CONSTRUCTING SYSTEM OF INSTANT PERMEABILITY AND UNDERFLOW PAVEMENT PREVENTING FROM FLOOD AND METHOD THEREOF

Applicants: Heung Sik Yu, Gyeonggi-do (KR); Seong Kyun Jin, Seoul (KR); Kyung Young Choi, Gyeonggi-do (KR)

Inventors: Heung Sik Yu, Gyeonggi-do (KR); Seong Kyun Jin, Seoul (KR); Kyung Young Choi, Gyeonggi-do (KR)

Assignees: Heung Sik Yu, Gyeonggi-do (KR); ECO-TOP CO., LTD, Kyungbuk (KR); Seong Kyun Jin, Seoul 1 (KR)

Appl. No.: 14/129,305
PCT Filed: Nov. 30, 2012
PCT No.: PCT/KR2012/010316
§ 371 (e)(1), Date: Dec. 26, 2013

Foreign Application Priority Data

Publication Classification
Int. Cl.
E01C 5/00 (2006.01)
E01F 5/00 (2006.01)
E01C 19/00 (2006.01)

U.S. Cl.
CPC: E01C 5/00 (2013.01); E01C 19/00 (2013.01); E01C 5/001 (2013.01); E01F 5/00 (2013.01)

ABSTRACT
The present invention is directed to a road pavement system with instant rainwater penetration and storing functions for protecting flood and a construction method thereof, which system comprises a plurality of lower blocks which each have a vertical engaging wing formed at a side of each lower block and a first through hole formed at a center region, with the neighboring lower blocks being engaged with each other in a vertical direction for preventing them from being separated in a horizontal direction; a plurality of intermediate layer blocks which are arranged spaced apart in a horizontal direction at the upper sides of the lower blocks and each have a second through hole in a vertical direction at a center region, with the neighboring intermediate layer blocks being engaged with each other; and a plurality of upper surface layer blocks which are arranged at the upper sides of the intermediate layer blocks and form an upper side of the road pavement and are connected with each other or are connected with the intermediate layer blocks in a horizontal direction.
manufacturing a lower layer

manufacturing an intermediate layer

manufacturing an upper surface layer
CONSTRUCTING SYSTEM OF INSTANT PERMEABILITY AND UNDERFLOW PAVEMENT PREVENTING FROM FLOOD AND METHOD THEREOF

TECHNICAL FIELD

[0001] The present invention relates to a road payment system with instant rainwater penetration and storing functions for protecting flood and a construction method thereof and in particular to a road payment system with instant rainwater penetration and storing functions for protecting flood and a construction method thereof which make it possible to provide a structurally safe and good flatness system by assembling, in multiple layers, a surface layer block penetrating water at a fast speed, an intermediate layer block and a connection block which help instantly store a lot of penetrating rainwater and a lower layer block which has a differential settlement prevention function and a water storing function without causing any stepped portion the ground that has weakened due to the penetration of a lot of rainwater.

BACKGROUND ART

[0002] In the 21st century, there are increasing natural disasters such as flood, earthquake, drought, etc. throughout the world, so it may be called an era of disaster.

[0003] In terms of the natural disasters, the flood causes most server damages because of the increasing payments which generally are performed with asphalt, concrete, etc., all impervious materials in the course of nation’s development, and the amount of rainwater penetrating into the underground decreases.

[0004] For the above mentioned reasons, underground water depletion and water lack problems occur even in the region that has a high level rainwater.

[0005] Since a water penetration-controlled road payment construction technology (method) or a road payment system which can resolve the above mentioned problems is not yet developed, a vicious circle of natural disasters largely affecting a human life in the form of flood, drought and underground lack continues to happen.

[0006] Though the Korean patent application number 10-2006-0071289 discloses a road payment system using a road payment block, a spacing-apart or separation problem occurs because of the weakened engagements of the blocks which make it hard to maintain the flatness of the paved surfaces. So, efficient developments on the stable structure are necessary.

DISCLOSURE OF INVENTION

[0007] Accordingly, it is an object of the present invention to provide a road payment system with instant rainwater penetration and storing functions for protecting flood and a construction method thereof which have features in that the flatness of a paved surface can be maintained by efficiently preventing a spacing-apart or separation problem between the engaged blocks, and the rainwater can be fast penetrate into the underside of the paved surface and can be fast stored for thereby preventing the rainwater flowing toward the surface, which results in the prevention of the flood. In addition, the depletion of the underground water can be prevented.

[0008] To achieve the above objects, there is provided a road payment system with instant rainwater penetration and storing functions for protecting flood, comprising a plurality of lower blocks which each have a vertical engaging wing formed at a side of each lower block and a first through hole formed at a center region, with the neighboring lower blocks being engaged with each other in a vertical direction for preventing them from being separated in a horizontal direction; a plurality of intermediate layer blocks which are arranged spaced apart in a horizontal direction at the upper sides of the lower blocks and each have a second through hole in a vertical direction at a center region, with the neighboring intermediate layer blocks being engaged with each other; and a plurality of upper surface layer blocks which are arranged at the upper sides of the intermediate layer blocks and form an upper side of the road payment and are connected with each other or are connected with the intermediate layer blocks in a horizontal direction.

[0009] The vertical engaging wing comprises a first wing part formed at one side surface of the lower layer block; and a second wing part formed at the other side surface of the lower layer block and fits the first wing part of the neighboring lower layer block in a vertical direction.

[0010] The lower layer block further comprises a water draining groove part formed at the region of the first wing part.

[0011] The neighboring intermediate layer blocks and the upper surface layer blocks comprise a plurality of arc shaped engaging arms which are engaged in vertical directions for thereby preventing them from being separated in horizontal directions, and a plurality of the arc shaped engaging arms are arranged in radial shapes in the circumferential directions of the upper surface layer blocks.

[0012] The connection blocks are cross shaped connection blocks which are arranged lower than the upper surfaces of the intermediate layer blocks.

[0013] The upper surface layer blocks comprise first upper surface layer blocks arranged on the upper sides of the intermediate layer blocks; and second upper surface layer blocks which are arranged on the upper sides of the connection block and are connected with each other or with the first upper surface layer blocks, and the first upper surface layer block is thinner than the thickness of the second upper surface block.

[0014] To achieve the above objects, there is provided a road payment system with instant rainwater penetration and storing functions for protecting flood, comprising a plurality of lower blocks which each have a vertical engaging wing formed at a side of each lower block and a first through hole formed at a center region, with the neighboring lower blocks being engaged with each other in a vertical direction for preventing them from being separated in a horizontal direction; manufacturing an intermediate layer on an upper side of the lower layer with a plurality of intermediate layer blocks which are arranged spaced apart in a horizontal direction at the upper sides of the lower blocks and each have a second through hole in a vertical direction at a center region, with the neighboring intermediate layer blocks

[0015] To achieve the above objects, there is provided a instant rainwater penetration and storing road payment method for protecting flood, comprising manufacturing a lower layer with a plurality of a lower blocks which each have a vertical engaging wing formed at a side of each lower block and a first through hole formed at a center region, with the neighboring lower blocks being engaged with each other in a vertical direction for preventing them from being separated in a horizontal direction; manufacturing an intermediate layer on an upper side of the lower layer with a plurality of intermediate layer blocks which are arranged spaced apart in a horizontal direction at the upper sides of the lower blocks and each have a second through hole in a vertical direction at a center region, with the neighboring intermediate layer blocks
being engaged with each other; and manufacturing an upper surface layer on an upper side of the intermediate layer with a plurality of upper surface layer blocks which are arranged at the upper sides of the intermediate layer blocks and form an upper side of the road and are connected with each other or are connected with the intermediate layer blocks in a horizontal direction.

ADVANTAGEOUS EFFECTS

[0016] According to the present invention, that the flatness of a paved surface can be maintained by efficiently preventing a spacing-apart or separation problem between the engaged blocks, and that the rainwater can fast penetrate into the underside of the paved surface and can be fast stored for thereby preventing the rainwater from flowing toward the surface, which results in an effective prevention of the flood. In addition, the depletion of the underground water can be prevented.

BRIEF DESCRIPTION OF DRAWINGS

[0017] FIG. 1 is a view illustrating a side structure of a road payment system with instant rainwater penetration and storing functions for protecting flood according to an embodiment of the present invention.

[0018] FIG. 2 is a perspective view of FIG. 1.

[0019] FIG. 3 is a disassembled perspective view of FIG. 2.

[0020] FIG. 4 is a perspective view illustrating a state that two lower layer blocks are connected.

[0021] FIG. 5 is a perspective view illustrating a lower layer block.

[0022] FIG. 6 is a side view illustrating a lower layer block.

[0023] FIG. 7 is a perspective view illustrating a state that intermediate layer blocks are connected by means of cross-shaped connection blocks.

[0024] FIG. 8 is a perspective view illustrating an upper layer block.

[0025] FIG. 9 is a flow chart of an instant rainwater penetration and storing road payment method for protecting flood according to an embodiment of the present invention.

[0026] FIG. 10 is a view illustrating a side structure of a road payment system with instant rainwater penetration and storing functions for protecting flood according to another embodiment of the present invention.

BEST MODES FOR CARRYING OUT THE INVENTION

[0027] The preferred embodiments of the present invention will be described with reference to the accompanying drawings.

[0028] FIG. 1 is a view illustrating a side structure of a road payment system with instant rainwater penetration and storing functions for protecting flood according to an embodiment of the present invention. FIG. 2 is a perspective view of FIG. 1. FIG. 3 is a disassembled perspective view of FIG. 2. FIG. 4 is a perspective view illustrating a state that two lower layer blocks are connected. FIG. 5 is a perspective view illustrating a lower layer block. FIG. 6 is a side view illustrating a lower layer block. FIG. 7 is a perspective view illustrating a state that intermediate layer blocks are connected by means of cross-shaped connection blocks. FIG. 8 is a perspective view illustrating an upper layer block. FIG. 9 is a flow chart of an instant rainwater penetration and storing road payment method for protecting flood according to an embodiment of the present invention.

[0029] As shown in FIGS. 1 to 3, the road payment system with instantaneous rainwater penetration and storing functions for protecting flood according to the present embodiment comprises a lower layer "L" formed of a plurality of lower layer blocks 110, an intermediate layer "M" formed of a plurality of intermediate layer blocks 120 and a plurality of connection blocks 130, and an upper surface layer "H" formed of a plurality of upper surface layer blocks 140a and 140b.

[0030] The lower layer "L" can be formed of a plurality of lower layer blocks 110 after a sand layer "A" is formed on an upper side of the ground aggregate layer "B", and the surface is flattened.

[0031] As shown in FIGS. 1 to 6, at a side surface of the lower layer block 110 are provided vertical engaging wings 111 and 112, thus forming a block structure body. The neighboring vertical engaging wings 111 and 112 are engaged so as to prevent themselves from separating in the horizontal direction. A first through hole 113 is formed at the center of the same.

[0032] At this time, the vertical engaging wings each 111 and 112 comprises a first wing part 111 formed at one side surface of the lower layer block 110, and a second wing part 112 which is formed on the other side surface of the lower layer block 110 and fits the first wing part 111 of the neighboring lower layer block 110 in a vertical direction.

[0033] As shown in FIG. 4, when two lower layer blocks 110 are engaged, the first and second wing parts 111 and 112 are engaged in a vertical direction, so that the engaged two lower layer blocks 110 are not spaced apart or separated in a horizontal direction for thereby obtaining a road stabilization thanks to a stronger engaging power, in other words, the compression resistance power and shearing resistance power of the road can be greatly enhanced.

[0034] The first and second wing parts 111 and 112 don't have the same shapes. A gap of 2-4 mm is formed between them for thereby maximizing a water drain effect.

[0035] Since the first through hole 113 formed in a horizontal direction of the lower layer block 110 is formed in a relatively larger size in the wider regions of the center of the lower layer block 110, a lot of rainwater coming in through the upper surface layer "H" and the intermediate layer "M" can be fast stored, instantly.

[0036] In the region of the first wing part 111 of the lower block 110 is further formed a water draining groove part 114. A semi-spherical water draining groove part 114 can maintain an empty space even when the lower blocks 110 are engaged in a side direction for thereby obtaining an effective water penetration effect and a water storing effect.

[0037] The lower layer block 110 having the above described structure has a flat upper surface 13a, and the front side 110b is protruded forwards, which can be seen in FIG. 6.

[0038] Next, the intermediate layer "M" has as wide surface as the lower layer "L" on the upper side of the lower layer
“L” in a horizontal direction. It may be formed of a plurality of intermediate layer blocks 120 and a plurality of connection blocks 130.

[0040] As shown in FIGS. 1 to 3 and 7, the intermediate layer blocks 120 form an intermediate layer “M” as they are arranged spaced-apart from each other. The neighboring spaced-apart intermediate layer blocks 120 are interconnected by the connection blocks 130.

[0041] The connection block 130 according to the present embodiment is formed of a cross shaped connection block 130 which is arranged lower than the upper surface of the intermediate layer block 120.

[0042] The intermediate layer block 120 has the same outer look as the upper surface layer blocks 140a and 140b in their planes. So, the intermediate layer blocks 120 well fit the upper surface layer blocks 140a and 140b, respectively, and are interconnected with each other in an assembly type.

[0043] The intermediate layer block 120 has a plurality of arc-shaped engaging arms 122 which help prevent a separation in the horizontal direction now that they are engaged with the neighboring upper surface layer blocks 140a and 140b in a vertical direction. The arc shaped engaging arms 122 arranged in a radial shape in the circumferential direction of the intermediate layer block 120 are arranged forming a S-shaped ring and are engaged with the neighboring upper surface blocks 140a and 140b. Thanks to the above mentioned connection structure, since the intermediate layer blocks 120 and the upper surface layer blocks 140a and 140b don’t not become spaced-apart or separated, the road can be stabilized with a strong engaging power, in other words, the compression resistance power and shearing resistance power of the roads can be greatly enhanced.

[0044] At the center of the intermediate layer block 120 is formed a second through hole 121 in a vertical direction. Since the second through hole 121 is formed with a larger size in a vertical direction, the drain and storing efficacies of water gathering thereat are high.

[0045] The upper surface layer “L” has as much area as the intermediate layer “M” in the horizontal direction on the upper side of the intermediate layer “M” and may be formed of a plurality of upper surface layer blocks 140a and 140b.

[0046] As shown in FIGS. 1 to 3 and 8, the upper surface layer blocks 140a and 140b are arranged on the upper sides of the intermediate layer blocks 120 forming the intermediate layer “M” for thereby forming an upper layer of a road payment and are connected with each other or with the intermediate layer block 120 in the horizontal direction.

[0047] Since the intermediate layer blocks 120 are connected through the cross shaped connection blocks 130 having the height lower than their surfaces, the heights of the upper surface layer blocks 140a and 140b should be different as shown in FIGS. 8A and 8B so that the upper surface layer can maintain a horizontal state after they are arranged on the upper sides of the intermediate layer blocks 120 and the cross shaped connection blocks 130.

[0048] In other words, in case of the present embodiment, the upper surface layer blocks 140a and 140b may be divided into the first upper surface block 140a arranged on the upper side of the intermediate layer block 120 and the second upper surface block 140b which is arranged on the upper side of the cross shaped connection block 130 and is connected with each other and is connected with the first upper surface block 140a. At this time, the first upper surface layer block 140a is thinner than the thickness of the second upper surface layer block 140b. In case that the first and second upper surface blocks 140a and 140b are arranged on the upper sides of the intermediate layer block 120 and the cross shaped connection block 130, the upper surfaces of the first and second surface layer blocks 140a and 140b become horizontal.

[0049] As mentioned above, the outer looks of the planes of the first and second upper surface layer blocks 140a and 140b and the intermediate layer block 120 are same, so the first and second upper surface blocks 140a and 140b are engaged with each other, and the first and second upper surface blocks 140a and 140b and the intermediate layer block 120 are engaged with each other in the assembling types. As the first and second upper surface layer blocks 140a and 140b are engaged with each other, a gap “G” as enlarged in FIG. 3 is formed between the first and second upper surface blocks 140a and 140b.

[0050] A plurality of arc shaped engaging arms 142a and 142b arranged in a radial shape in a circumferential direction are formed on the outer surfaces of the first and second upper surface blocks 140a and 140b, which form an S-shaped ring, so the neighboring elements strongly are engaged, so they are not spaced-apart and separate from each other in a horizontal direction.

[0051] The road payment system with instant rainwater penetration and storing functions for protecting flood according to the present invention will be described with reference to FIG. 9.

[0052] The lower layer “L” is made with a plurality of lower layer blocks 110 (SI1). At this time, the lower layer blocks 110 are connected in a side direction with the first and second wing parts 111 and 112, so that the lower layer blocks 110 are not separated or are not spaced apart in the side direction, in other words, in a horizontal direction.

[0053] The intermediate layer blocks 120 and the cross shaped connection block 130 are assembled to form a regular triangle and are arranged on the upper side of the lower layer “L” for thereby completing the intermediate layer “M” (SI2).

[0054] Next, the first and second upper surface layer blocks 140a and 140b are arranged on the upper sides of the intermediate layer blocks 120 and the cross shaped connection blocks 130, and the first and second upper surface layer blocks 140a and 140b are engaged with corresponding intermediate layer blocks 120 for thereby manufacturing the upper layer “L”, so the system assembled as shown in FIG. 1, in other words, the road payment structure can be completed.

[0055] When the above described connection structure is made, even when the ground has a problem due to an impact of a vehicle or a weakened ground, the arc shaped engaging arms 142a and 142b are not spaced apart or don’t separate in a horizontal direction. The compression resistance power and the shearing resistance power can be greatly enhanced.

[0056] In case of the road payment system of the above described structure, rainwater penetrate through the gap “G” formed between the first and second upper surface blocks 140a and 140b of the upper surface layer “L” and falls down and penetrates into the ground after it penetrates through the gap formed between the second through hole 121 and the cross shaped connection block 130 of the intermediate layer “M” and is stored in the first through hole 113 of the lower layer “L”, by which it is possible to substantially prevent the flood and the depletion of the underground water.

[0057] According to the present embodiment of the present invention, it is possible to prevent a phenomenon that the interconnected blocks 110, 120, 140a and 140b are spaced
apart or separate, thus maintaining a uniform flatness in the paved surface while preventing water from flowing on the road surface by fast penetrating and storing the rainwater as soon as it rains for thereby preventing the damages due to flood and the depletion of underground water. In addition, since the blocks 110, 120, 140a and 140b forming each layer are interconnected in a ring shape, the interlocking in the horizontal and vertical directions are good and the structural stability and durability are good as well. Even when a problem occurs at the ground, the blocks 110, 120, 140a and 140b won’t space apart easily and separate. In worse case, even when a heavy load and impact is repeatedly applied as a vehicle frequently runs, the blocks can be permanently used because the compression resistance power and shearing resistance power are good. Since the blocks are paved in a multistage-laminated structure so as to increase a storing space, it is possible to effectively cope with even when unexpected heavy rains fall.

[0058] FIG. 10 is a view illustrating a side structure of a road pavement system with instant rainwater penetration and storing functions for protecting flood according to another embodiment of the present invention.

[0059] In this case, the above described lower layer blocks 10 are stacked in a multistage-laminated structure in the directions of the heights for thereby completing a road pavement system. With the above described structure, an intended object of the present invention can be obtained.

[0060] As the present invention may be embodied in several forms without departing from the spirit or essential characteristics thereof, it should also be understood that the above-described examples are not limited by any of the details of the foregoing description, unless otherwise specified, but rather should be construed broadly within its spirit and scope as defined in the appended claims, and therefore all changes and modifications that fall within the means and bounds of the claims, or equivalences of such means and bounds are therefore intended to be embraced by the appended claims.

1. A road pavement system with instant rainwater penetration and storing functions for protecting flood, comprising:
   a plurality of lower blocks which each have a vertical engaging wing formed at a side of each lower block and a first through hole formed at a center region, with the neighboring lower blocks being engaged with each other in a vertical direction for preventing them from being separated in a horizontal direction;
   a plurality of intermediate layer blocks which are arranged spaced apart in a horizontal direction at the upper sides of the lower blocks and each have a second through hole in a vertical direction at a center region, with the neighboring intermediate layer blocks being engaged with each other; and
   a plurality of upper surface layer blocks which are arranged at the upper sides of the intermediate layer blocks and form an upper side of the road payment and are connected with each other or are connected with the intermediate layer blocks in a horizontal direction.

2. The system of claim 1, wherein the vertical engaging wing comprises:
   a first wing part formed at one side surface of the lower layer block; and
   a second wing part formed at the other side surface of the lower layer block and fits the first wing part of the neighboring lower layer block in a vertical direction.

3. The system of claim 2, wherein the lower layer block further comprises a water draining groove part formed at the region of the first wing part.

4. The system of claim 1, wherein the neighboring intermediate layer blocks and the upper surface layer blocks comprise a plurality of arc shaped engaging arms which are engaged in vertical directions for thereby preventing them from being separated in horizontal directions, and a plurality of the arc shaped engaging arms are arranged in radial shapes in the circumferential directions of the upper surface layer blocks.

5. The system of claim 1, wherein the connection blocks are cross shaped connection blocks which are arranged lower than the upper surfaces of the intermediate layer blocks.

6. The system of claim 1, wherein the upper surface layer blocks comprise:
   first upper surface layer blocks arranged on the upper sides of the intermediate layer blocks; and
   second upper surface layer blocks which are arranged on the upper sides of the connection block and are connected with each other or with the first upper surface layer block, and the first upper surface layer block is thinner than the thickness of the second upper surface block.

7. A road pavement system with instant rainwater penetration and storing functions for protecting flood, comprising:
   a plurality of lower blocks which each have a vertical engaging wing formed at a side of each lower block and a first through hole formed at a center region, with the neighboring lower blocks being engaged with each other in a vertical direction for preventing them from being separated in a horizontal direction;
   an intermediate layer block on an upper side of the lower layer with a plurality of intermediate layer blocks which are arranged spaced apart in a horizontal direction at the upper sides of the lower blocks and each have a second through hole in a vertical direction at a center region, with the neighboring intermediate layer blocks being engaged with each other; and
   an upper surface layer block which are arranged at the upper sides of the intermediate layer blocks and form an upper side of the road payment and are connected with each other or are connected with the intermediate layer blocks in a horizontal direction.

8. An instant rainwater penetration and storing road pavement method for protecting flood, comprising:
   manufacturing a lower layer with a plurality of lower blocks which each have a vertical engaging wing formed at a side of each lower block and a first through hole formed at a center region, with the neighboring lower blocks being engaged with each other in a vertical direction for preventing them from being separated in a horizontal direction;
   manufacturing an intermediate layer on an upper side of the lower layer with a plurality of intermediate layer blocks which are arranged spaced apart in a horizontal direction at the upper sides of the lower blocks and each have a second through hole in a vertical direction at a center region, with the neighboring intermediate layer blocks being engaged with each other; and
   manufacturing an upper surface layer on an upper side of the intermediate layer with a plurality of upper surface layer blocks which are arranged at the upper sides of the intermediate layer blocks and form an upper side of the road payment and are connected with each other or are connected with the intermediate layer blocks in a horizontal direction.