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(54) Prefabricated constructive element for the construction of soil consolidating stuctures, relative method of production and structure obtainable thereby, and relative method of installation

(57) Prefabricated constructive element (19) for the construction of a soil consolidating structure comprising containing means (20) and filling material (22) to fill said containing means (20). The peculiarity of this element (19) consists in that such filling material (22) comprises a supporting core (23) to support said consolidating structure and a shielding cover (24) associated with said supporting core (23) to shield the latter. This solution allows setting up a soil consolidating structure in a very limited amount of time and by the prevalent use of installation equipment. The invention also refers to a method for producing such a prefabricated construction element (19), a soil consolidating structure obtainable thereby, and the relative method of installation.

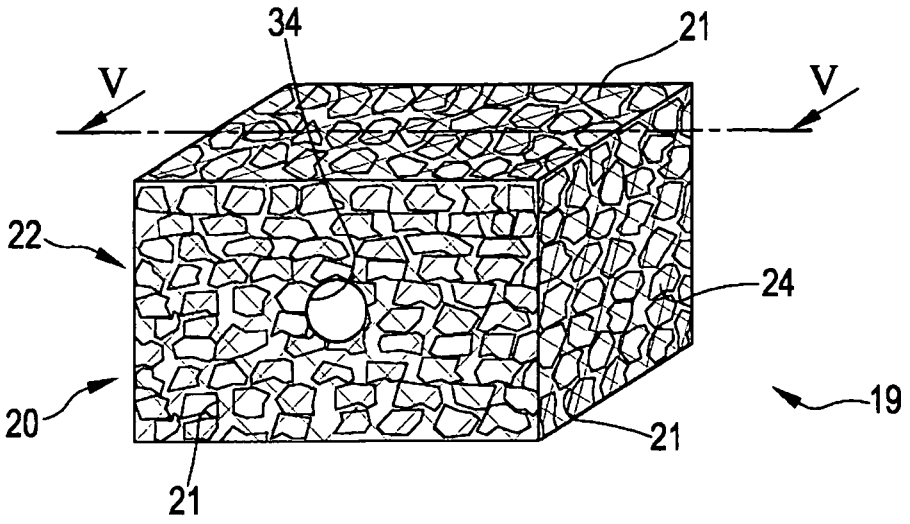

FIG.3

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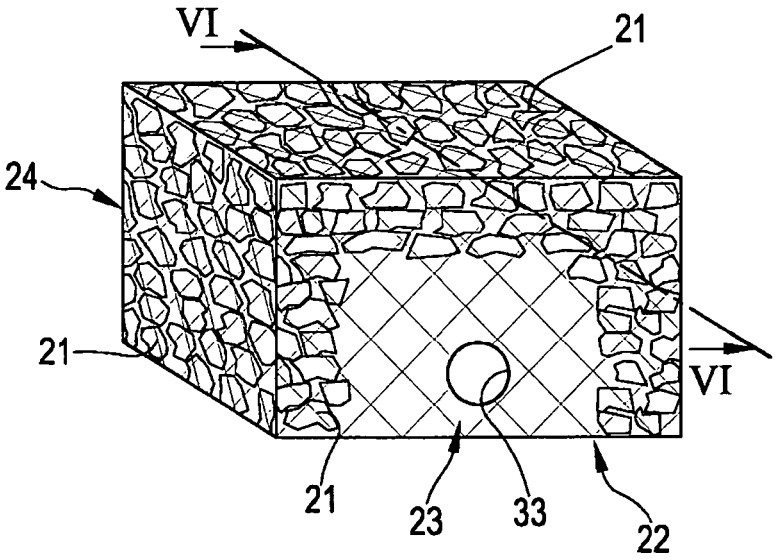
FIG.4



Description

[0001] The object of the present invention is a constructive element for constructing consolidating structures such as containing, reinforcing, supporting, stabilizing and arranging works for the soils of hillsides, slopes and banks subject to sliding and/or eroding events. The invention also refers to a production method for producing such a constructive element and to a consolidating structure incorporating a plurality of such prefabricated construction elements, as well as a method of installing them. The invention is advantageously suitable for use in numerous landscape-engineering applications and especially for construction, reconditioning and maintenance works on infrastructures for roads and banks in a mountainous, forested, watery environment and the like.

[0002] Today's constructive elements generally comprise containing means constituted of a plurality of net-shaped, mutually interconnected panels. The containing means obviously have a box-like, meaning parallelepiped form. Moreover, the mentioned constructive elements comprise a filling material suitable for filling the mentioned containing means. This filling material must be made of pebbles or fractured rocks of an adequate shape and average size in the range of 20 to 30 cm. In the first case, this means pebbles encountered in the neighbourhood of the construction site of the consolidating structure, for instance from a river-bed. In the second case, it means fragments obtained reducing into pieces stones from rocks of an exclusively non-freezing type. Such a constructive element finally avails itself of a reinforcing structure allowing it to be firmly connected to anchoring spikes driven into the soil. Such a structure is, in detail, essentially constituted of a metal frame, and associated with the rear side of the mentioned containing means. The connection between the latter and the anchoring means normally occurs through removable blocking stops.

[0003] The main drawback encountered in the mentioned technical and constructive solution essentially consists in the long time delays needed for installing a consolidating structure made of the mentioned constructive elements. Specifically, these drawbacks are attributable to the operations needed for inserting and correctly emplacing the filling materials into the containing means, which are carried out manually by qualified personnel. In fact, this is the only way to provide the constructive element, and consequently the consolidating structure, with suitable characteristics of solidity and strength.

[0004] Another drawback recognized in the technical and constructive solution described above consists in the limited duration of the consolidating structures made by using the constructive elements mentioned above. Their structural characteristics are in fact subject to a progressive deterioration that manifests itself in their loosening to the point of finally releasing the filling material. This phenomenon appears to be essentially provoked, on one side by casual events such as impacts from an operating device or tree trunk, and on the other side by systematic events such the combined erosive action of a waterway or the growth of plants rooting in the structure.

[0005] Not the least of the drawbacks encountered in the technical and constructive solution mentioned above comes from the high lay-down costs of a consolidating structure made of such constructive means. This drawback is partly attributable to the high incidence the manual labour costs needed to produce each constructive element as seen above, and partly to the cost of the filling material whenever chosen of an appropriate quality.

[0006] The aim of this invention is to set up a prefabricated constructive element to construct a soil consolidating structure, a method for producing said prefabricated constructive element and a consolidating structure obtainable by using a plurality of said constructive elements as well as a method for installing the latter, which is capable of resolving the drawbacks and problems encountered in the solutions of the prior art as described above.

[0007] Within the aim outlined above, an important object of the present invention is to set up a prefabricated constructive element especially suitable for use under emergency conditions, for instance for containing earth slides, floods and the like.

[0008] Moreover, within the aim outlined above, an important object of the present invention is to set up a prefabricated constructive element capable of granting an exceptional and durable structural strength to a consolidating structure.

[0009] A further object of the present invention is to set up a prefabricated constructive element capable of making the construction of a consolidating structure much more economical and safe.

[0010] An additional object of the present invention is to set up a prefabricated constructive element capable of granting the outer appearance of an already existing consolidating structure to a new consolidating structure.

[0011] Not the last object of the present invention is to set up a prefabricated constructive element capable of allowing a complete recovery of the consolidating structure in case of dismantling and re-utilizing it for new constructions.

[0012] This aim, as well as these and other objects that will be better apparent here in after, are achieved by a prefabricated constructive element to construct soil consolidating structure, a production method for producing such a prefabricated constructive element and a consolidating structure obtainable by using a plurality of said prefabricated constructive elements, as well as a method for installing the same, according to the attached claims.

[0013] In agreement with some first advantageous features of the invention, the prefabricated constructive element comprises, based on the prior art, containing means and filling material for filling said containing means. In particular, the aforesaid filling material presents above all the peculiar feature of comprising at

least a supporting core capable of supporting the consolidating structure.

[0014] This peculiar feature allows achieving the aim of the invention, as will also be appreciated later, because it allows setting up a consolidating structure in much shorter time and through the prevalent usage of installation equipments. This solution in fact allows transferring the constructive elements, by conventional means of transport, from the production site to the usage site and to install it in a likewise facilitated manner and with the practically exclusive usage of terrestrial or aerial means. In conclusion, it happens to be possible to take timely and rapid steps to face even the worst emergencies. Moreover, this solution also allows setting up suitable stocks of constructive elements for use in emergencies.

[0015] This peculiar feature also allows attaining another object of the invention, as will also be appreciated from the description to follow, because it is capable of granting an exceptional and lasting structural strength to a consolidating structure. This solution in fact allows the constructive element to achieve a considerable and permanent strength against accidental impacts of an even serious nature on the part of rocks or tree trunks and the erosive action caused for instance by water streams. Moreover, this solution allows a constructive element to attain a considerable crushing strength, to make it possible to advantageously create larger consolidating structures than conventional ones.

[0016] Moreover, this peculiarity allows attaining a further object of the invention because, as will be appreciated in the description to follow, the construction of a consolidating structure happens to be more economical and safe. In fact, based on the above considerations, this solution allows minimizing the use of a general and qualified labour force on the site, and leaves most of the work to installation equipments. There is also a reduced usage of valuable filling material, such as non-freezing rock fragments. These results, on one hand, in a considerable reduction of general outlays, and on the other, in substantially enhanced safety conditions, even under the worst emergency conditions.

[0017] Based on the first advantageous features outlined above, said filling material also presents the peculiar feature of comprising at least one shielding cover associated with said supporting core, which functions to shield the latter.

[0018] This peculiarity allows achieving another object of the present invention because, as will be appreciated from the description to follow, it allows granting to a new consolidating structure the outer appearance of an already existing consolidating structure. This solution therefore allows rendering environmental recovery jobs, although performed at different and even far removed periods of time, uniform from a visual viewpoint. This aspect appears to have a particular advantage in undertakings aimed at reconditioning certain consolidating structures of the past, which are composed of traditional constructive elements capable of being replaced by the prefabricated constructive elements according to this invention.

[0019] The constructive element according to the invention also appears advantageous because it allows a full recovery where a consolidating structure is dismantled and eventually re-utilized for new construction jobs. On the contrary, the constructive elements according to the art become useless, because they loosen to the point of releasing the relative filling material.

[0020] A further advantageous aspect of the invention is in the fact that the work of the operators needed to apply blocking stops is only needed after concluding the installation of the consolidating structure, meaning under conditions of adequate safety. On the contrary, according to the art, such interventions must be carried out in the initial phase, thus exposing the operators to serious impending risks, for instance in cases of slides with breakaway masses of earth, rocks and the like.

[0021] Finally, one last advantageous aspect of the constructive element according to the invention may be seen in that there is no need to arrange for special transports for any transfers of materials from the production site to the usage site. The constructive element in fact occupies the same volume as that of conventional constructive elements, and its overall weight is suitable for transport by the same trucks used in the construction trade.

[0022] These and other advantageous aspects of the invention will become better evident from the description of the forms of embodiment of the prefabricated constructive element for the construction of a soil consolidating structure, the relative method of its production and the consolidating structure obtainable by using a plurality of said constructive elements, as well as the method of installing the same according to the invention, as illustrated for exemplifying yet not limiting purposes, in the attached drawings, wherein:

- Figure 1 represents a frontal view of a consolidating structure, according to the invention, for consolidating a hillside comprising a plurality of constructive elements, according to the invention;
- Figure 2 represents a sectional view, according to the sectional plane along the line II-II of Figure 1, of the consolidating structure shown in the preceding figure;
- Figure 3 represents a front prospective view of a prefabricated constructive element, according to the invention;
- Figure 4 represents a rear prospective view of the constructive element of the preceding figure;
- Figure 5 represents a sectional view, according to a sectional plane along the line V-V of Figure 3, of the constructive element mentioned above;
- Figure 6 represents a sectional view, according to a sectional plane along the line VI-VI of Figure 4, of the constructive element mentioned above;
- Figure 7 represents an exploded prospective view

of a preparatory initial phase of the production method, according to the invention;

- Figure 8 represents an exploded prospective view of a second preparatory phase of the production method mentioned above;
- Figure 9 represents a sectional view, according to a sectional, vertical/frontal plane not indicated here, of a subsequent phase of the production method mentioned above;
- Figure 10 represents another sectional view, like the former one, of a first executive phase of the production method mentioned above;
- Figure 11 represents a sectional view, according to a sectional plane along the line XI-XI of Figure 10, of said first executive phase of the production method mentioned above;
- Figure 12 represents a sectional view, in a sectional, vertical/frontal plane not indicated here, of a second executive phase of the production method mentioned above;
- Figure 13 represents a ground view from above of said second executive phase of the production method mentioned above.
- Figure 14 represents a sectional view, according to a sectional plane along the line XIV-XIV of Figure 13, of said second executive phase of the production method mentioned above;
- Figure 15 represents another sectional view, according to a vertical/frontal sectional plane not indicated here, of an intermediate executive phase of the production method mentioned above;
- Figure 16 represents another sectional view, like the former one, of a further intermediate executive phase of the production method mentioned above;
- Figure 17 represents a sectional view, according to a vertical/lateral plane along a line not indicated here, of the terminal executive phase of the production method mentioned above;
- Figure 18 represents a sectional view, like the former one, of the last phase of the production method mentioned above.

[0023] With a particular reference to Figure 3, the prefabricated constructive element is generally indicated by the reference number 19. In accordance with the known art, this prefabricated constructive element 19 comprises above all containing means, indicated as a whole by the reference number 20, which are appropriately constituted of a plurality of net-like, reciprocally interconnected panels. The latter are advantageously made of robust metallic nets made of polygonal double-twisted meshes to enhance their strength and subjected to a surface galvanizing treatment to extend their durability.

[0024] In the second place, this prefabricated constructive element 19 comprises a filling material, indicated in the overall by the reference number 22, which is suitable for filling the mentioned containing means 20. In detail, this filling material 22 comprises above all a supporting core, indicated by the reference number 23, which fulfills the function of supporting the consolidating structure shown in Figure 1, as detailed below. Said filling material 22 also comprises a shielding cover, indicated by the reference number 24, which is associated with the supporting core 23 mentioned above and has the function of shielding the latter. More specifically and also with reference to the Figures 5 and 6, the mentioned supporting core 23 is constituted of a concrete matrix 25 and a reinforcing/lifting frame 26, respectively, which is incorporated, as a whole, in the concrete matrix 25. The mentioned reinforcing/lifting frame 26 consists in turn of a cage of bars 27 and a triplet of reticular panels 28, arranged in a frontal position and on the sides of said cage of bars 27, respectively. It is noted that the mentioned supporting core 23 is arranged in the central and rearward area of the mentioned containing means 20. It is further noted that the solution of employing the mentioned triplet of reticular panels 28 determines a considerably advantageous appearance. These reticular panels 28 allow it on one hand to insert appropriate stiffening ties designed to stiffen the containing means 20, as will be seen in detail further on, and on the other hand to confer the entire supporting core 23 greater strength, because said reticular panels 28 are all incorporated into the concrete matrix 25. In turn, the mentioned shielding cover 24 is essentially formed by a front layer 29, lateral layers 30 and a final covering layer 31. These layers 29, 30 and 31 are constituted of a plurality of rock fragments 32 obtained from a non-freezing rock. These rock fragments 32 are advantageously partly incorporated in the concrete matrix 25 mentioned above. This technical measure determines a further advantageous appearance of the invention. In case of a rupture of the containing means 20, the release of the outermost rock fragments 32 does not in fact compromise the outer appearance of the prefabricated constructive element 19, because the supporting core 23 retains those rock fragments 32 that are at least partially incorporated into the concrete matrix 25 mentioned above. Finally, this prefabricated constructive element 19 is fitted with an inserting passage 33 transversally carved out of the mentioned supporting core 23, so as to allow inserting an anchoring spike 212. This prefabricated constructive element 19 is completed by using an access opening 34 carved out from the portion facing the mentioned shielding cover 24 at the outlet level of the mentioned inserting passage 33, to allow the access of the mentioned anchoring spike 212. In conclusion, the prefabricated constructive element 19 comprises a plurality of stiffening ties 35. The latter are interposed between the mentioned reticular panels 28 and the mentioned containing means 20 through the mentioned rock fragments 32. These stiffening ties 35 are entrusted with the task of stiffening the mentioned containing means 20.

[0025] With reference to the Figures from 7 to 18, the production method for producing the prefabricated constructive element 19 is described as follows. With partic-

ular reference to Figure 7, the preliminary phase of this method consists in assembling suitable conforming means, indicated as a whole by the reference number 101, to form the mentioned constructive element 19. In detail, this phase is carried out on a supporting floor and consists in a sequence of an operation to flatwise approach a pair of "L"-shaped and laid down walls 102, and an operation to tie up the extremities in contact with this pair of walls 102. The method then provides for inserting said containing means 20, in a vertical sense from the top and in a partially assembled form, into the mentioned conforming means 101. This allows achieving the operating condition illustrated in the following Figure 8. With reference to the latter, the next phase then comprises a vertical topside insertion of a delimiting and supporting armature 103 without a floor, in a position set up at the center and moved backward from the mentioned containing means 20. The purpose of this delimiting and supporting armature 103 is to define a positioning sector indicated by 104 in the subsequent Figure 9, to facilitate the emplacement of the mentioned rock fragments 32 and to support the relative installation. With reference to the Figures 10 and 11, the method provides for positioning the triplet of reticular panels 28 at the sides of the mentioned delimiting and supporting armature 103. Immediately thereafter, an operator (not evidenced here) steps inside the delimiting and supporting armature 103. From this point onward, the operator proceeds with picking up a rock fragment 32 from a heap set up in the immediate neighborhood of the conforming means 101 and appropriately arranging it inside the positioning sector 104. In so doing, the operator produces a first layer of these rock fragments 32. The same operator then manually proceeds to apply a number of stiffening ties 35, so-called ties interposed between the mentioned reticular panels 28 and the mentioned containing means 20, just above the mentioned first layer of rock fragments 32. After completing this operation, the operator proceeds to lay down a plurality of subsequent layers of said rock fragments 32 inside the mentioned positioning sector 104, until reaching the summit of the mentioned containing means 20, and to apply a plurality of stiffening ties 35 interposed between the mentioned subsequent layers. The same operator then appropriately provides for inserting a profiling body 105 into the positioning sector set up in the front of and approximately at the center of the area between the mentioned rock fragments 32, as detailed in Figure 11. At this point, the production of the shielding 24 can be considered to be complete, and the operator thus quits the delimiting and supporting armature 103. The mentioned cage of bars 27 is then vertically inserted from above and rested inside the mentioned delimiting and supporting armature 103. At the end of this operation, said operator takes care of fastening a conforming body 106, in this case a tubular body, into the mentioned cage of bars 27.This conforming body 106 is disposed in a position facing the mentioned profiling body 105, in a transversal and downward sloping condition. The scope of this conforming body 106 is to confer a shape to the mentioned inserting passage 33. At this point, and with specific reference to Figure 15, the method provides for injecting a concrete in a pasty condition 107 into the mentioned delimiting and supporting armature 103, and at the same time for extracting this delimiting and supporting structure 103 from its inserting position. It should be clarified that said extraction allows the concrete 107 to spread out inside these conforming means 101, until it reaches and incorporates at first the triplet of reticular panels 28 and then the rock fragments 32 that are in contact with these reticular panels 28. It is precisely for this reason that the speed of extraction of said delimiting and supporting armature 103 must be functional to the speed of diffusion of the concrete 107. The concrete 107 is advantageously, over the duration and at the conclusion of the input phase, subjected to some suitable vibration to promote the mentioned diffusion and achievement of a suitable degree of self-leveling. At the end of the casting, the general situation will look as shown in Figure 16, in which the conformation of the supporting core 23 is completed and the delimiting and supporting armature 103 is set in a raised position with respect to the conforming means 101 and ready to be removed. Now with reference to Figure 17, the operator proceeds with drowning a plurality of rock fragments 32 in the surface of the concrete 108, and immediately thereafter with closing the upper portion of the mentioned containing means 20. The method provides, at this stage, for holding the prefabricated constructive element 19 in a stationary position inside the conforming means 101, for a suitable length of time to cause the concrete 107 to attain the most suitable degree of curing. After completing this phase, the prefabricated construction element 19 is delivered from the conforming means 101. In detail, the delivery occurs simply by releasing and then removing the "L"-shaped and laid-down walls 102. The prefabricated constructive element 19 is then hooked up to the portions of the reinforcing/lifting frame 26 which are projecting from the supporting core 23, and transferred to storage.

[0026] With reference to the Figures 1 and 2, a description is at first given for a consolidating structure for soil consolidating, indicated as a whole by the reference number 210, and for its method of installation. As seen in the last figures cited, this consolidating structure 210 is essentially composed of a plurality of superimposed, offset and interconnected rows 211 of prefabricated constructive elements 19, all having the features mentioned above. The consolidating structure 210 also comprises anchoring spikes 212 suitably driven into the ground that perform the function of anchoring the mentioned rows 211 to the ground. Finally, this consolidating structure 210 includes blocking stops 213 interposed between the mentioned anchoring spikes 212 and the prefabricated constructive elements 19. The blocking stops 213 have the purpose of blocking said prefabricated constructive elements 19 to the respective anchoring spikes 212.

[0027] The method of installing said consolidating structure 210 is in turn articulated into the following operating phases. It is at first necessary to appropriately arrange the bottom 214 on the ground, based on the characteristics of the consolidating structure 210. After completing this phase, one takes up the operation of positioning a first row 211 of prefabricated constructive elements 19 by using installation equipment on the mentioned bottom 214, and of the relative filling with a draining gravel material from the rear. This operation is followed by another essentially similar operation, which consists of positioning a second row 211 of prefabricated constructive elements 19, by installation equipment, to be set up in a superimposed and offset position with respect to that of the first row 211. The following phase than provides for driving a plurality of said anchoring spikes 212 into the ground, while using specific installation equipment. The mentioned anchoring spikes 212 are appropriately inserted at a distance from the mentioned bottom 214 that is functional with respect to the overall height of this consolidating structure 210 and at an angle with respect to the horizontal that is suitable to perform the anchoring to the mentioned consolidating structure 210. Simultaneously with this driving-in operation, a cement slurry is injection-pumped into these anchoring spikes 212. A superimposed row 211 of prefabricated constructive elements 19 is again emplaced, by installation equipment, in a position superimposed and offset with respect to each underlying row 211. This operation is repeated until the last superimposed row 211 reaches the height demanded by the consolidating structure 210. At this point, a team of operators proceeds to apply the stiffening ties (not shown here) interposed between the mentioned prefabricated constructive elements 19, for stiffening the consolidating structure 210 as a whole. After completing this operation, the same team of operators applies the blocking stops 213 on the lengths of the anchoring spikes 212 that project from the prefabricated constructive elements 19. The volume behind the last row of the consolidating structure 210 is then filled with debris and small-size pebbles, and the overlaying zone of said bottom is finished at the end.

[0028] In the light of this description, it has in practice been recognized that the prefabricated constructive element the relative method of production, the consolidating structure thus obtainable by using a plurality of said prefabricated constructive elements and the method of installing the same achieve the expected aim and objects. In conclusion, a further beneficial aspect is in the fact that the consolidating structure allows a suitable drainage of the surface waters from the bottom, as it permits its evacuation through the lateral layers of the shielding cover. It is finally mentioned that this production method is advantageously performed wholly in the factory, and therefore under optimum operating conditions, especially as refers to the safety of the operators.

[0029] The prefabricated constructive element, the relative method of production, the consolidating structure obtainable by using a plurality of said prefabricated constructive elements and the method of installing the latter according to the invention are susceptible to numerous modifications and variants, all of which fall into the range of the same inventive concept.

[0030] In a practical implementation, the materials employed, the shapes, dimensions and executive details may differ from those listed above but be technically equivalent to the same, without thereby abandoning the scope of the invention.

Claims

1. Prefabricated constructive element (19) for the construction of a consolidating structure (210) comprising containing means (20) and filling material (22) for the filling of said containing means (20), **characterized in that** said filling material (22) comprises at least one supporting core (23) to support said consolidating structure (210) and at least one shielding cover (24) associated with said at least one supporting core (23) to shield said at least one supporting core (23) so as to allow the construction of said consolidating structure (210) within a very limited period of time and through the prevalent use of operating means.

2. Element (19), according to the former claim, **characterized in that** said containing means (20) comprise a plurality of mutually interconnected reticular panels.

3. Element (19), according to claim 1 and/or 2, **characterized in that** said at least one supporting core (23) comprises a concrete matrix (25) and a reinforcing/lifting frame (26) incorporated in said matrix (25).

4. Element (19), according to one or more of the former claims, **characterized in that** said reinforcing/lifting frame (26) comprises a cage of bars (27) arranged in a central position and a triplet of reticular panels (28) set up in a frontal and in a lateral position, respectively, of said cage of bars (27).

5. Element (19), according to one or more of the former claims, **characterized in that** said supporting core (23) is arranged in the central and rear area of said containing means (20).

6. Element (19), according to one or more of the former claims, **characterized in that** said at least one shielding cover (24) comprises a frontal layer (29), a pair of lateral layers (30) and a cover layer (31).

7. Element (19), according to one or more of the former claims, **characterized in that** said frontal (29), lateral (30) and cover (31) layers comprise a plurality

of stone fragments (32).

8. Element (19), according to one or more of the former claims, **characterized in that** said stone fragments (32) are at least partially incorporated in said concrete matrix (25).

9. Element (19), according to one or more of the former claims, **characterized in that** it comprises an introduction passage (33) transversally carved out in said supporting core (23) for introducing anchoring nails (212) for said consolidating structure (210) and an access opening (34) provided in the forward portion of said shielding cover (24) at the outlet level of said introduction passage (33) for accessing the terminal portion of said anchoring nails (212).

10. Element (19), according to one or more of the former claims, **characterized in that** it comprises a plurality of stiffening connections (35) interposed between said reticular panels (28) and said containing means (20) through said stone fragments (32) so as to stiffen said containing means (20).

11. Production process for producing a prefabricated constructive element, according to one or more of the former claims, **characterized in that** it comprises the following preparatory phases:

- Assembling forming means (101) so as to form said prefabricated constructive element (19);
- Introducing said containing means (20), in a conformation partially assembled, vertically from above in said forming means (101);
- Inserting, vertically from above, at least one limiting/supporting armature (103) without a bottom in a central and backward shifted position of said containing means (20), so as to define a positioning sector (104) and to support the lay down of said stone fragments (32);
- Applying said triplet of reticular panels (28) at the sides of said limiting/supporting armature (103);

and in the following executing phases:

- Emplacing a first layer of said stone fragments (32) in said positioning sector (104);
- Executing a plurality of said stiffening connection (35) interposed between said reticular panels (28) and said containing means (20) just above said first layer of said stone fragments (32);
- Emplacing a plurality of subsequent layers of said stone fragments (32) in said positioning sector (104) until reaching the top of said containing means (20) and executing a plurality of stiffening connections (35) interposed between said subsequent layers;
- Inserting a profiling body (105) into the front positioning sector (104) approximately in the central area between said stone fragments (32) so as to profile said access opening (34);
- Introducing said bar cage (27) into said limiting/supporting armature (103);
- Emplacing a conforming body (106) in said bar cage (27) in a position opposite said profiling body (105) in a transversal and downward sloping condition, so as to conform said introducing passage (33);
- Introducing concrete (107) in a pasty form into said limiting/supporting armature (103) and at the same time extracting said limiting/supporting armature (103) from its inserting position in a vertical sense and at a speed commensurate with the diffusion of said concrete (107) in said forming means (101);
- Vibrating said concrete in a pasty form during and after said introducing phase, so as to favor said diffusion and achieve an adequate self-leveling action of said concrete;
- Partially submerging stone fragments (32) in the surface of said concrete (107) in order to realize said cover layer (31);
- Closing off the upper porting of said containing means (20);

and in the following final phases:

- Maintaining said prefabricated constructive element (19) in said forming means (101) for a period of time suitable for achieving an adequate maturing of said concrete (107);
- Removing said prefabricated constructive element (19) from said forming means (101).

12. Consolidating structure (210) for consolidating a soil, **characterized in that** it comprises a plurality of superimposed rows (211) that are offset and interconnected by prefabricated constructive elements (19) according to one or more of the former claims, anchoring nails (212) driven into said soil for anchoring said rows (211) to said soil and blocking stops (213) interposed between said anchoring nails (212) and said prefabricated constructive elements (19) so as to firmly block said prefabricated constructive elements (19) to their respective anchoring nails (212).

13. Method for laying down a consolidating structure (210) for consolidating a soil, according to one or more of the former claims, **characterized in that** it comprises the following phases:

- Preparing the bottom (214) of said soil based on the characteristics of said consolidating structure (210);
- Emplacing a first row (211) of prefabricated constructive elements (19) through operating means on said bottom (214) and filling it out at the back with a gravel-type draining material:

- Emplacing a second row (211) of prefabricated constructive elements (19) through operating means in a manner superimposed and offset with respect to said first row (211);
- Driving a plurality of anchoring nails (212) into said soil through operating means, at a distance from said bottom (214) commensurate with the height of said consolidating structure (210) and at a sloping angle with respect to the horizontal plane suitable to perform the anchoring with said consolidation structure (210);
- Simultaneously with said driving-in phase, injecting cement grout into said anchoring nails (212);
- Emplacing a superimposed row (211) of prefabricated constructive elements (19), through operating means, in a position superimposed and offset with respect to each underlying row (211), until reaching the height required by said consolidating structure (210);
- Executing the stiffening connections interposed between said prefabricated constructive elements (19) so as to stiffen said consolidating structure (210);
- Applying said blocking stops (213) to the portions of said anchoring nails (212) projecting from said prefabricated constructive elements (19);
- Filling out the area in the back of the last row of said consolidating structure (210) with small-size debris and pebbles.
- Ordering the area overlaying said soil.

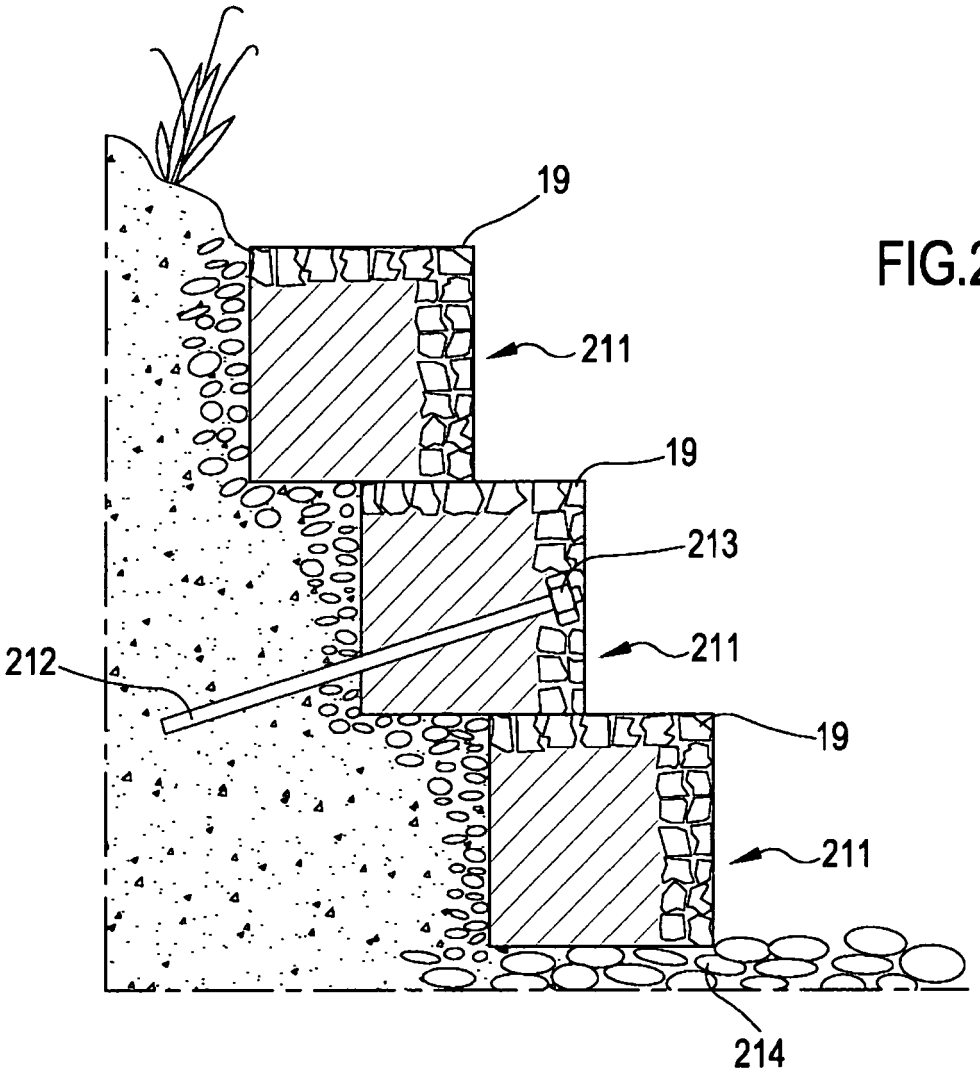


FIG.2

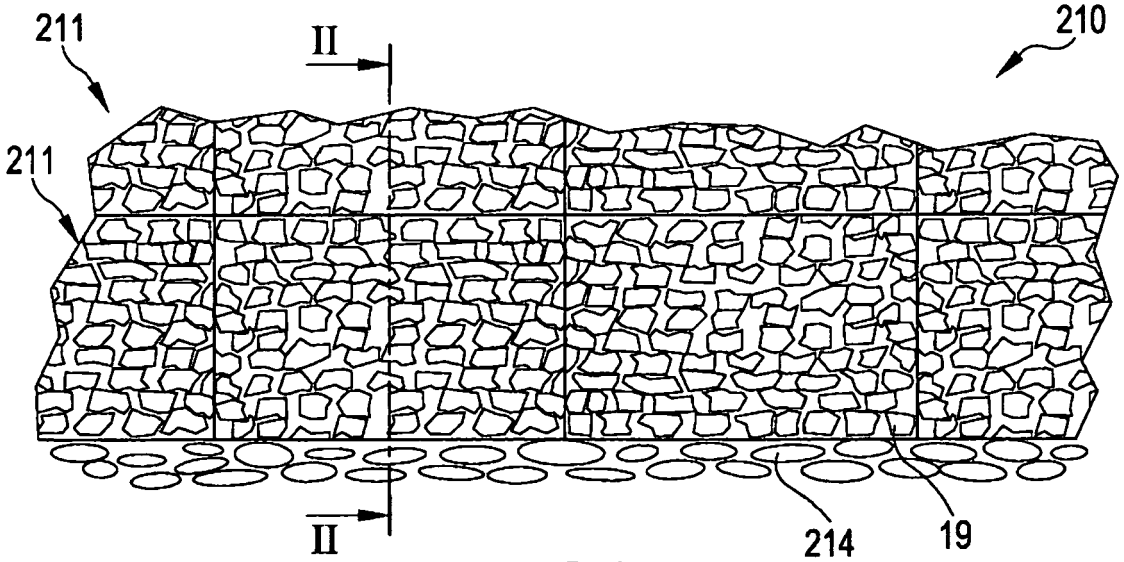


FIG.1

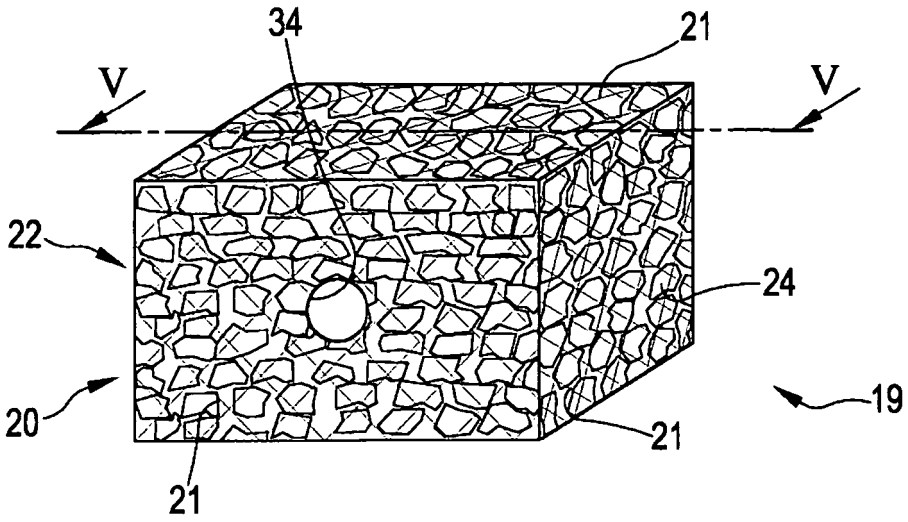


FIG.3

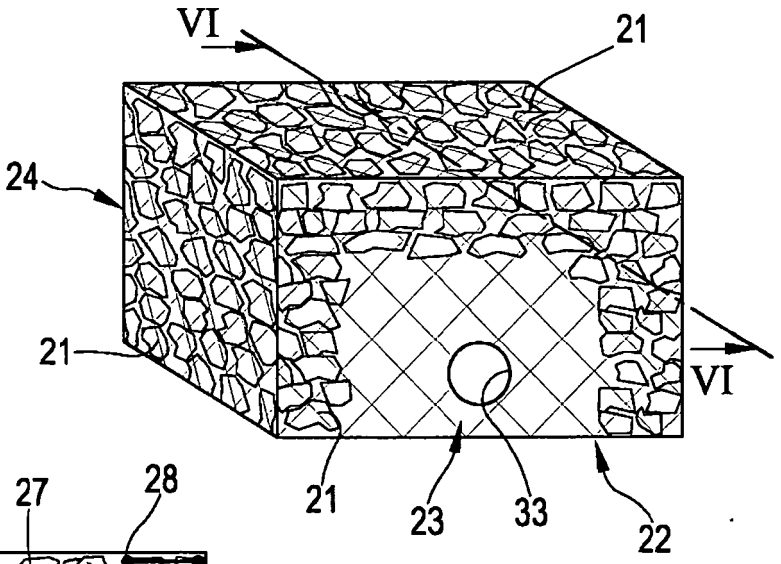


FIG.4

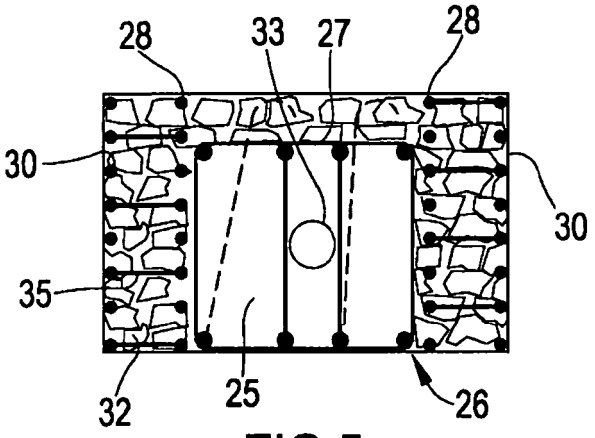


FIG.5

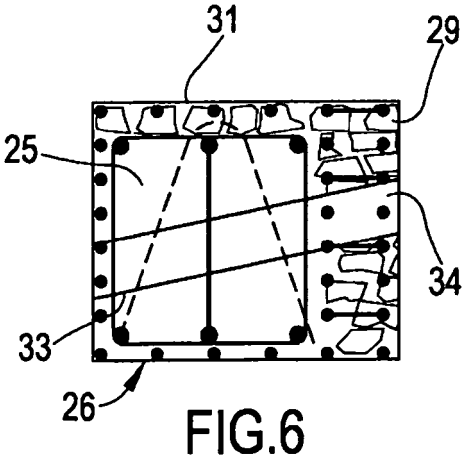


FIG.6

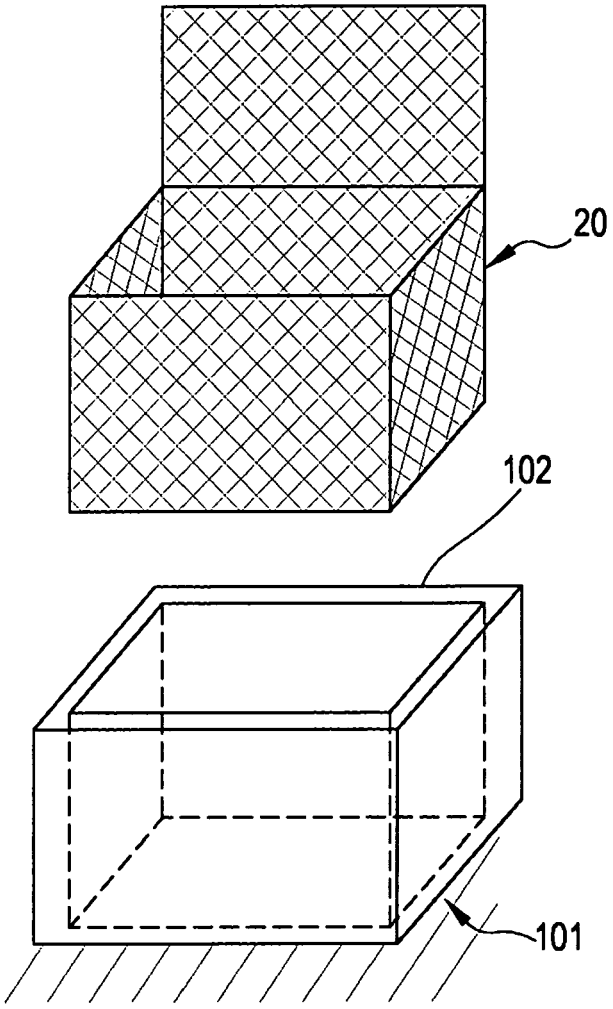


FIG.7

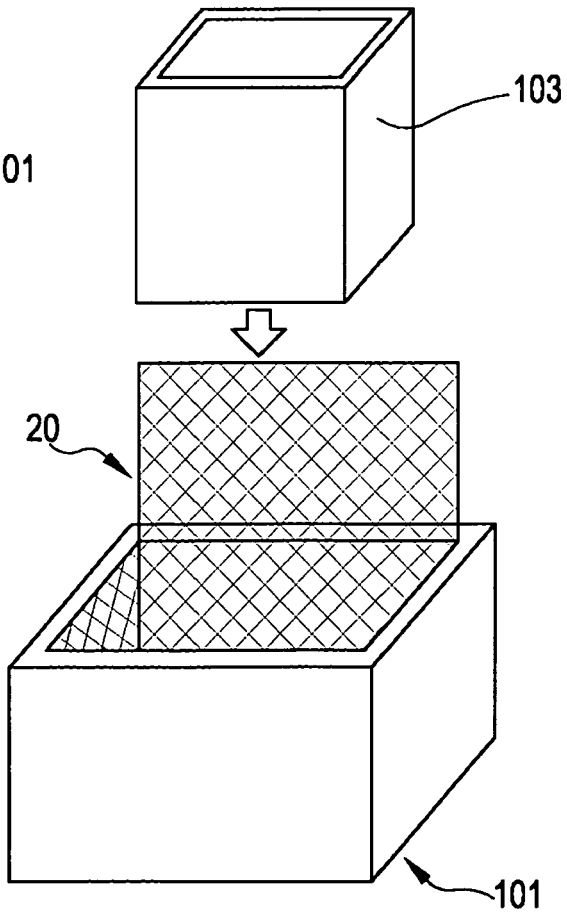


FIG.8

FIG.9

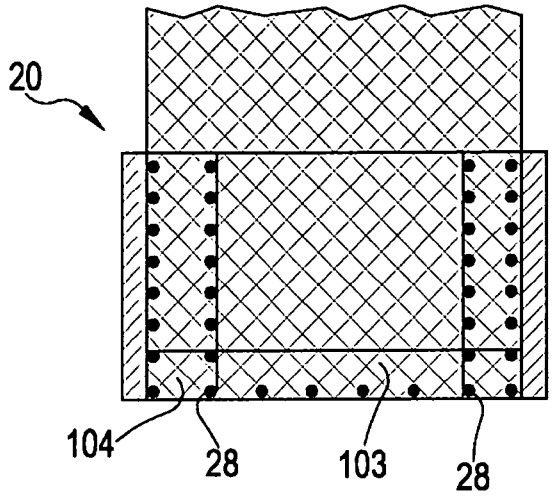


FIG.10

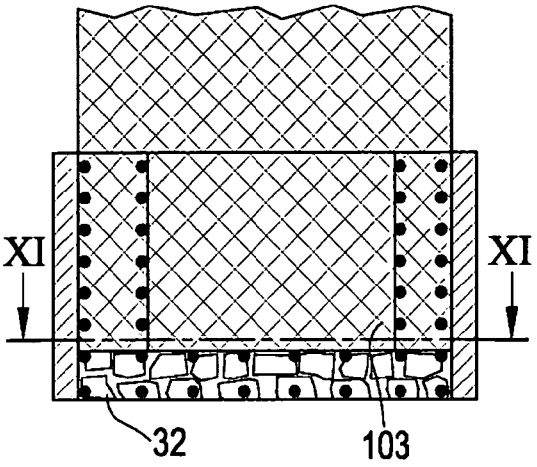
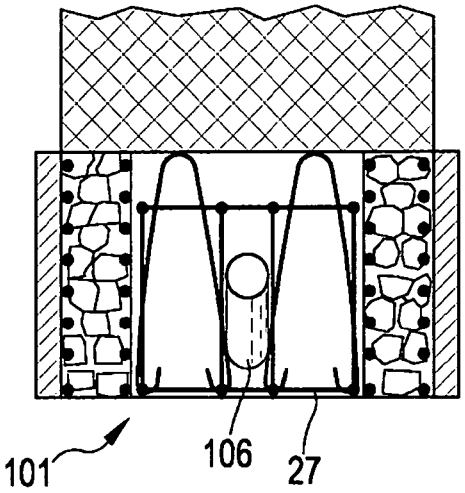


FIG.12



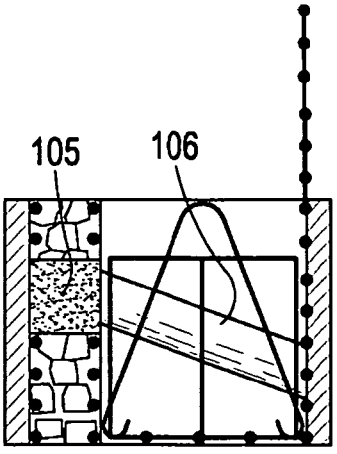


FIG.14

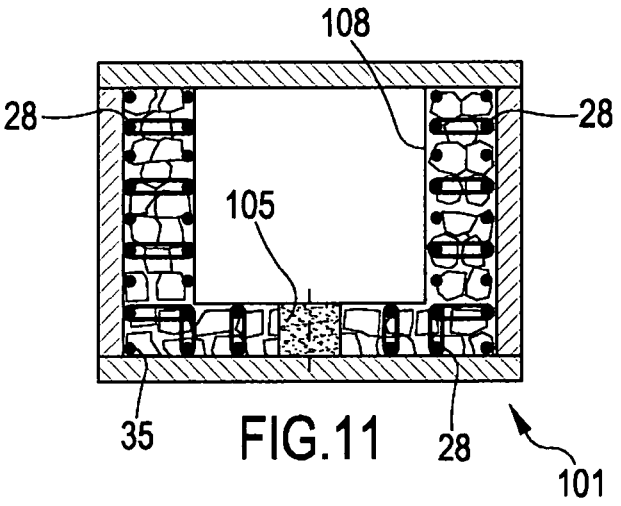


FIG.11

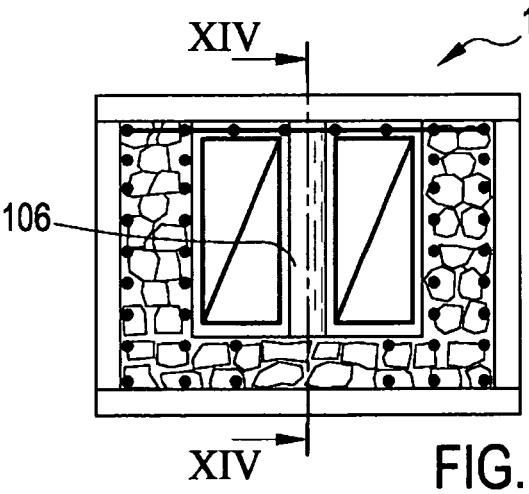


FIG.13

FIG.15

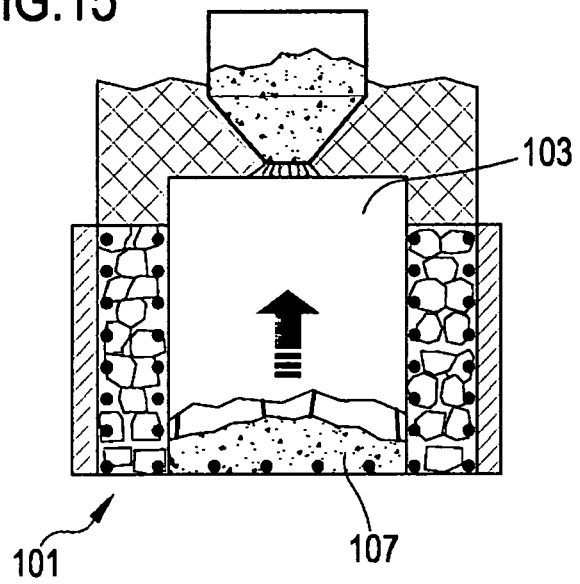


FIG.16

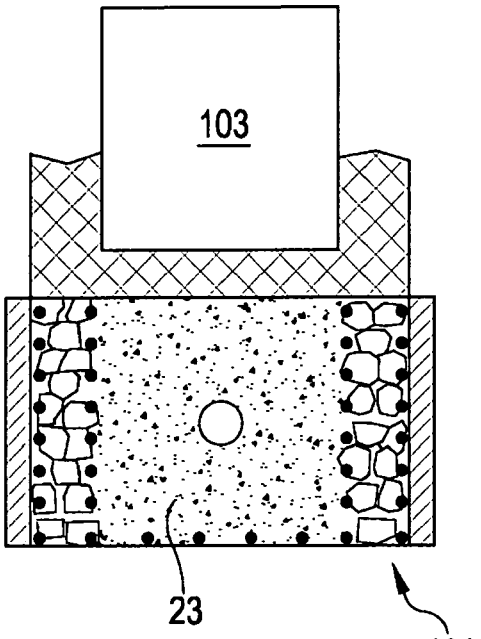
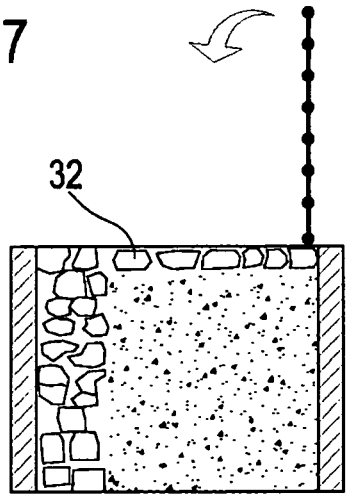


FIG.17



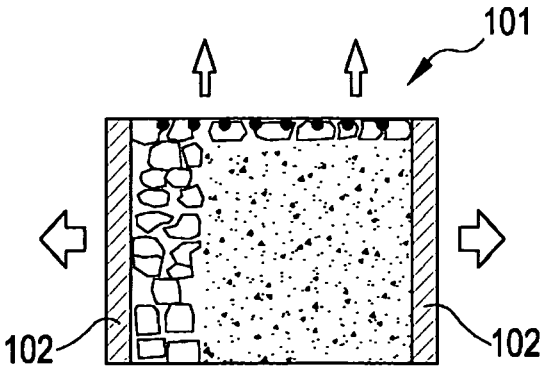


FIG.18

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EUROPEAN SEARCH REPORT

Application Number
EP 12 00 0145

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	14 May 2012	Leroux, Corentine

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