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(54) ASPHALT PAVEMENT REINFORCING INTERLAYER

(57) The present invention concerns a pavement interlayer system comprising successively: a bottom layer comprising a disposable peel off film, an adhesive layer comprising bitumen, a structural reinforcement layer comprising an open grid of continuous filament glass fibres, and a top layer consisting essentially of sand. The invention further pertains to a process of installing and repairing a pavement.

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Description

Technical field

[0001] The invention concerns an asphalt pavement reinforcing interlayer, a method of obtaining the same and of repairing or constructing a pavement.

[0002] Pavement usually consist of asphalt, concrete or mixtures thereof, which can be damaged by many factors such as weather and traffic loading. The latter in particular induces cracking in new and rehabilitated pavement through the transmission to the pavement through wheels of loads in the down and transverse directions.

Technical background

[0003] It is known to include reinforcement system in a pavement, either as an overlay or an interlayer to reduce the cracking of said pavement.

[0004] As an interlayer, said system is placed between two layers: a semi-rigid base layer that, for example in the case of the repairing of a pavement, may be a layer of the existing asphalt or cement; and a top layer comprising asphalt. For example, such a system is described in the document EP 3 686 344 A1. This document discloses a paving textile interlayer system comprising a non-woven paving textile, made of thermoplastic fibers, and a tack coat. This system may further include a fiberglass grid.

Summary of the invention

Technical problem

[0005] The known systems usually require the use of a tack coat for a better bonding of the interlayer to at least one of the base or the top layer. This bonding is primordial as it prevents the cracking of the pavement and thus prolongate its lifespan. Said tack coat is usually an asphalt emulsion and require the curing of the water it contains before applying any further layer.

[0006] The present invention offers to ease the installation or the repairing of a pavement while still maintaining a good level of bonding of the whole pavement.

[0007] Furthermore, the known systems, when including a fiberglass grid, also include a non-woven textile which brings a stress-relief function to the system

Solution to the technical problem

[0008] Accordingly, in a first aspect, the present invention concerns a pavement interlayer system comprising successively:

- a bottom layer comprising a disposable peel off film,
- an adhesive layer comprising bitumen,
- a structural reinforcement layer comprising an open grid of continuous filament glass fibres, and
- a top layer consisting essentially of sand.

[0009] In a second aspect, the present invention relates to a process of installing or repairing a pavement comprising:

- removing the disposable peel off film of the bottom layer of the system according to the invention,
- applying the system to a semi-rigid base layer, and
- paving an asphalt layer on top of the system.

Advantages of the invention

[0010] The disposable peel off film, or foil, allows to handle the system, for example in the form of a roll, by preventing the bonding of said system to an undesired surface, before being removed for the application of the system.

[0011] The adhesive layer ensures the cohesion of the whole system according to the invention, for example by preventing the delamination of the layers constituting the system, as well as its bonding to the repaired or new pavement.

[0012] The structural reinforcement layer, while ensuring the reinforcement of the road, also allows the adhesive(s) layer(s) to pass through the openings of the open grid it comprises to provide an enhanced bonding thanks to its grid structure.

[0013] The sand of the top layer, while fulfilling the same role as the disposable peel off film, i.e. allowing the handling of the system prior to its installation without said system bonding to an undesired surface, further allows vehicles, such as construction vehicles, to drive on the system of the invention, for example during the installation or repairing of a pavement, without damaging the system, for example because of the interactions between the adhesive layer and the tyres of the vehicles.

[0014] The combination of these features yields an interlayer system for repairing or constructing pavement that is easy to use and handle while providing an improved bonding within the layers of the new or repaired pavement, a prevention of the cracking of the pavement, and thus improve the lifespan of said pavement.

Detailed description of embodiments

[0015] The system of the invention may further comprise a second adhesive layer comprising bitumen disposed between the structural reinforcement layer and the top layer.

[0016] The addition of a second adhesive layer to the system further enhances the bonding of the layers and the cohesion of the repaired or new pavement that comprises the system of the invention.

[0017] In the system of the invention, the grid comprised in the structural reinforcement layer may be formed of at least two sets of substantially parallel strands of continuous filament glass fibres, each set having open-

ings between adjacent strands and the sets being oriented at a substantial angle, in particular at a substantially right angle, so as to define openings within the grid.

[0018] As recited above, this grid structure allows the bitumen comprised in the adhesive(s) layer(s) through, in order to provide a better bonding of the layer constituting both the system of the invention and a pavement comprising it.

[0019] Furthermore, the adhesive(s) layer(s) may contain fillers, the size of which must allow said adhesive(s) layer(s) to intertwine with the structural reinforcement layer.

[0020] To this end, the adhesive layer and/or the second adhesive layer may further comprise fillers having a D_{50} ranging from 50 μm to 150 μm, in particular ranging from 65 μm to 120 μm and preferably from 80 μm to 100 μm, and/or having a D_{90} ranging from 200 μm to 300 μm, in particular from 220 μm to 280 μm, and preferably from 230 μm to 270 μm

[0021] Such fillers may be such as $CaCO_3$ and SiO_2.

[0022] The openings of said grid may have dimensions, in particular lengths and/or widths, ranging from 15 mm to 50 mm, in particular ranging from 20 mm to 40 mm and preferably ranging from 22 mm to 30 mm.

[0023] A grid with such dimensions is particularly adapted to provide a good compromise between the enhancement of the bonding of the system as recited herein and the structural reinforcement of the system.

[0024] The open grid in a system according to the invention may have a weight ranging from 200 g/m^2 to 700 g/m^2, in particular ranging from 300 g/m^2 to 650 g/m^2, preferably ranging from 400 g/m^2 to 600 g/m^2.

[0025] The structural reinforcement layer in a system according to the invention may have a tensile strength ranging from 30 to 250 kN/m, in particular from 50 to 200 kN/m.

[0026] In a particular embodiment, the system of the invention is devoid of any non-woven textile.

[0027] According to this embodiment, the system of the invention offers an improved bonding and thus better prevents the cracking of the road.

[0028] In another embodiment, the structural reinforcement layer further comprises a non-woven textile, in particular a non-woven polymer textile, and preferably a non-woven thermoplastic textile, such as a non-woven polyethylene and/or polyester textile.

[0029] According to this embodiment, the system of the invention further provides a stress-relief function to the pavement.

[0030] The non-woven textile may consist essentially of fibers of at least one material, for example chosen from polymers, minerals and carbon fibers.

[0031] Amongst mineral fibers that may be used as a non-woven textile in the structural reinforcement layer of a system according to the invention may be cited glass fibers and basalt fibers.

[0032] Amongst the polymer fibers that may be used as a non-woven textile in the structural reinforcement layer of a system according to the invention may be cited thermoplastic fibers such as polyester fibers, polypropylene fibers, polyethylene fibers, polyamide fibers and acrylic fibers.

[0033] In this embodiment, the non-woven textile may have a weight ranging from 5 g/m^2 to 150 g/m^2, in particular ranging from 10 g/m^2 to 100 g/m^2 and preferably ranging from 15 g/m^2 to 50 g/m^2.

[0034] The system according to the invention may have a top layer essentially consisting of sand particles having a size ranging from 0.05 mm to 3.00 mm, in particular from 0.06 mm to 2.50 mm.

[0035] The system according to the invention may have a top layer having a weight ranging from 100 g/m^2 to 600 g/m^2, in particular ranging from 120 g/m^2 to 500 g/m^2, and preferably ranging from 150 g/m^2 to 450 g/m^2.

[0036] In preferred embodiments, the top layer of a system according to the invention has a weight of 150 g/m^2 or 400 g/m^2.

[0037] The weight of the top layer is chosen according to both the softness and the impregnation capacity of the bitumen comprised in the adhesive layer(s) of a system according to the invention.

[0038] A disposable peel-off non-stick film is affixed to the lower surface of the adhesive layer comprising bitumen and is removed prior to application.

[0039] In preferred embodiments of the invention, the system according to the invention comprises only the listed recited herein.

[0040] Thus, in a preferred embodiment, the system according to the invention consists of the following layers, said layers being as defined herein:

- a bottom layer,
- an adhesive layer,
- a structural reinforcement layer, and
- a top layer.

[0041] In another preferred embodiment, the system according to the invention consists of the following layers, said layers being as defined herein:

- a bottom layer,
- a first adhesive layer,
- a structural reinforcement layer comprising a non-woven textile,
- a second adhesive layer, and
- a top layer.

[0042] The system of the invention may be provided in the form of a roll.

[0043] During the installation of a road, a semi-rigid base layer comprising for example asphalt or cement may be laid. The system of the invention, for example as a roll, may then be placed upon that base layer, after removal of the disposable peel off film of the bottom layer as defined herein. A surface layer of asphalt may then be

paved on top of the system according to the invention to provide a road comprising said system.

[0044] In the case of the repairing of an existing road, the semi-rigid base layer may consist of existing materials of the road such as asphalt or cement.

[0045] According to a further aspect, the present invention relates to a process of installing or repairing a pavement comprising:

- removing the disposable peel off film of the bottom layer of the system according to the invention,
- applying the system to a semi-rigid base layer, and
- paving an asphalt layer on top of the system.

[0046] In a particular embodiment of the process according to the invention, the semi-rigid base layer is an asphalt layer or a cement layer.

[0047] As described herein above, in the case of repairing an existing pavement, said semi-rigid layer may consist of materials from said existing pavement.

Claims

1. A pavement interlayer system comprising successively:

   - a bottom layer comprising a disposable peel off film,
   - an adhesive layer comprising bitumen,
   - a structural reinforcement layer comprising an open grid of continuous filament glass fibres, and
   - a top layer consisting essentially of sand.

2. The system according to the preceding claim further comprising a second adhesive layer comprising bitumen disposed between the structural reinforcement layer and the top layer.

3. The system according to any of the preceding claims, wherein the grid is formed of at least two sets of substantially parallel strands of continuous filament glass fibres, each set having openings between adjacent strands and the sets being oriented at a substantial angle, in particular at a substantially right angle, so as to define openings within the grid.

4. The system according to the preceding claim, wherein the openings have dimensions, in particular lengths and/or widths, ranging from 15 mm to 50 mm, in particular ranging from 20 mm to 40 mm and preferably ranging from 22 mm to 30 mm.

5. The system according to any of the preceding claims, wherein the structural reinforcement layer further comprises a non-woven textile, in particular a non-woven polymer textile, and preferably a non-woven thermoplastic textile such as a non-woven polyethylene and/or polyester textile.

6. The system according to the preceding claim, wherein the non-woven textile has a weight ranging from 5 g/m^2 to 150 g/m^2, in particular ranging from 10 g/m^2 to 100 g/m^2 and preferably ranging from 15 g/m^2 to 50 g/m^2.

7. The system according to any of the preceding claims, wherein the open grid has a weight ranging from 200 g/m^2 to 700 g/m^2, in particular ranging from 300 g/m^2 to 650 g/m^2, preferably ranging from 400 g/m^2 to 600 g/m^2.

8. The system according to any of the preceding claims, wherein the structural reinforcement layer has a tensile strength ranging from 30 to 250 kN/m, in particular from 50 to 200 kN/m.

9. The system according to any of the preceding claims, wherein the top layer essentially consists of sand particles having a size ranging from 0.05 mm to 3.00 mm, in particular from 0.06 mm to 2.50 mm.

10. The system according to any of the preceding claims, wherein the top layer has a weight ranging from 100 g/m^2 to 600 g/m^2, in particular ranging from 120 g/m^2 to 500 g/m^2, and preferably ranging from 150 g/m^2 to 450 g/m^2.

11. The system according to any of the preceding claims, wherein the adhesive layer and/or the second adhesive layer further comprises fillers having a D_{50} ranging from 50 μm to 150 μm, in particular ranging from 65 μm to 120 μm and preferably from 80 μm to 100 μm, and/or having a D_{90} ranging from 200 μm to 300 μm, in particular from 220 μm to 280 μm, and preferably from 230 μm to 270 μm.

12. A process of installing or repairing a pavement comprising:

    - removing the disposable peel off film of the bottom layer of the system according to any of the preceding claims,
    - applying the system to a semi-rigid base layer, and
    - paving an asphalt layer on top of the system.

13. The process according to the preceding claim, wherein the semi-rigid base layer is an asphalt layer or a cement layer.

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EUROPEAN SEARCH REPORT

Application Number
EP 23 30 5948

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y	KR 101 174 256 B1 (KIM MOON JUNG [KR]; JUNG SHIN KUEK [KR]) 14 August 2012 (2012-08-14) * paragraphs [0021] - [0034]; figures *	1-13	INV. E01C7/18
Y	JP S55 92403 A (NICHIREKI CHEM IND CO) 12 July 1980 (1980-07-12) * the whole document *	1-13	
A	KR 100 463 914 B1 (KIM WOON KI; S & P CLEVER REINFORCEMENT AG) 30 December 2004 (2004-12-30) * claims; figures *	1-13	
A	KR 101 612 491 B1 (SN CONSTRUCTION CO LTD [KR]; ACE ROAD TECH CO LTD [KR] ET AL.) 14 April 2016 (2016-04-14) * claims; figures *	1-13	
			TECHNICAL FIELDS SEARCHED (IPC) E01C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	6 November 2023	Movadat, Robin

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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A : technological background
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E : earlier patent document, but published on, or after the filing date
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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 23 30 5948

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

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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