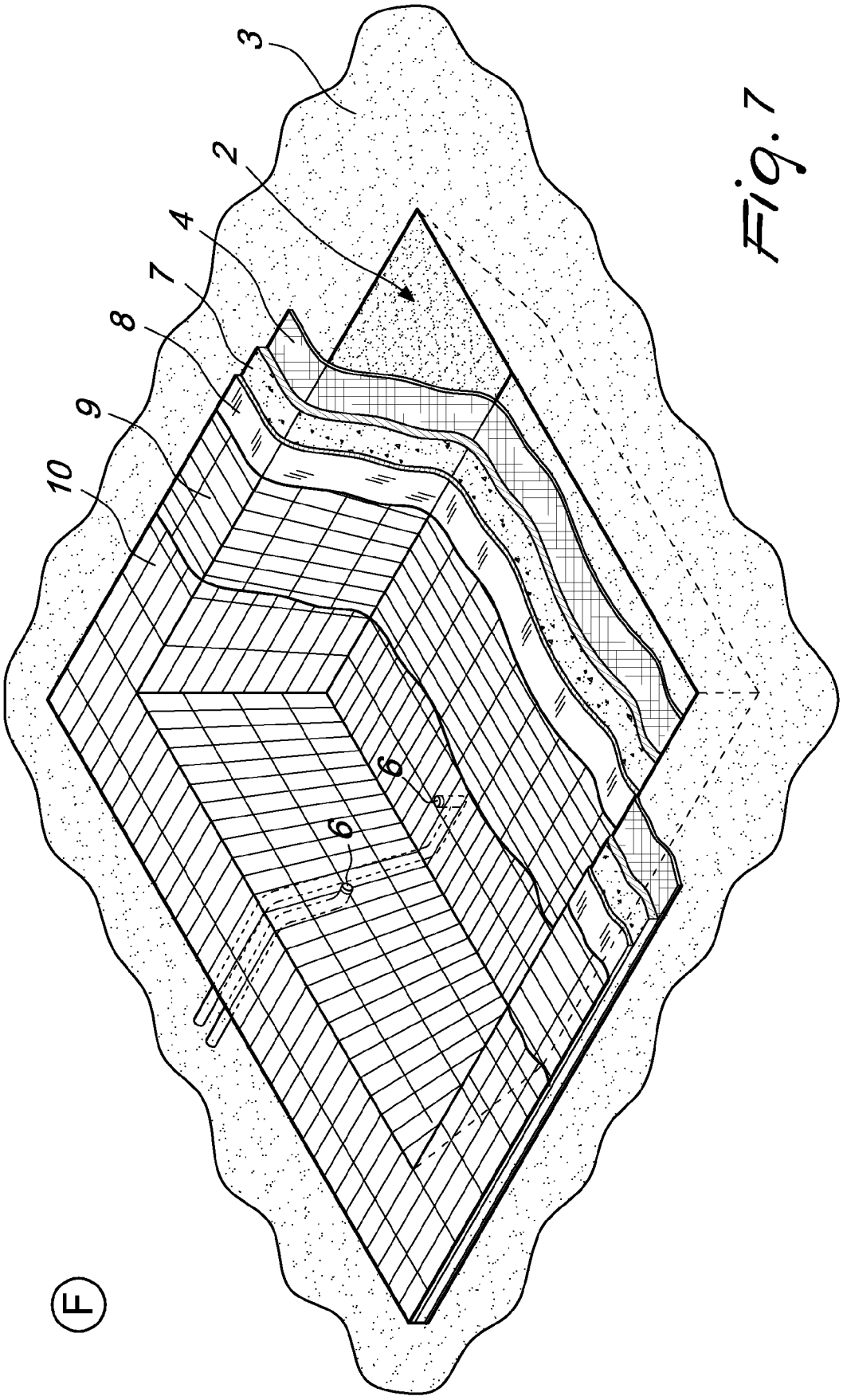

Fig. 7

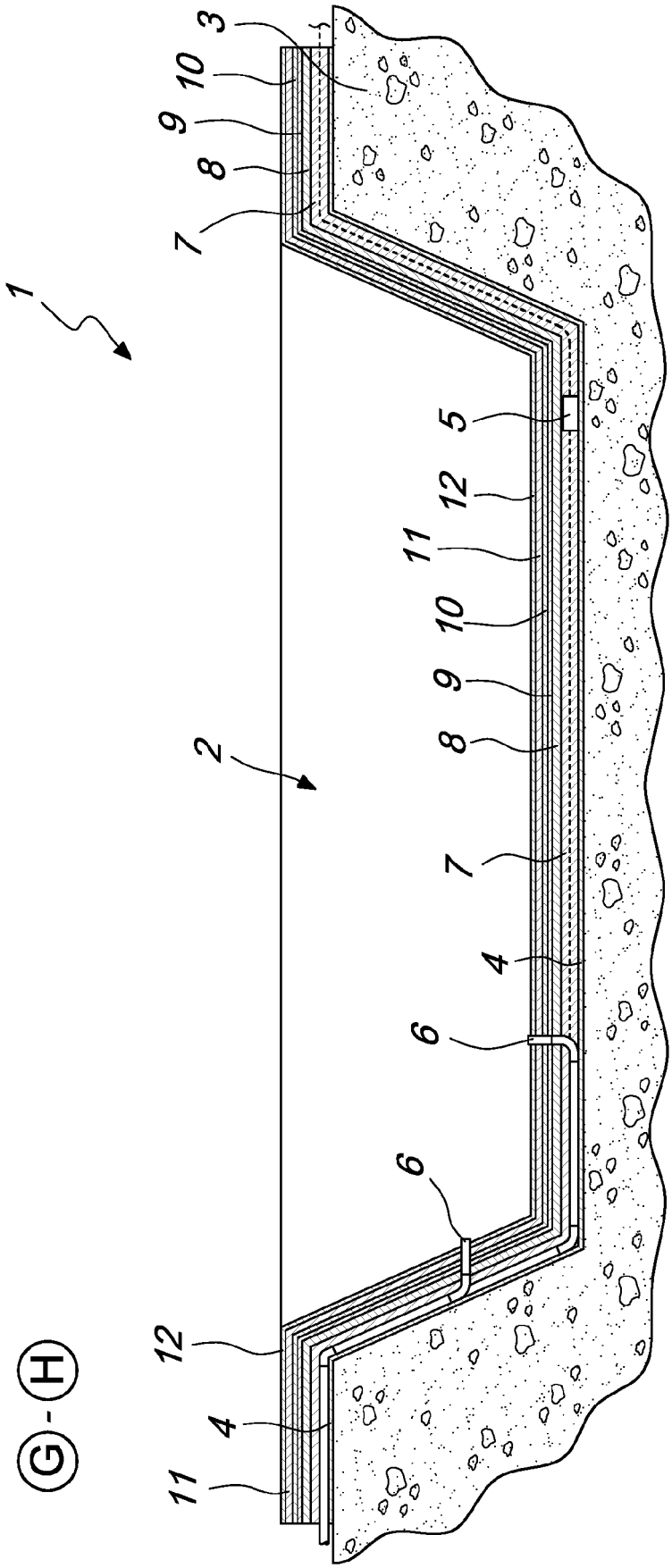

Fig. 8

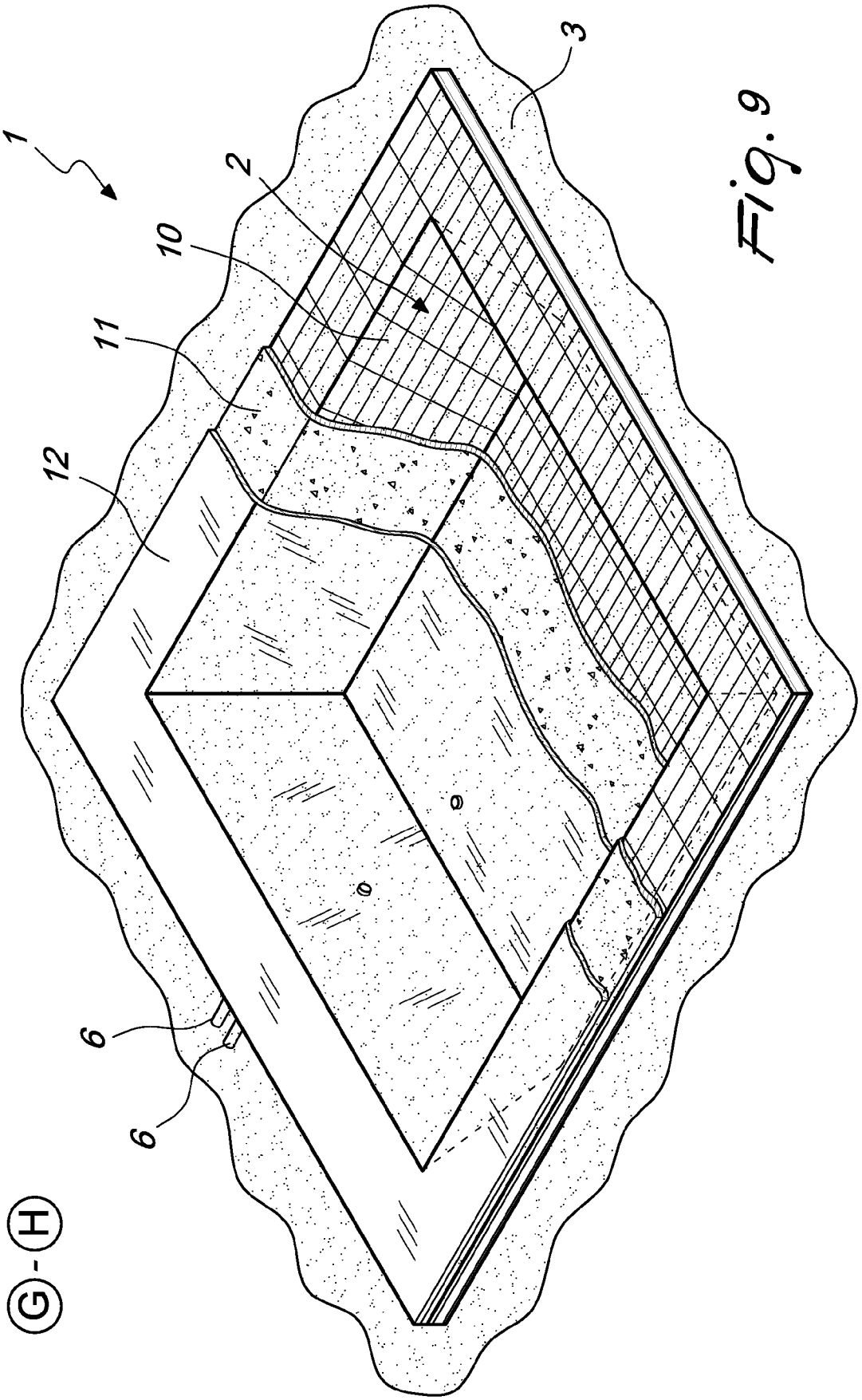

Fig. 9

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EUROPEAN SEARCH REPORT

Application Number
EP 18 16 6381

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A	AU 82521 82 A (HRIBAR B F) 21 April 1983 (1983-04-21) * claim 8; figures 1,2 *	1-12	INV. E04H4/00
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E04H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	3 August 2018	Rosborough, John

CATEGORY OF CITED DOCUMENTS

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