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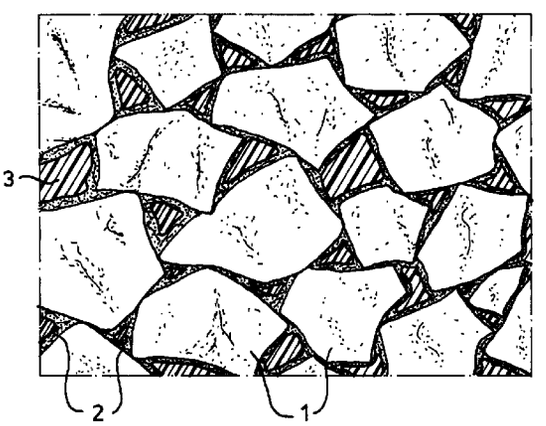
(54) Method for covering a joining interface in a road surface, and also the joining interface thus obtained

(57) A method for covering the interface between a bridge abutment and a bridge in a road with a surface material, comprises the steps of:

- providing an asphaltic mixture having high porosity and composed of small stone fragments (1) and bitumen (2),
- applying the apshaltic mixture at least at the interface,
- filling the pores or open cavities in the asphaltic mixture with a curable elastic plastics compound (3),
- curing the plastics compound.

fig-1



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Description

The invention relates to a method for applying a road-surface material composed of an asphaltic mixture of bitumen and small stone fragments which enclose cavities. This is, in particular, the road-surface material at the joining interfaces encountered in a road surface.

A method for covering such a joining interface between a bridge abutment and a bridge in a road is disclosed in EP-A-506196. At the position of the interface, an asphaltic mixture is used which has a high percentage of enclosed open cavities (drainage asphalt).

The interface between a bridge abutment and a bridge is exposed to fairly large movements which are produced by differences in expansion as a consequence of temperature variations in the bridge deck span structure. The road interface is also heavily loaded by the impact stresses of the traffic.

The asphaltic mixture having a relatively large quantity of enclosed cavities (drainage asphalt) appears to be less resistant to such conditions. The flexibility is fairly low, as a result of which the expansion differences may be inadequately absorbed. In addition, the capacity to absorb impact stresses without permanent deformations occurring is too low.

EP-B-642 has attempted to offer a solution to this problem. For this purpose, the joining interface is filled with a mixture of aggregate parts and a bituminous binder with a rubber base. Such a mixture is less suitable for high traffic stresses in view of its viscoelastic behaviour resulting from of the high proportion of bitumen. It has been found that such improvements do not offer an adequate solution with the increase in traffic stresses.

The object of the invention is therefore to provide a method which is adequate in this connection. This is achieved by means of a method for covering the interface between a bridge abutment and a bridge in a road with a surface material, comprising the steps of:

- providing an asphaltic mixture having high porosity and composed of small stone fragments (1) and bitumen (2),
- applying the asphaltic mixture at least at the interface,
- filling the pores or open cavities in the asphaltic mixture with a curable elastic plastics compound (3),
- curing the plastics compound (3).

The combination of a very open asphalt and the plastics compound present therein has various advantages. First of all drainage asphalt has an improved bearing capacity compared with a conventional asphaltic mixture. The essentially equally graded small stone fragments are encased in a bituminous mortar which provides for the cohesion of the mixture.

During the application and compacting of the drainage asphalt layer, the small stone fragments are pressed against one another so that a supporting stone skeleton is produced, which provides for a good load transfer from the road surface to the underlying supporting structure. Because, however, the bituminous joint between the small stone fragments can undergo only limited deformation, the cohesion of the layer would be lost in the event of fairly large deformation and crack formation occurs (fatigue effect), as explained above.

This disadvantage is counteracted by the plastics filling in the accessible hollows of the drainage asphalt. Said plastics filling forms an elastic cohesion means which continues through the layer of surface material and is comparable with a network structure which counteracts the loss of cohesion in the asphaltic mixture in the event of large deformations. The positive consequence of this is that the supporting skeleton of the surface layer remains intact. Both crack formation and ruts can thereby largely be avoided.

Together with the viscoelastic behaviour of the bitumen layer around the small stone fragments, the plastics compound thus appears to provide a predictable and stable behaviour of the combination, even in the case of the relatively large movements which occur in road interfaces.

Crucial in the absorption of such large elongations or movements is that the points in the road-surface material where the largest percentage deformations occur (near the contact faces between the stones) are provided with bituminous, plastic deformable mortar and that the binding elastic plastics filler is situated at the points where the percentage movements have more or less been eliminated by damping and are thus smaller (in the hollows between the asphalt grains, at a certain distance from the contact faces).

A further improvement may be obtained by applying a curable plastics compound which, during the curing process, produces a small amount of foam (small gas bubbles). Thereby, the formation of large stress concentrations in the plastics filling, resulting from a three axial stress pattern, is avoided when great deformations occur of the system comprising drainage asphalt and plastics.

As a result of these properties, the surface material is pre-eminently suitable for the interface between a bridge and the adjoining bridge abutment.

According to a first possibility, the asphaltic mixture can be applied on either side of and above the interface between the bridge abutment and the bridge. The adjoining road-surface sections may have a different composition.

According to a second possibility, the asphaltic mixture can be applied over a bridge deck and the adjoining road sections and also over the interface between bridge deck and at least one road section, the plastics compound being introduced at least at the interface.

Such a method makes it possible to carry out the work efficiently since the road, the interface and the

bridge can be covered in one continuous operation. Only later is it necessary to introduce the plastics compound at the point of the interface without affecting the finished road surface.

A boundary can be provided in the surface material on either side of the interface before the plastics compound is introduced.

According to a variant, the plastics compound can also be introduced into the asphaltic mixture covering the bridge.

Reference is made to the method for applying a surface material as disclosed in NL-A-7314861. Said known method is used for covering traffic surfaces such as runways for an airport, road surfaces, etc.

The traffic surfaces thus obtained must be very resistant to the fatigue stresses which occur as a consequence of the passing traffic. Said fatigue stresses comprise local deflections which may ultimately give rise to crack formation.

Such stresses are not primarily crucial for a joining interface. At the point of a joining interface, the road-surface material is exposed especially to stresses which are the consequence of expansion movements of the bridge, which essentially generate horizontally directed stresses.

The plastics compound introduced into the asphaltic mixture imparts a higher stability to the covering material thus manufactured, in combination with a certain degree of flexibility.

It is not known from said publication to use the method described therein in an interface between a bridge abutment and a bridge deck. Reason for this is that the flexibility of the product as known therefrom offers a too limited deformation capability.

The invention also relates to a road-surface structure comprising an interface between a bridge and a bridge abutment, at which interface a surface material is situated which comprises an asphaltic mixture of small stone fragments having an encasing of bituminous mortar which is situated on the surface of the small stone fragments, by means of which encasing the small stone fragments are attached to one another with the inclusion of residual cavities filled with an elastic plastics compound.

According to a first possibility the plastics compound can only be introduced into the asphaltic mixture at the interface. In that case, the asphaltic mixture filled with plastics material can be enclosed between two boundaries extending through the surface material.

According to a second possibility, the surface material extends continuously over bridge, interface and bridge abutment.

The invention will be explained in greater detail below with reference to the attached figures.

Figure 1 shows a section through the surface material.

Figure 2 shows a section through a joining interface.

Figure 1 shows a surface material according to the invention. Said surface material is composed of an asphaltic mixture known per se (drainage asphalt) composed of small stone fragments 1 and a bituminous mortar 2 which is situated on the surface of the small stone fragments. By means of this layer of bituminous mortar 2 on the small stone fragments 1, the latter are attached to one another, as a result of which a rigid stone skeleton is produced which can transmit stresses in a suitable manner to a foundation via the contact faces between the various small stone fragments.

The bituminous mortar gives the skeleton a slight degree of flexibility, as a result of which said skeleton can yield to a limited degree under stress. If a certain degree of deformation is exceeded, as may occur, for example, on steel bridge decks or in joining interfaces between a bridge deck and a bridge abutment, the skeleton deforms plastically, as a result of which cracks may be produced and small stone fragments may ultimately break away under the influence of the vehicular traffic.

According to the invention, the cavities between the small stone fragments with their bituminous mortar layer are filled with an elastic plastics compound 3 which is capable of causing the skeleton to yield elastically even for fairly large deformations so that the skeleton can return to its original shape.

Said elastic plastics compound 3 may be composed, for example, of polyurethane or epoxy. A material which can be cured by means of UV light can also be used.

The plastics compound 3 can be introduced into the cavities between the small stone fragments 1 in the form of a two-component mixture. Said mixture can easily penetrate all the cavities, and can then cure as a result of the two components reacting with one another.

Figure 2 shows the joining interface between a bridge abutment 4 and a bridge deck span structure 5 which rests on bearing 6. A sealing profile 7 has been provided in a known manner between bridge abutment 4 and bridge deck span structure 5, as well as a steel plate 8 which is coated on the top and bottom with a sliding layer of bituminous material 13.

Together with the adjacent surfaces of the bridge abutment 4 and bridge deck span structure 5, the joining interface is provided with a continuous layer of surface material 9 composed of a very open asphaltic mixture composed of small stone fragments with a bituminous mortar (drainage asphalt). According to the invention, the open cavities of the asphaltic mixture in the vicinity of the joining interface have been filled with a cured elastic plastics material.

The asphaltic mixture 10 according to the invention is therefore situated at the point of the joining interface. Said asphaltic mixture is pre-eminently suitable, on the one hand, for absorbing stresses exerted by the road traffic and, on the other hand, for absorbing the relative movements resulting from expansion movements of the bridge deck span structure.

The asphaltic mixture 10 may be enclosed by boundaries 11, 12 which are intended to enclose the plastics material against leakage during introduction so that the mixture according to the invention is produced only at the point of the joining interface.

As an alternative, the asphaltic mixture could also be provided in a slot recessed or provided at the point of the joining interface and then filled with the plastics compound. It is also possible for bituminous topping layers to be present in addition between the concrete bearing structure and the mixture according to the invention.

Claims

1. Method for covering the interface between a bridge abutment and a bridge in a road with a surface material, comprising the steps of:

   - providing an asphaltic mixture having high porosity and composed of small stone fragments (1) and bitumen (2),
   - applying the asphaltic mixture at least at the interface,
   - filling the pores or open cavities in the asphaltic mixture with a curable elastic plastics compound (3),
   - curing the plastics compound (3).

2. Method according to Claim 1, wherein the asphaltic mixture is applied on either side of and above the interface between the bridge abutment and the bridge.

3. Method according to Claim 1 or 2, wherein the asphaltic mixture is applied over a bridge deck and the adjoining road sections and also over the interface between bridge deck and at least one road section, and the plastics compound is introduced at least at the interface.

4. Method according to Claim 3, wherein a boundary (11, 12) is provided in the surface material on either side of the interface before the plastics compound (3) is introduced.

5. Method according to Claim 3 or 4, wherein the plastics compound is introduced into the asphaltic mixture covering the bridge.

6. Method according to one of the preceding claims, wherein a plastics compound is applied providing foam formation or formation of gas bubbles upon curing.

7. Road-surface structure manufactured according to the method according to one of the preceding claims, comprising an interface between a bridge (5) and a bridge abutment (4), at which interface a surface material is situated which comprises an asphaltic mixture of small stone fragments (1) having an encasing of bituminous mortar (2) which is situated on the surface of the small stone fragments (1), by means of which encasing the small stone fragments (1) are attached to one another with the inclusion of residual cavities filled with an elastic plastics compound (3).

8. Road-surface structure according to Claim 7, wherein the surface material extends continuously over bridge (5), interface and bridge abutment (4).

9. Road-surface structure according to Claim 7 or 8, wherein the plastics compound is only introduced into the asphaltic mixture at the interface.

10. Road-surface structure according to Claim 9, wherein the asphaltic mixture filled with plastics material is enclosed between two boundaries (11, 12) extending through the surface material.

11. Road-surface structure according to Claim 9 or 10, wherein the bridge-covering asphaltic mixture is filled with the plastics compound.

12. Road-surface structure according to one of Claims 7-11, wherein the interface is covered by a plate (8) which is coated on the top and bottom with a sliding layer (13) composed of bituminous material, above which plate the surface material is situated.

fig-1

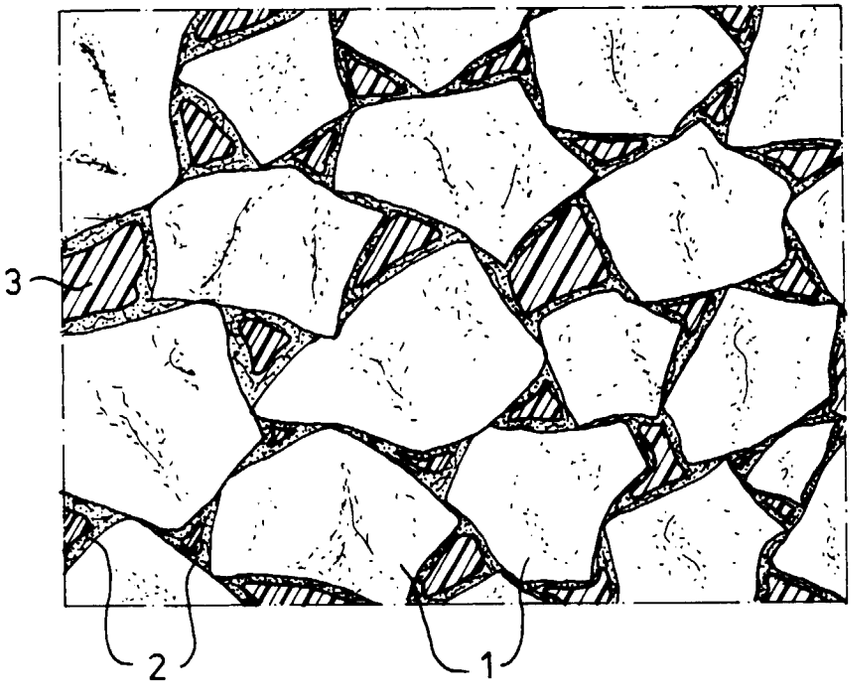
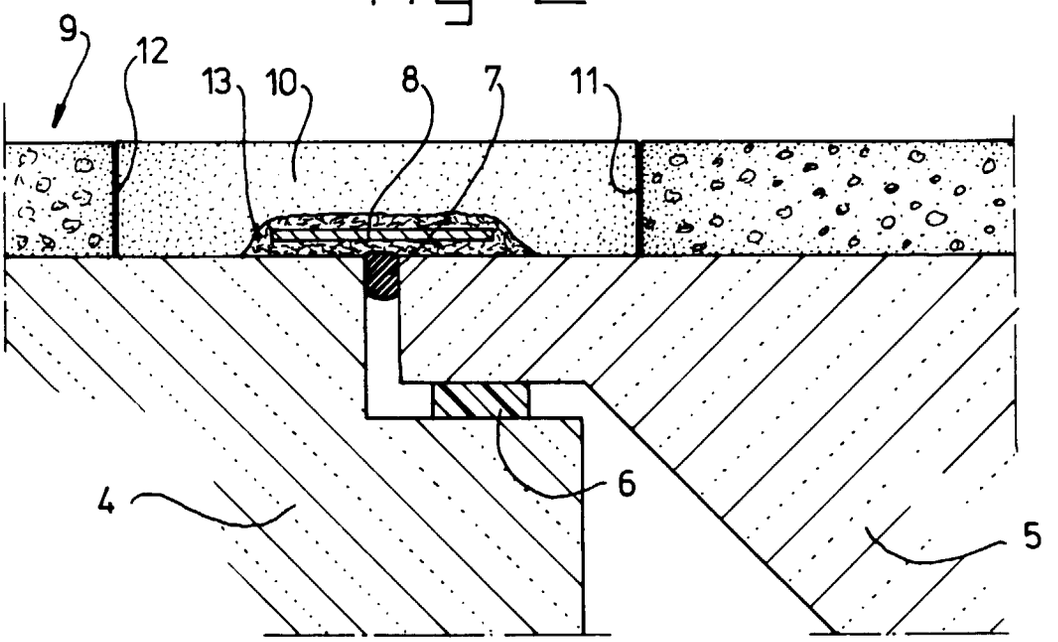


fig-2



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EUROPEAN SEARCH REPORT

Application Number
EP 98 20 0341

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
D,Y A	NL 7 314 861 A (KUNZ) 2 May 1974 * the whole document *	1,2,7,8 11	E01C7/32 E01D19/06 E01D19/08
D,Y	EP 0 000 642 A (THORMACK) 7 February 1979 * the whole document *	1,2,7,8	E01C7/26
D,A	EP 0 506 196 A (HOLLANDSCHE BETONGROEP NV) 30 September 1992 * abstract *	1,7,12	
A	NL 7 104 951 A (SHELL) 19 October 1971 * the whole document *	1,7	

TECHNICAL FIELDS SEARCHED (Int.Cl.6)

E01C
E01D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	15 May 1998	Dijkstra, G

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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