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**(54) A permeable layered element carrearageable parking construction**

(57) A permeable layered element carrearageable parking construction is characterized in that said construction comprises a water accumulating and hydrometric compensation layer made of foamed perlite (6) contained in filtering geotextile material bags; selected culture layers (10) adapted to hold a proper aerating and water ratio for a vegetable or grass species (9) root ap-

paratus; vegetable or grass species layer armoring elements (8) made of a synthetic or concrete material for allowing an efficient draining of meteoric water, consolidating the soil and protecting the grass surface from damages due to vehicular traffic; a sub-irrigation system for compensating for rain precipitation lacks, and a water supply net (11) arranged between the water accumulating element and overlaying layered patterns.

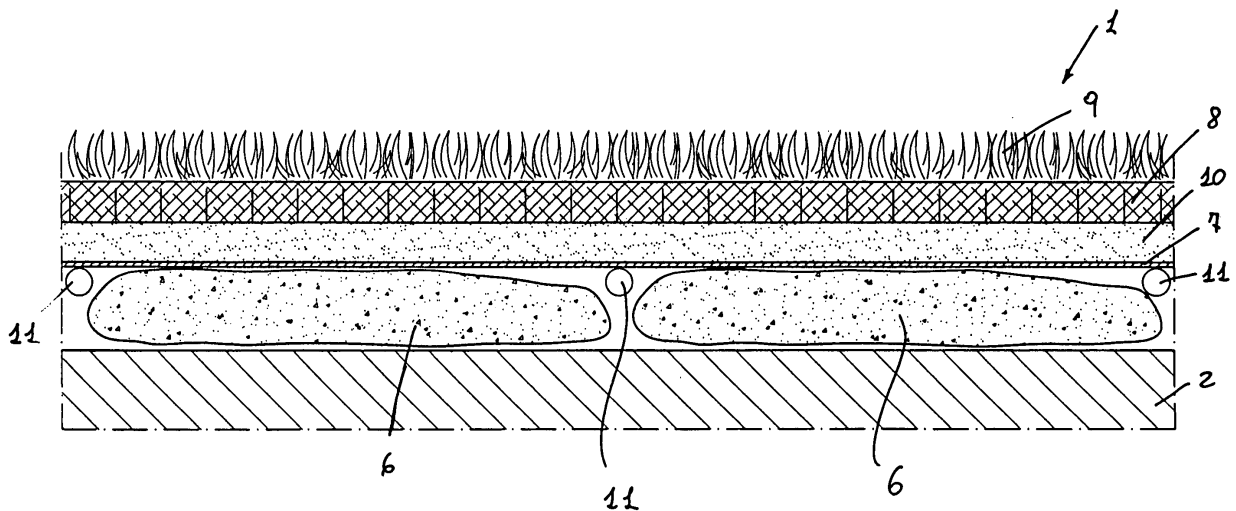


Fig. 1

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## Description

### BACKGROUND OF THE INVENTION

[0001] The present invention relates to a permeable layered element carrearageable parking construction.

[0002] As is known, a very important problem in making parking constructions is that of properly waterproofing soil in areas provided for receiving motor vehicles being parked.

[0003] This involve a comparatively large variation of the thermal-hydrometric conditions of the parking environment and a concentration of underground water toward the sewage system or net, with a consequent depletion of the underground water table.

[0004] Actually, to make percolating parking constructions by using un-selected soils and poor permeability foundations, causes quick drying phenomena or, vice versa, a large water stagnation.

### SUMMARY OF THE INVENTION

[0005] The aim of the present invention is to provide a water permeable carrearageable parking construction, having good ecologic properties, with a high water retaining capability, thereby overcoming the above mentioned prior art drawbacks and problems.

[0006] Within the scope of the above mentioned aim, a main object of the invention is to provide such a parking construction including a highly water retaining layered construction, not directly contacting the soil, in particular for pensile or closed structures, thereby providing an artificial type of water table holding optimum hydrometric conditions for a proper growing and preserving the overall parking system in a perfect green grass type of configuration.

[0007] Yet another object of the invention is to provide such a parking construction adapted to allow meteoric water to be easily conveyed to the natural water table or other water disposal off systems, while preventing any water stagnation phenomena from occurring.

[0008] Another object of the invention is to provide such a parking construction allowing water to be properly filtered before conveying it to the water table.

[0009] Yet another object of the invention is to provide such a parking construction allowing to achieve a great saving of required irrigation waters, and by providing a highly water accumulating foamed perlite layer.

[0010] Yet another object of the present invention is to provide such a parking construction which, owing to its specifically designed features, is very reliable and safe in operation.

[0011] Yet another object of the present invention is to provide such a parking construction which can be easily made by easily available elements and materials and which, moreover, is very competitive from a mere economic standpoint.

[0012] According to one aspect of the present inven-

tion, the above mentioned aim and objects, as well as yet other objects, which will become more apparent hereinafter, are achieved by a permeable layered element carrearageable parking construction, **characterized in that** said construction comprises a water accumulating and hygrometric compensation layer made of foamed perlite contained in filtering geotextile material bags; selected culture layers adapted to hold a proper aerating and water ratio for a vegetable grass or species root apparatus; vegetable grass or species layer armoring elements made of a synthetic or concrete material for allowing an efficient draining of meteoric water, consolidating the soil and protecting the grass surface from damages due to vehicular traffic; a sub-irrigation system for compensating for rain precipitation lacks, a water supply net arranged between the water accumulating element as well as overlaying layered patterns.

### BRIEF DESCRIPTION OF THE DRAWINGS

[0013] Further characteristics and advantages of the present invention will become more apparent hereinafter from the following detailed disclosure of a preferred, though not exclusive, embodiment of the invention, which is illustrated, by way of an indicative, but not limitative, example in the accompanying drawings, where:

Figure 1 is a schematic cross-sectional view of a parking construction according to the present invention, directly formed on permeable natural soil, with its layered patterns directly supported by the soil; Figure 2 is a further cross-sectional view showing an embodiment of the subject parking construction built on a waterproof soil where percolating water and polluting residues are conveyed to disposal off systems by a draining net and a anti-root waterproofing membrane, upon filtering by a foamed perlite layer; Figure 3 schematically shows a further parking embodiment directly supported on a green pensile covering construction, where the layered patterns are fully similar to the extensive and intensive plant green covering areas, integrated with armoring or reinforcing elements allowing the thus made structure to be used as a motor vehicle carrearageable construction; and Figure 4 is a cross-sectional view of yet another embodiment of the parking construction according to the present invention.

### DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0014] With reference to the number references of the above mentioned figures, the carrearageable parking construction according to the present invention, which has been generally indicated by the reference number 1, comprises supporting elements including a covering floor slab 2, with a properly tested load bearing capability, a

slope controlling layer, for conveying water toward outlet fittings of a sewage net, an optional thermoinsulating element, and a properly tested natural draining capability, chemical-physical composition and limit layer property natural permeable soil layer.

**[0015]** The subject parking construction comprises moreover a grass or vegetable species anti-root waterproofing element 4, preventing water, polluting substances and roots from penetrating buildings and/or natural underlying soil.

**[0016]** In this connection, it should be pointed out that, to meet the above critical requirements, it is possible to use herein different material and thickness membranes.

**[0017]** In a pensile embodiment of the invention, as shown in figure 3, the inventive parking construction comprises a draining and thermoinsulating element 5, including a plurality of panels forming an underlying air chamber for easily conveying water to discharging outlets and distributing it on the covering areas.

**[0018]** Said panels, in particular, also provides a mechanical protective action for protecting said membranes, as well as a thermoinsulating function.

**[0019]** In the embodiment of the inventive parking construction shown in figure 2, said parking construction comprises a tridimensional net draining element 3, arranged above an waterproofing structural element, to easily and quickly convey water to the water disposal off nets or systems.

**[0020]** In particular, said water disposal off nets or systems are used only in the embodiments of figures 2 and 3, since in the embodiment shown in figure 1 water is directly conveyed to the soil.

**[0021]** The inventive parking construction can moreover comprise a plurality of optional draining tubes, for improving the performance of said draining and thermally insulating element, for a very small inclination soils.

**[0022]** The subject construction also comprises a hygrometric compensating and water accumulating element 6, made of foamed perlite, held in filtering geotextile material bags, said foamed perlite having perlite cells so designed as to also provide the assembly with good aesthetic properties, further specially designed pieces for horizontally delimiting useful parking areas being moreover provided.

**[0023]** For allowing seeded plant or grass species to properly grow, it is further provided a culture sublayer 10, comprising inert and organic materials, as suitably manured, allowing water to be efficiently drained to prevent it from stagnating.

**[0024]** In particular, to further improve the green growth, a series of grass species adapted to grow in a small sublayer thickness have been herein chosen, said species having a high vehicle traffic resistance for a low speed vehicle traffic.

**[0025]** Furthermore, the inventive parking construction comprises a sub-irrigating system including a water supplying main net and a plurality of water irrigation and delivering tubes 11, arranged at a variable spacing between

the water accumulating element and filtering geotextile material felt.

**[0026]** Thus, owing to this sub-irrigating system, and the adoption of specifically designed dried arrangements encompassing the tubes, it is possible to reduce to a minimum possible cloggings of the tubes, thereby further improving the overall parking system operating capabilities.

**[0027]** The construction shown in figure 1, in particular, provides to directly install on the soil a plurality of layered patterns.

**[0028]** The foamed perlite element is herein designed to filter and accumulate any polluting substances, thereby slowing down and hindering their percolation into the water table.

**[0029]** This is also true for accidental oil and fuel leakages, in which comparatively high amounts of fuels and lubricating oils are discharged through the soil: in these cases, it would be preferred to properly replace the layered pattern forming materials, while preserving the underlying soil from polluting phenomena.

**[0030]** Figure 2 shows a parking construction embodiment built on a waterproof soil, where percolating water and polluting residues are conveyed to disposal off systems by a draining net and a waterproofing anti-root membrane, upon filtering through the above mentioned foamed perlite layer, thereby holding a water accumulation high degree to facilitate percolated water horizontal draining.

**[0031]** This embodiment can be alternatively arranged with vehicle parking regions on closed surfaces.

**[0032]** Figure 3 shows an embodiment of the invention built on a green grass pensile covering where the layered pattern is fully similar to those of extensive and intensive green grass coverings, and further comprising reinforcing elements for perfectly supporting motor vehicle parking and traffic loads.

**[0033]** It has been found that the invention fully achieves the intended aim and objects.

**[0034]** In fact, the invention provides a parking construction having many very great advantages with respect to prior parking constructions.

**[0035]** Moreover, the inventive parking construction is made of either natural or recycled materials, such as used materials, in particular plastic bottles or other non polluting synthetic material products.

**[0036]** Moreover, the ecologic parking construction according to the present invention can include soil layers having a thickness much less than that of conventional systems while preserving its very reliable and safe characteristics.

**[0037]** Furthermore, the subject parking construction has low maintenance requirements, thereby it is very competitive from a mere economic standpoint.

**[0038]** In addition, the possibility of using a sub-irrigation system overcome the need of installing exposed to the view irrigating elements, susceptible to vandalic acts, as they are used in public or motor vehicle traffic areas.

[0039] To the above it is to be further added that the above sub-irrigation system also prevents parked motor vehicle from being wetted by possible artificial rain irrigation system, to greatly water consume.

[0040] In addition, in a case of a scarcely permeable foundation, or on a continuous waterproofing or pensile surface, the subject system can be integrated with specifically designed draining systems adapted to convey waters to more permeable adjoining regions, outward of the sewage systems.

[0041] Finally, a proper selection of the grass species represents allows a controlled growth and a long duration of the grass surface.

[0042] In practicing the invention, the used materials, as well as the contingent size and shapes, can be any, depending on requirements.

### Claims

1. A permeable layered element carrearageable parking construction, **characterized in that** said construction comprises a water accumulating and hygrometric compensation layer made of foamed perlite contained in filtering geotextile material bags; selected culture layers adapted to hold a proper aerating and water ratio for a vegetable grass or species root apparatus; vegetable grass or species layer armoring elements made of a synthetic or concrete material for allowing an efficient draining of meteoric water, consolidating the soil and protecting the grass surface from damages due to vehicular traffic; a sub-irrigation system for compensating for rain precipitation lacks, and a water supply net arranged between the water accumulating element and overlying layered patterns.
2. A parking construction, according to claim 1, **characterized in that** said parking construction comprises supporting elements including a covering slab, a slope controlling layer, for conveying water toward the outlet fittings of the sewage net, an optional thermoinsulating element, and a natural permeable soil layer.
3. A parking construction, according to claim 1, **characterized in that** said parking construction comprises an anti-root water proving element preventing water and polluting substances and roots from penetrating into buildings and/or into the natural underlying soil.
4. A parking construction, according to claim 1, **characterized in that**, in a pensile configuration thereof, said construction comprises a draining and thermoinsulating element including a plurality of panels forming an underlying air chamber helping water to be conveyed to the discharging outlets and a distributing of the covering areas.
5. A parking construction, according to claim 1, **characterized in that** said parking construction comprises a tridimensional net draining element arranged above said waterproofing element to help a conveying of waters toward the water disposal nets.
6. A parking construction, according to claim 1, **characterized in that** said parking construction comprises a plurality of optional draining tubes for supporting a performance of said draining and thermally insulating element in a case of a very small inclination.
7. A parking construction, according to claim 1, **characterized in that** said parking construction comprises a geotextile material filtering felt of high toughness properties arranged above said accumulating element for restraining fine parts of the overlying sub-layer and consolidating the layered pattern.
8. A parking construction, according to claim 1, **characterized in that** said parking construction comprises a floor, for arranging thereon the armoring or stiffening elements of the overlying grass surface, defining a leveling layer with a porous stone material.
9. A parking construction, according to claim 1, **characterized in that** said parking construction comprises a synthetic or concrete armoring or reinforcing element, including a plurality of grid elements made of a recycled plastic material or concrete conglomerate elements adapted to operate as a consolidated armoring construction for the grass surface thereby rendering the latter carrearageable and resistant against a vehicle traffic; a culture sublayer including inert and organic fertilized materials being moreover provided.
10. A parking construction, according to claim 1, **characterized in that** said parking construction comprises a sub-irrigating system including a water supplying main net and a plurality of water irrigation and delivering tubes arranged at a variable spacing between the water accumulating element and filtering geotextile material felt; said tubes being encompassed by braided socks thereby limiting clogging of holes and improving the over operation of the system.
11. A parking construction, according to claim 1, **characterized in that** said element comprises moreover additional natural emending materials, of a vegetal or mineral nature (for example zeolites, coconuts), for actuating target agronomic functions.
12. A parking construction, according to claim 1, **characterized in that** said foamed perlite element is de-

signed for filtering and accumulating polluting substances thereby slowing their percolation through the water table; the percolating polluting residues being conveyed to disposal of nets by a draining nets and an anti-root waterproofing membrane upon filtering by said foamed perlite filtering layer.

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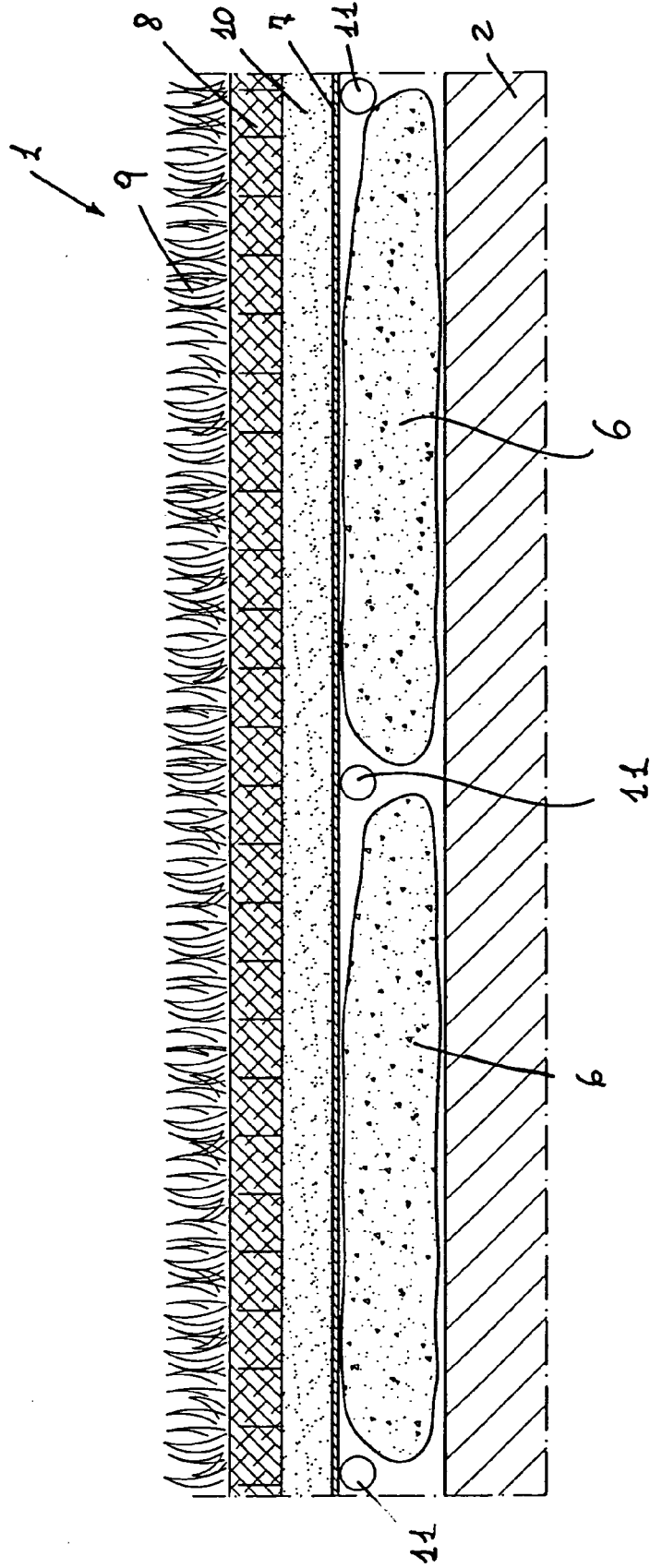


FIG. 1

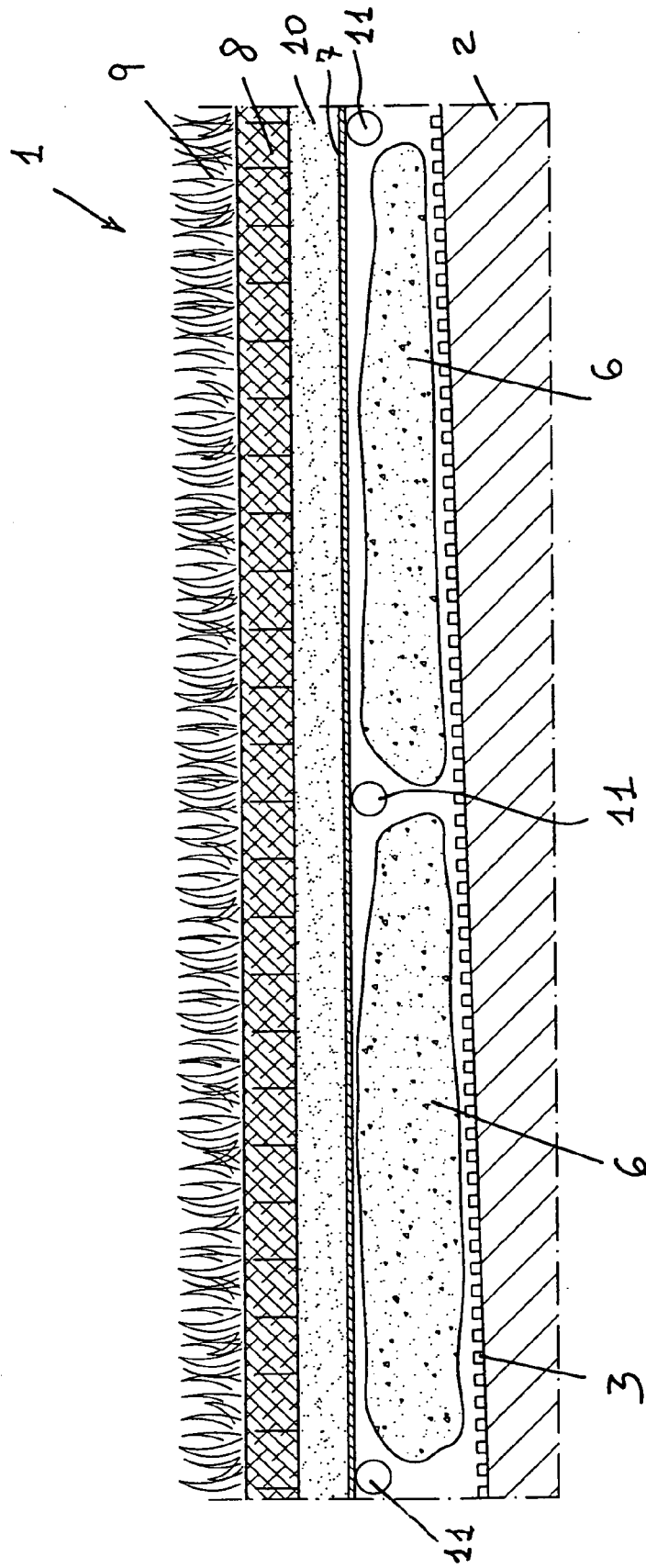


FIG. 2

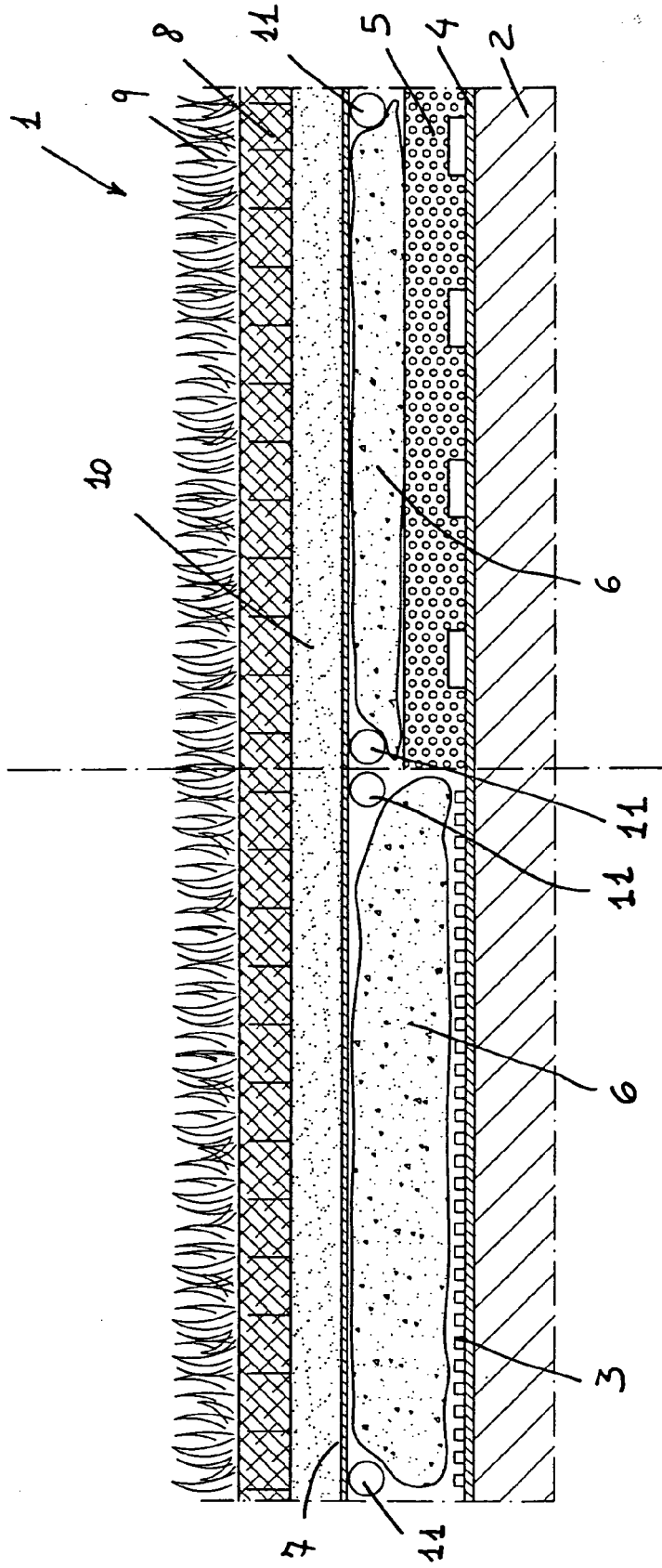


FIG. 3



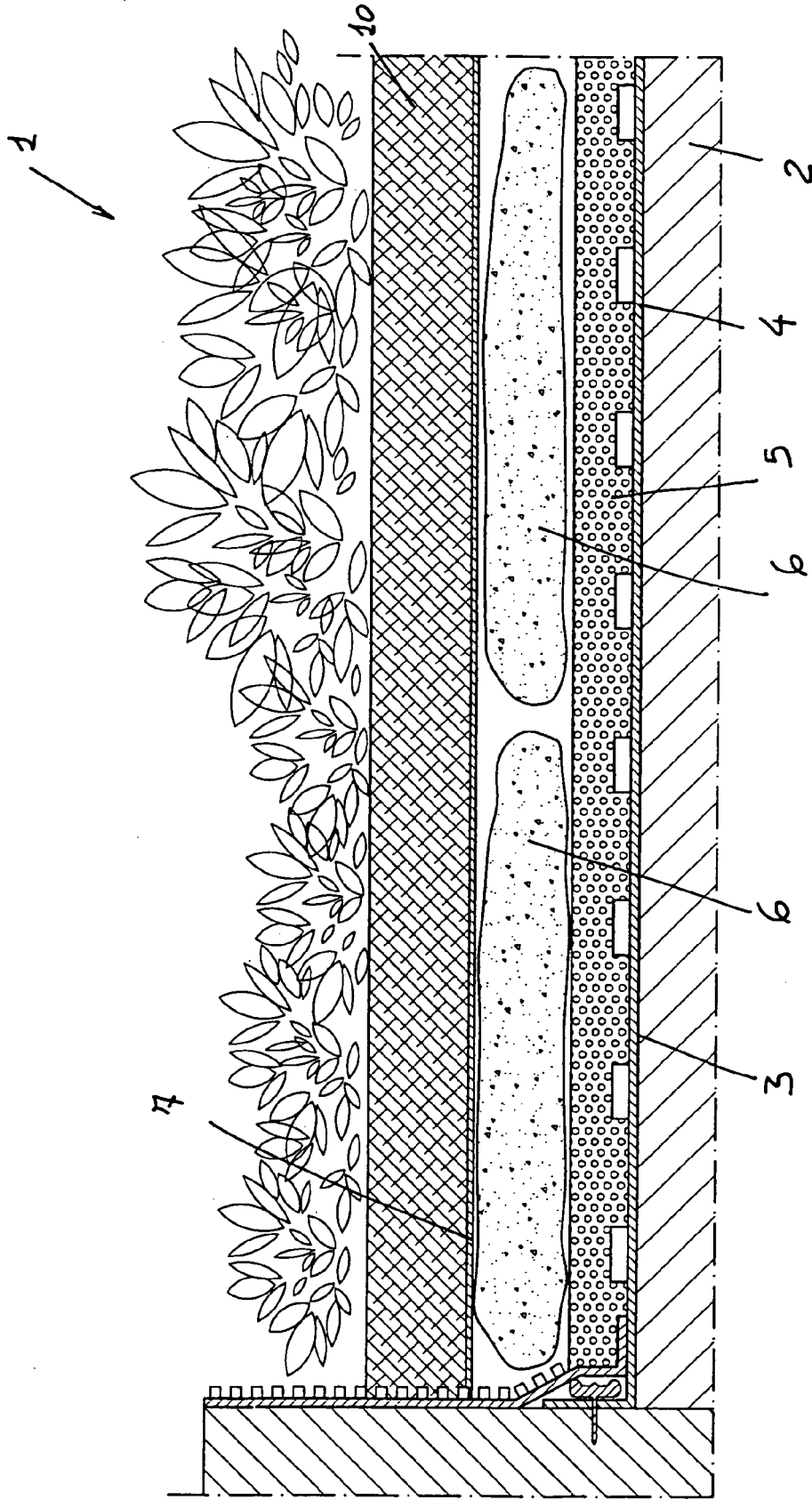


FIG. 4



## EUROPEAN SEARCH REPORT

Application Number  
EP 09 00 2543

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	US 2005/100401 A1 (URRIOLA HUMBERTO [AU] ET AL) 12 May 2005 (2005-05-12) * paragraphs [0103] - [0107]; figures 7,18-20 *	1	INV. E01C9/00 E01C13/02
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A	JP 2005 139891 A (FUYO PAARAITO KK) 2 June 2005 (2005-06-02) * abstract; figure *	1	
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			E01C
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 30 June 2009	Examiner Flores Hokkanen, P
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ..... & : member of the same patent family, corresponding document	

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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT  
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EP 09 00 2543

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30-06-2009

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82